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Dear colleagues, collaborators and students,

It is my great pleasure to address you a few thoughts and to express my thanks for the contribution each of you has brought and will bring to the development of Romanian education and research in the fields of agriculture, food industry and environmental protection. This conference, which is organized regularly by the Faculty of Agricultural Sciences, Food Industry and Environmental Protection, pursues today a much deeper approach, since it interknits with ULBS 45, an event marking 45 years of continuous academic education within our university.

Sustainable development is the fundamental goal of the Europe 2020 strategy, by means of which the European Union intends to surmount the present global economic crisis and to cope with such challenges as globalization, the pressure upon the use of resources or the ageing of the population.

Sustainability is a paradigm in the frame of which the future is thought of as a balance between economic growth and environmental protection and, in this respect, it means satisfying not only the present needs, but also the prospective ones in relation to social development, in view of developing and improving the quality of life. These challenges do require a change in the industrial policy in order to increase the importance of the social components represented by food and environment. These objectives, translated to an organizational level will allow a more powerful orientation of organizations in promoting eco-bio-economy, with emphasize on innovation, entrepreneurship, as well as on a more efficient capitalization of intangible values. An important landmark in the development of eco-bio-economy is represented by the large scale use of bio-technologies, the intensification of scientific research in bio-engineering, so as to insure the food global security.

Agriculture and food industry have their clearly defined roles all around the world, since they are the ingredients providing for continuity, security and well-being and therefore,

the issues in connection with these fundamental domains must be tackled upon with utmost responsibility by all the stakeholders: specialists, politicians or "mere" consumers. Next year, in 2015, we will celebrate 25 years of continuity in the food industry and agricultural education within the central area of the country, meaning a quarter of a century during of which, people dedicated to their profession, have built the infrastructure for study and research, have created values which will stand up to the test of time, and last but not least, have refined characters. Our accomplishments were first and foremost possible due to the fact that we have always had friends and collaborators next to us, who have helped to enhance the climate of normality which is necessary to educate and shape specialists in these priority domains for a sustainable society.

I wish you all the best of health, efficiency, lots of accomplishments and joys that will always keep the flame of knowledge and scientific creation alive.

Yours truly,

Dean of Faculty of Agricultural Sciences, Food Industry and Environmental Protection,

Prof. Ovidiu TIȚA, Ph.D.

SUMMARY

CONCEPTUAL ISSUES IN DEVELOPING A RED LIST FOR CROPS

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Abstract
Developing a red list for crops in Romania may become an excellent instrument for enhancing political efforts in mitigating the climate change effects especially into agricultural ecosystems. The main barriers, at the conceptual level, are as following: defining the level of investigation at the species level, defining descriptors and indicators as well as socio-economic indicators to be taken into account based on the methodology already in place and developed by the IUCN. Appling a smart agriculture and protecting valuable landraces may support the conservation of biodiversity as a whole inside protected areas. And still developing rural guidelines in such areas may need the support of prioritizing instruments such as offered by the red list for ensuring both food security and the richness of biodiversity. The scope of this article is to discuss conceptual issues related to the process of red list development.

Keywords: agro-biodiversity, genetic erosion, red list for crops, Sibiu county, Romania

Introduction

The concept of red listing is shaped and defined the late twentieth century to characterize the degree of endangered wildlife. It applies today animal and plant kingdom and it is a scientific instrument for characterizing the conservation status of the species to prioritize conservation efforts to ensure financial and perpetuating the survival of humankind (Hooper et al., 2012). From the genetic point of view, any species may be defined by all genes pool that make up the individual belonging to the species, or more, belonging to the population they are representing. Thus, when planning the development of a red list for crops a particular significance analysis has the adoption and development of recommendations for the characterization of the conservation status of species prepared by the experts of the International Union for Conservation of Nature since 1996, as updated in 2008 (Vié et al., 2009). Such a methodology for the assessment of crop plants status of conservation must follow up to a certain extent the recommendations of IUCN possible plus new elements descriptors. This reference is significant because, at present, for such crops Red Lists are extremely difficult on one hand to be developed and on the other hand to be accepted in

international scientific and more in particular related to applied standards and methodology approaches becoming really costly (McCarthy et al., 2012). However, a number of studies since the 90s of the XX century led to the scientific and technical Red List of crop species in Germany which was adopted by deliberative decision by the German Government in 2008 to be included in the National Biodiversity Strategy and Action Plan (Brütting et al., 2013. The scope of this article is to address some major concepts should be investigated during the adoption of a red list for crops species.

Material and methods

This study is a survey on the scientific and official papers for evaluating the current trends in the policy for agro-biodiversity conservation, food security, agriculture and environment protection as a support in discussing conceptual issues regarding the development of a red listing methodology of the crops species.

Results and discussion

Adopting such a red list may work as an excellent political and strategic instrument for dispensing financial efforts dedicated for biodiversity conservation as a whole - essential to achieve a balance between the needs of conservation in situ (i.e. on-site, of the habitat where the species or variety is used on farm) and ex situ (i.e. gene banks) which is more expensive and stop the evolution of the genetic resources for the agro-ecosystem where it was established for long time (Halewood et al., 2012). Also, certification, monitoring and inspection should not be forgotten in the broader financial efforts managed at national budget.

Moreover, internationally attempts have been made to adopt a specific methodology for crops but the main obstacle is that crop plants are below the specific level as varieties or hybrids which are complicated by the addition of socio-economic connotations and the willingness of the local communities. In other words if the IUCN red list of wildness supports that specific unit of reference for analysis is the species, for the red list of crops it should be recognized different genotypes (varieties, hybrids) that can retain the vigour and which form agronomic point of view express essential features especially developed for a certain climatic condition. Moreover, the diversity of genotypes within a species of agricultural interest is extremely high if we refer to wheat, corn, rice or potato - the four crop species most commonly used and traded in the world market in the last 20 years, according latest report of the European Commission (2010).

It is however important to emphasize that unlike wild species that evolves over time according to natural rules, the crops are continuously improved by humans and their maintenance for cultivation is achieved with considerable financial resources. Crops are produced exclusively as an anthropogenic activity originating from wild genetic resources and subsequently breed.

The genetic pattern of each variety can capture the best phenotypic configuration possible for a certain climatic conditions which is constantly changing and based on this the genetic resource is evolving by increasing its adaptive capacity and becomes better adapted. This is probably the most difficult chapter of developing a methodology approach as food security amid the climate change is dependent on the versatility of the crop to climatic conditions - and reported to their epigenetics (Bailey-Serres, 2013). Just from this point of view it becomes significant to assess the correlation of genetic resources of crops to climatic conditions and socio- economic constraints

In the context of the manifestation of climate change effects it will become important to assess all vulnerability of agro-ecosystems and also all available genetic resources. Assessment of the economic impact of maintaining these rare genotypes that are essential for food security associated with a particular region becomes determining in the orientation of new agricultural policies at the local level. The economic value of these connotations should be coupled with the intrinsic value of biodiversity associated protected areas where are implementing specific agricultural practices, including traditional, using specific genetic resources. In other words, in the implementation process of measures regarding the impact of climate change mitigation it is necessary to take into account socio-economic factors and the inestimable value offered by the landscape's components (habitats and species) simultaneously.

Maintaining the integrity of the landscape and implicitly of agricultural landscape units may become a reasonable requirement in the governance efforts for prioritizing economic measures for biodiversity conservation (Enengel et al., 2011). At the last Summit conducted in October 2010 The Hague Agriculture, climate change and food security recognized the essential value of agricultural ecosystems and agricultural practices needed to ensure food security in the context of climate change event (Vermeulen et al., 2010). The needs to prioritize these efforts conceptually grounded the need to develop specific methodologies that take into account local conditions, to ensure success in achieving red lists of crop plants. Moreover, it should be considered that red listing methodologies of crop plants

cannot be transferred completely from one country to another as socio-economic factors identified different.

Guidelines development for crops

Guidelines on the descriptors (e.g. essentials traits for the characterization of genetic resources and farmers) can define what should be developed and adopted globally and will get the attention of FAO for review and discussion at the upcoming Conference of the Parties to the International Treaty on Plant Genetic Resources for Food and Agriculture (Engelmann and Rao, 2013). It should be emphasizing here that the Plant Treaty was adopted under the Convention on Biological Diversity adopted in Rio de Janeiro in 1992 and genetic resources in agriculture are part of the generally accepted concept of genetic resources of the Convention ratified by Romania by laws. Descriptors can be simplistically defined as elements for identification and characterization of specific features of genetic resources or space where they are grown including farmers. On the basis it is possible to define descriptors for social or economic issues based on mutually agreed terms of references.

Clarify the addressing genetic level

For developing a red list it is essential conceptually in this regard for a clear approach to addressing specific levels. Thus, from the beginning it is important to define very clearly the concepts, standards and other adjacent process methodologies. Bellow species level (i.e. subspecies) is the target group for which the crop listing methodology should be developed. In the selection process is recommended to work first in the lower level of species: varieties and hybrids. In the case of landraces is difficult to replicate in the context of national efforts and it is preferable that they be considered especially in terms of local efforts after the completion of the listing varieties and hybrids. Only connotations of cultural identity may raise local varieties that rank if it can be demonstrated that vulnerability and presents a genetic configuration advantageous amid the climate change for vulnerable agro- ecosystems or to prove the interest of cultivation under the European Union regulatory framework for protecting the landraces as conservation varieties (Spataro and Negri, 2013).

Prioritizing the list of species of agricultural interest

Even if into the Annex I of the International Treaty on Plant Genetic Resources for Food and Agriculture or Plant Treaty a list of 35 species are considered important for food

security, it is important to note that the diversity of species and hybrids exceeds national investigative possibilities, considering that there is a need for assessing the conservation status of each genetic resource (Vincent et al., 2013). Therefore prioritizing the list by addressing in particular some of the species of interest (e.g. 4-5 species of local interest) would be sufficient to substantiate the action and scientific rigor and technical verification procedure applied respectively to test the degree of replication of the methodology to other regions in the context of ensuring its sustainability or amend its application and ensure its successful implementation in the future. Overall into this list is preferable to be listed species recognized for their potential in supporting food security. But it should be taken into account the degree of their endangered status, their sustainable use, as a result of negligence in continuing their cultivation and promotion in the local level for marketing. Note that currently the Gene Bank of Suceava is the National Focal Point of the Plant Treaty for Romania and has a limited capacity to explore and preserve all genetic resources for food and agriculture of the country, and therefore it is necessary to initiate this methodology for prioritizing efforts on country to ensure food security for the future in the context of climate change effect and not only.

Landscape approach concept

Addressing the concept of landscape by applying the principles of ecosystem - approach adopted by the Convention on Biological Diversity (Sayer et al., 2013) is essential as the choice of crops is primarily a matter of social type having economic implications and it is essential to address also the knowledge and involvement of all stakeholders in the development and acceptance final Red List. The process is complex and it is involving the analysis of economic balance, to develop the trainees' level of social, socio - economic forecasting on short, medium and long term. The connotations of protected areas overlapping will further feed the needs for the real assessment of the management capacity in dealing mainly with land owners. It is significant to recognize from the starts what the agricultural landscape units are also to ensure the acceptance in local communities for applying the best agricultural practice respecting and subordinating not to the properties border but rather to landscape units borders. This process is requiring also a strong capacity in grounding the reasons for increasing harmony in between landscape units crossing territorial administrative units and private or public properties.

Farmers and descriptors

Developing farmers associated descriptors is an important step in the governance efforts for characterizing the current situation and for assessing their socioeconomic status development. Perhaps the most sensitive segment of this methodology is the characterization of small landholders and farmers who practice subsistence agriculture without complying with the requirements of minimum measures to protect agricultural landscape units in the context of the landscape which they are circumscribed (Rudel and Meyfroidt, 2014). Under the boundary conditions imposed by climate change, carbon footprint reduction, and abandonment of arable land associated with overgrowth of invasive alien species and reduce soil quality - it is necessary to reorganize locally the small plots cultivated to ensure the maximum yields that can be provided in agro- ecosystems circumscribed to natural environments without damaging their future. This goal should be important for agricultural practices inside the borders of protected areas where they should be maximized for increasing the production without exceeding the resilience of agro-ecosystems.

Clarify the role would have a red list

The interconnection between farmers and research community and also addressing farmers to improve crop plants should be the best organized and functioning. From this point of view it should be implemented the synergy between theoretical and applied research activities that have to aim reducing of financial losses, rapid field assessment and fast transfer of technology from the laboratory to the farm. The involvement of farmers, small landholders or local communities in national programs for the conservation and breeding lead to financial constraints decrease and in this way it may become easily to support ex situ conservation and breeding programmes in the context of food security (Moon and Cocklin, 2011). These analyses combined with those regarding forecasting of climate change are grounding the implementation of adequate measures specific to a "smart agriculture" a concept recently officially adopted internationally in the context of decisions FAO (Beddington et al., 2012).

Protected areas and food security

Protected areas and food security is a relevant subject under discussion and in this context it is worthy to remind the Hartibaciului Plateau where is officially recognized one of the largest protected area for birds in our country as part of the European Union Natura 2000 ecological network. And yet this place is inhabited with thousands of small landholders

belonging to couples of local communities. In this area are acting at least two important regulatory frameworks: for agriculture and environment and due to this national policy at the local level is acting the incentives measures system. Unfortunately at the local level there are no connectivity between the management plans of the protected areas and the rural development strategy imposed from the Sibiu county. This is creating a conflict area between the interest of the local communities and the local governance for agriculture on one hand and environment on the other hand with negative impact on the traditional landscape and wildlife protection. The major socio-economic vulnerabilities are represented based on the official records by a major population migration, income reduction and poverty, increase in job demands and increasing of the ageing population.

Red list and Smart Agriculture

Smart agriculture is perhaps the only activity which through the eco-friendly practices can become a catalyst for maintaining the balance of protected ecosystems. Agricultural practices realized in Hartibaciului Plateau, mostly as traditional practices, have maintained the quality of the conservation status of species and habitats that today are inherited by the local communities. The negative impact in the region is mainly due to the lack of policy harmony between agriculture and environment protection which locally creates confusion and increased the socio-economic conflicts (Barbu et al., 2013). But, practicing smart agriculture will further support food security in the context of climate change and adding more socio-economic values to local population.

Conclusions

Red listing may become a toll for getting together all major stakeholders for agriculture and environment protection and not only for setting the scene for the better future of next generation and also for preserving the wild nature and all genetic resources relevant for food security. For local communities under discussion, agro-biodiversity may easily become a brand, as they are inheriting a treasure of landraces, if the local governance is harmonizing the environmental protection issues into the rural development policy guidelines. Such landraces may become the subject of a red listing tool for supporting their further recognition as conservation varieties into the Common Catalogue. It remains only to acknowledge the value of this treasure if they will do an imagination exercise that they will see simply disappearing all landraces inherited from their ancestors which are replaced only

by commercial crops with the dramatic effect on biodiversity loss, soil erosion and water pollution. Imagine disappear the task of saving seed from plants that merge with the care of family and children and impoverish the emotional and spiritual side of who loves each plant. New skills for the 2020 in the European context may have grounds on these experiences. Moreover, biodiversity value is exceeding the edge of trade and financial in monetary terms, many times these values merge with the spiritual, ethical or aesthetic values. It is important to know what we should replace the wonder seed of Lucian Blaga a philosopher born near Sibiu.

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BIODIVERSITY OF THE ENTOMOLOGIC FAUNA IN THE CORN AGRICULTURAL ECOSYSTEM IN POPLACA (SIBIU COUNTY) AND ITS ECONOMIC IMPORTANCE

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Abstract

Biodiversity is the variety of life on the Earth – from the food we eat to the "services" the ecosystems offer to us and on which we rely. This research shows that ecologic practices have a potential of supporting and preservation of biodiversity in agricultural ecosystems by maintaining the soils fertility where live beneficial entomologic fauna, such as hymenopterans, springtails and beetles (Carabidae). Species of many of these groups can be bio indicators of the agricultural ecosystem, indicating its state of health.

Key words: biodiversity, agricultural entomologic fauna, corn

Introduction

Agricultural biodiversity has a wide spectrum including all the components of the biologic diversity relevant for food and agriculture. All the components of the biologic diversity constitute the agricultural ecosystems; animal variety and variability, plants and microorganisms, are necessary for supporting the key functions of the agricultural system, the structure and its internal processes (COP decision V/5), appendix).

From the conceptual point of view, biodiversity has its own value, to this being associated also the ecologic, genetic, social, economic, scientific, educational, cultural, leisure and esthetic value.

Representing the primordial condition of the human civilization, biodiversity provide support for life and for the development of the social-economic systems. Within the natural and semi-natural ecosystems there are established intra and inter specific connections through which are done the material, energetic and information exchanges, thus granting their productivity, adaptability and disappearance. These interconnections are extremely complex ones, being difficult to estimate the importance of each and every species function of these systems, and which can be the consequences of the reduction of their effectives or even of their disappearance, in order to provide the survival on long term of the ecologic systems, the main provider of the resources of which the development and welfare of the humankind

depend of. That is why the maintaining of the biodiversity is essential for assuring the survival of any kind of life, including human beings (Antonie, 2013).

The structure of the agricultural biocoenosis is influenced firstly by the more and more intense use of the insecticides, but also by the agro technique, mechanic and physic methods that are used. These methods endanger the natural enemies of the pests, namely the insects which are considered as beneficial in an agricultural system.

The coleopteron represents he biggest order of the Insecta class, comprising about 500.000 known species (Teodorescu & Antonie, 2008). Within this order *Carabidae* family with those 25.000 species (Dücker & coworkers, 1997) represents one of the most important families of hexapods. These are exclusively terrestrial coleopteron, walking quickly, with a prognat head and setiform anthems. The elytrons are frequently longitudinally striated, presenting hulls and points. All these aspects determine a proper aspect making them to be easily distinguished from the other species of coleopteron. Ground beetles (*Carabidae*) in their majority are zoophagous insects, both in a larvae stadium and as an adult, having their mouth apparatus adapted for tearing and chewing. They are considered beneficial insects, feeding themselves with other insects, like mollusks and oligochets. In agricultural systems many species are important ecologic indicators, responding immediately to some interventions, such as: pesticides, which determine paralysis or even death of the adults as well as of larvae at short time after the treatment. In the same time numerous zoophagous ground beetles (*Carabidae*) play an important role on the numerical adjustment of the pest insects from different agricultural ecosystems.

Material and method

The locality where the investigations have been done is Poplaca (Sibiu County);

The sampling of the fauna was done as follows: 02.03-06.03.2012, 05.06.2012-08.06.2012, respectively 03.09-06.09.2012. During October, namely 22.10-26.10.2012 due to the favorable weather there was done a supplementary sampling.

The cultivated corn hybrid was Pioneer PR 38A24 having a great productivity and being resistant to illnesses and pests;

The used technology was with elements of organic agriculture;

The collecting method of the agricultural entomologic fauna was that of using the Pitfall traps on the soil. There were 10 traps, at each 10metres. The formaldehyde was used as an attractant and time was 48 hours (Antonie, 2012).

Results and discussion

As a result of the analysis of the collected material using Pitfall traps it was identified the taxonomic and quantitative structure of the agricultural entomologic fauna in the researched agricultural corn system. (Table 1)

Table 1

The taxonomic and quantitative structure of the agricultural entomologic fauna collected by the Pitfall traps method in Poplaca (Sibiu County)

Insecta class	Period of collecting during 2012				Numerical abundance	Relative abundance
	April	June	September	October		
Collembola	-	62	-	-	62	20.06
Orthoptera	-	1	-	-	1	0.32
Homoptera	1	1	-	1	3	0.97
Heteroptera	-	2	-	-	2	0.64
Hymenoptera	54	86	26	12	178	57.44
Coleoptera	12	23	18	6	59	19.28
Diptera	1	1	-	2	4	1.29
Total	68	176	44	21	309	100

The samples collected from the corn plot (technology with organic elements) comprised an agricultural entomologic fauna from 7 orders of insects: *Collembola, Orthoptera, Homoptera, Heteroptera, Hymenoptera, Coleopteron and Diptera.* The order insects having the biggest numerical abundance are: *Hymenoptera* with 178 samples (57.44%), *Collembola* with 62 samples (20.06%) and *Coleoptera* with 59 samples (19.28%). The taxonomic groups having the smallest numerical abundance are: *Orthoptera* with 1 sample (0.32%) and *Heteroptera* with 2 samples (0.64%).

The majority of the hymenopter belong to the *Formicidae* family. These play an important role in the agricultural ecosystems: some are zoophagous, feeding with insects, diminishing the pest populations, some are source of food for spiders; they contribute also to the growth of the porosity of the soil by doing macro pores and of moving the matter in the soil. That's why the ants are considered beneficial in the corn culture, too.

Springtails are well represented in the researched agricultural ecosystem. They are components of the trophic chains in the soil. They are considered bio indicators of the

contamination of the soil, being very sensitive at herbicide. The big population of springtails in the researched agricultural ecosystem confirms the fact that in the area the used technology presents elements of organic agriculture.

As can be seen in the table 1 the *Coleoptera* species are also well represented in the corn agricultural ecosystem. From these a great share has the *Carabidae f*amily (Table 2).

Table 2

Species of *Carabidae* collected in the corn agricultural ecosystem in Poplaca (Sibiu County) in 2012

Number	Species	Trophicity
1	*Harpalus distinguendus* Duft.	Phytophagous
2	*Harpalus pubescens* Müll.	Phytophagous
3	*Harpalus calceatus* Duft.	Zoophagous
4	*Microlestes maurus* Strm.	Zoophagous
5	*Tachys quadrisignatus* Duft.	Zoophagous
6	*Pterostichus niger* Schall.	Mixophagous
7	*Pterostichus cylindricus* Herbst.	Zoophagous
8	*Bembidion tibiale* Duft.	Zoophagous
9	*Clivina fossor* L.	Mixophagous
10	*Poecilus cupreus* L.	Mixophagous
11	*Asaphidion* (*Tachypus*) *flavipes* L.	Zoophagous
12	*Zabrus tenebrioides* Goeze	Phytophagous

In the corn culture there were identified 12 species, which regarding their trophicity come as follows: phytophagous (*Harpalus distinguendus* Duft. (figure 1), *H. pubescens* Müll., *Zabrus tenebrioides* Goeze); zoophagous: (*Harpalus calceatus* Duft., *Microlestes maurus* Strm., *Tachys quadrisignatus* Duft., *Pterostichus cylindricus* Herbst., *Bembidion tibiale* Duft., *Asaphidion (Tachypus) flavipes* L.) and mixophagous (*Pterostichus niger* Schall., *Clivina fossor* L., *Poecilus cupreus* L.). Analyzing the trophycity of the *Carabidae* species there can be noticed that the great share is represented by the zoophagous group.

Fig. 1 - Harpalus distinguendus* Duft. *(original photo)

Conclusions

1. The analysis of the obtained data as a result of establishing of the taxonomic structure and of the biodiversity of the agricultural researched biocoenosis allowed us the selection of some ecologic indicators which can be taken into study, in future researches as they are or in the dynamics of the parameters of state of the respective biocenosis;

2. The analysis of the relative abundance and of the food correlation with the "key" species of primary consumer in the researched culture, the species proposed as bio indicators fulfill the conditions for being appointed as indicator of taxonomy of affecting the biodiversity in the corn culture; the use of these bio indicator of taxonomy is justified also by their importance in assuring the stability of the agricultural biocoenosis , through the control practiced upon the effectives of the population of the primary consumer, which often has big densities, with economic implication upon the quantity and quality of the obtained production;

3. From the assembly of the collected fauna in the village Poplaca, the beneficial fauna is dominating, this indicating the maintaining of the structural and functional parameters of the agricultural biocoenosis at values above the level.

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MODERN SENSOR SYSTEMS IN HORTICULTURE

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Abstract

***Modern agricultural management is all about adopting different sensing methodologies in order to provide accurate information on crop, soil, and environmental conditions. Almost every sensing technique may find an application in agriculture. The paper briefly reviews one way to apply sensor systems in agriculture. Experiments were conducted on ivy (Hedera helix L.) plants to study the relationship between data obtained using the sensor suite and chlorophyll fluorescence measured with a multichannel fluorometer system MONI-PAM (Walz, Effeltrich, Germany) for long-term monitoring of photosynthesis. A controlled water* deficit and overheating was also imposed.**

Keywords: sensors systems, environmental monitoring,

Introduction

The development of modern society is dependent on scientific research and technological progress because we live in a world with finite resources and increasingly growing population, which is why it is imperative to substantially increase productivity. This addition in terms of productivity is sought to be achieved with a minimum consumption of natural resources and without any prejudice to the environment.

The field of embedded sensor systems employed in agriculture is enormous, as it can be used for both crops in the field and in greenhouses. When referring to in field crop monitoring, while knowing at any time the environmental factors variation, it is essential to correlate plant behaviour over the life cycle with changes in environmental factors. Plant behaviour can be characterized both by using sensors to monitor physiological processes and specific laboratory analysis, In this case the implementation of integrated wireless sensors are recommended due to the generally large crop areas [6, 11, 15].

As for the use of embedded sensors systems in protected areas both the wired and the wireless are recommended, depending on the dimensions of the culture, the number of parameters that need to be monitored and the enforced network flexibility [6].

Agriculture, on the other hand, is a major source of water pollution, the nutrients, pesticides, insecticides and other contaminants, lead to significant social, environmental and economic costs.

The effect of excessive use of fertilizers is, due to leaching of fertilizer elements, annual loss of large amounts of nitrogen and phosphorus reaching groundwater or surface waters and causing environmental pollution [17].

Agriculture is also a major water consumer, economically viable and competitive in the market, but resources are limited and rational consumption of water is extremely necessary.

Given that the environmental pollution in agriculture arises with the need to combat pests, diseases and to improve productivity, a non-destructive and non-invasive approach, enabling quick decisions making, is required to remedy damage [2].

The solution for the rational use of fertilizers and water resources comes from continuous monitoring of crops and environmental factors through integrated sensor systems. Its most significant benefit is that it can prevent, rather than combat. The first result of reducing the application of various chemical compounds in increasing agricultural productivity is getting bio products [7,19].

Regarding rational use of water, establishing an irrigation program implemented by sensors, controllers and actuators is of real importance for both the environment and for normal growth and development of plants.

Sensor networks also offer the possibility of designing a database that can be accessed at any time and the processed information can be correlated with other data obtained from field and laboratory tests [1].

Another advantage is the possibility to simultaneously monitor a large number of factors, without the interference of the human factor, this resulting in a decrease of the errors that may occur.

Integrated sensor systems are smart devices, sensing (measuring), computing and communication, which have a certain spatial distribution, in order to perform a global task. Design and implementation requirements of a typical sensor networks are energy efficiency, memory capacity, processing speed and operating frequency [13,16].

In agricultural research it is of real importance to establish a detailed data of the environmental factors to avoid inducing errors that can occur especially when you want to repeat an experiment. In this case a failure to control the previously environmental conditions can lead to completely different results; this is due to the reaction of plants to abiotic factors and not because of the applied treatment.

Material and methods

We suggested the use of two different methods of data acquisition: a cable linked system and a wireless one to ensure that all necessary parameters are monitored.

The cable linked system ensures real time monitoring of environment parameters: lighting, air temperature, soil and atmospheric humidity, temperature at canopy level. All data was archived and compiled using special software by "Tedelco"(Cluj-Napoca, Romania).

Its configuration has hardware and software elements at a low price in comparison with the wireless systems and has the following components: a standard PC and RS485 type nods, which can play the role of controllers, sensors and intelligent actuators based on microcontrollers. The sample requirements for the environment parameters (between 15 and 60 seconds according to Teemu A. Et al, 2008) do not require a broad band and so the RS485 communication method is Ethernet because of its low cost.

The wireless system monitors three environmental factors: photosynthetically active radiation, soil moisture, leaf humidity and another factor that characterizes plants physiological processes: leaf temperature.

Data transmission through the wireless network is made by sensors that are connected to a data logger that has the purpose of transmitting the acquired data to the gateway that is connected to a PC through a 2.4 GHz transmitter.

The four sensors are powered with three AA alkaline batteries and the gateway can be powered through USB from the PC or by using a direct adaptor to the socket.

To archive our goals experiments using ivy (Hedera helix L.) plants were established.

Monitoring was done on four ivy pots, each pot having three plants. Four experimental variants to induce a water deficit and exposure to a high intensity light were designed, as follows:

- ✓ Shadowed and normally hydrated plants
- ✓ Shadowed and submitted to water deficit plants
- ✓ Watered normally and exposed to light plants
- ✓ Plants subjected to water deficit and light exposure

Normal hydration was achieved by thoroughly watering while hydric stress by stopping watering, on ivy plants.

For a thorough study of the relationship between environmental factors and plant analyzes, measurements of chlorophyll fluorescence were performed in order to characterize the intensity of photosynthetic process.

Results and discussions

The proposed experimental pattern was monitoring the effects of light excess and lack of humidity on ivy plants that were grown in controlled conditions.

We obtained a high hydration level in all the plants that were in the shadows and that were watered properly (fig.1), but the highest value of leaf temperature was noticed in the case where the plants were submitted to a water deficit and light exposure (fig.1), because when there is a water deficit the plants activate their defence mechanism by closing their stomata and diminishing their transpiration process.

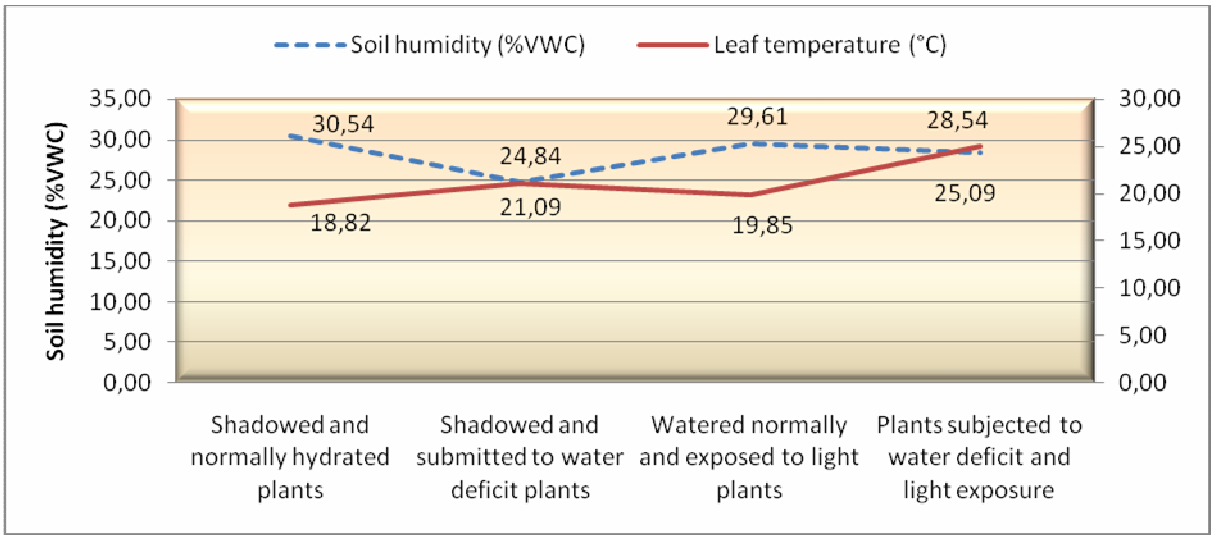

Fig.1 Soil moisture and leaf temperature averages for the four experimental variants studied

A maximum light exposure of 39324.8 lx was noticed in plants that were exposed to light, and of 16614.91 lx for the plants that were placed in the shadows (fig.2).

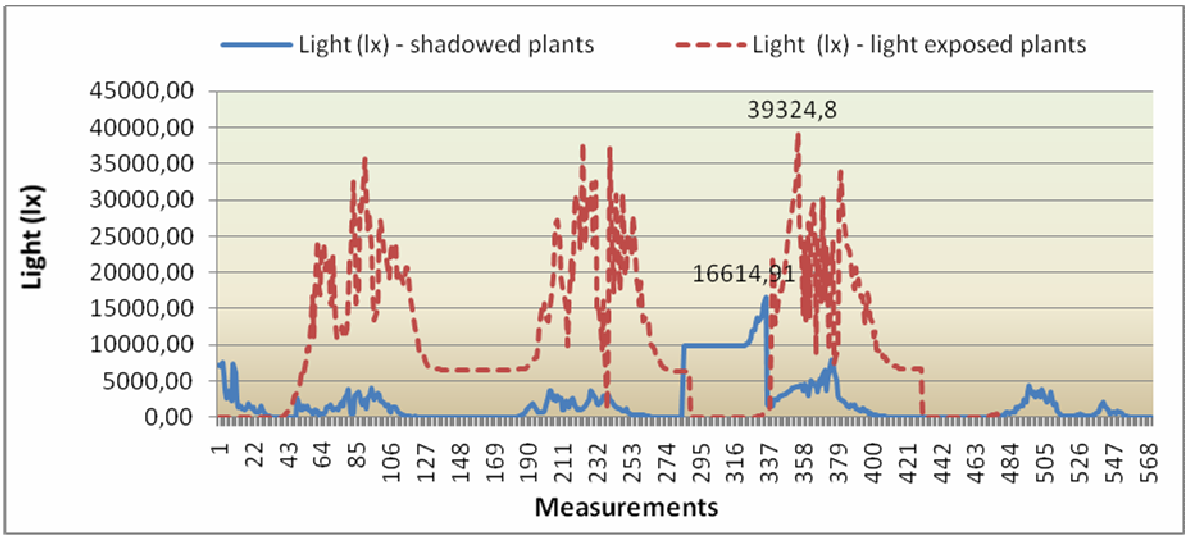

Fig.2 Changes in light level for the two experimental variants studied

A minimum for the average leaf temperature was registered in the case of shadowed and normally hydrated plants and a maximum in the case of plants submitted to a water deficit and exposed to the light (fig.3).

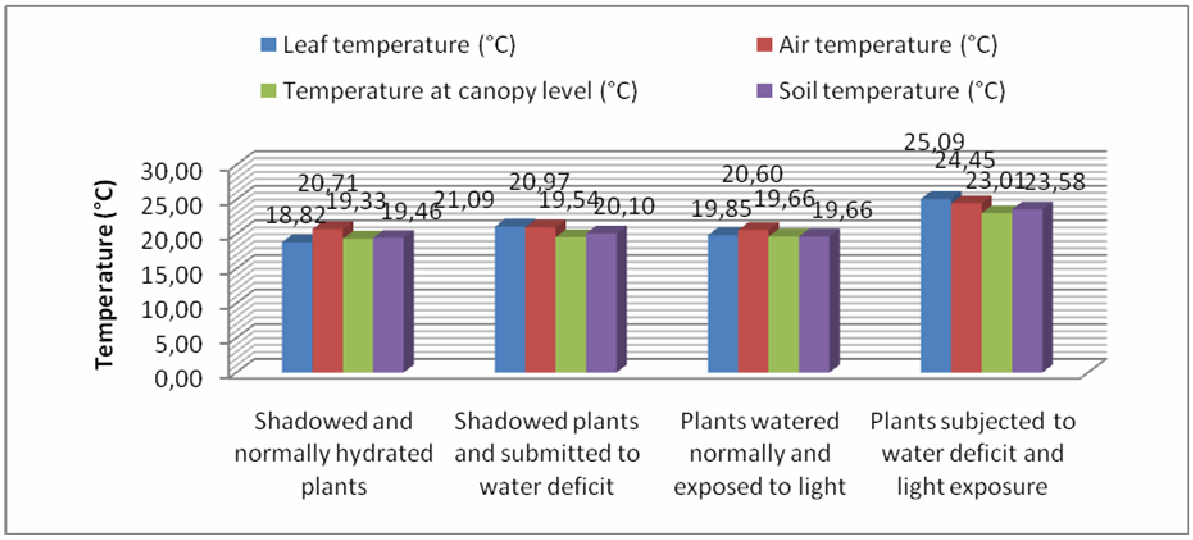

Fig.3 Leaf temperature, air temperature, canopy temperature and soil temperature averages for the four experimental variants studied

Both soil moisture and light intensity are important environmental factors affecting the development and distribution of vegetation. Generally, the two factors influence plant eco-physiological processes such as photosynthesis, transpiration and transport of organic matter, thus affecting the efficiency of light and water use by plants [27]. Currently, most research is

limited to the effects of a single factor, such as light and soil moisture on plant growth and physiological processes [5, 26], while studies on the interaction between the two factors are quantified on account of physiological indices and biochemical on ivy plants.

One of the modern methods of investigating the energy efficiency of photosynthesis is to determine the induced chlorophyll fluorescence parameters. Thus it can highlight where and how different stressors in the photosynthetic apparatus in thylakoid membranes of chloroplasts act.

The transient form of plants fluorescence is determined by the physiological state and by the physical and chemical conditions of the environment [22], such as light intensity [10,20], air temperature [21], soil moisture [24], or chemical influences [14]. A decline in photosynthetic activity is induced by applying a strong light pulse called photoinhibitor [25]. It is a process that occurs when the photosynthetic apparatus receives excess excitation energy and occurs in photosystem II.

An inverse dependence was observed between ETR - electron transport rate and Y(II) - photochemical quantum yield of photosystem II for all the four experimental variants.

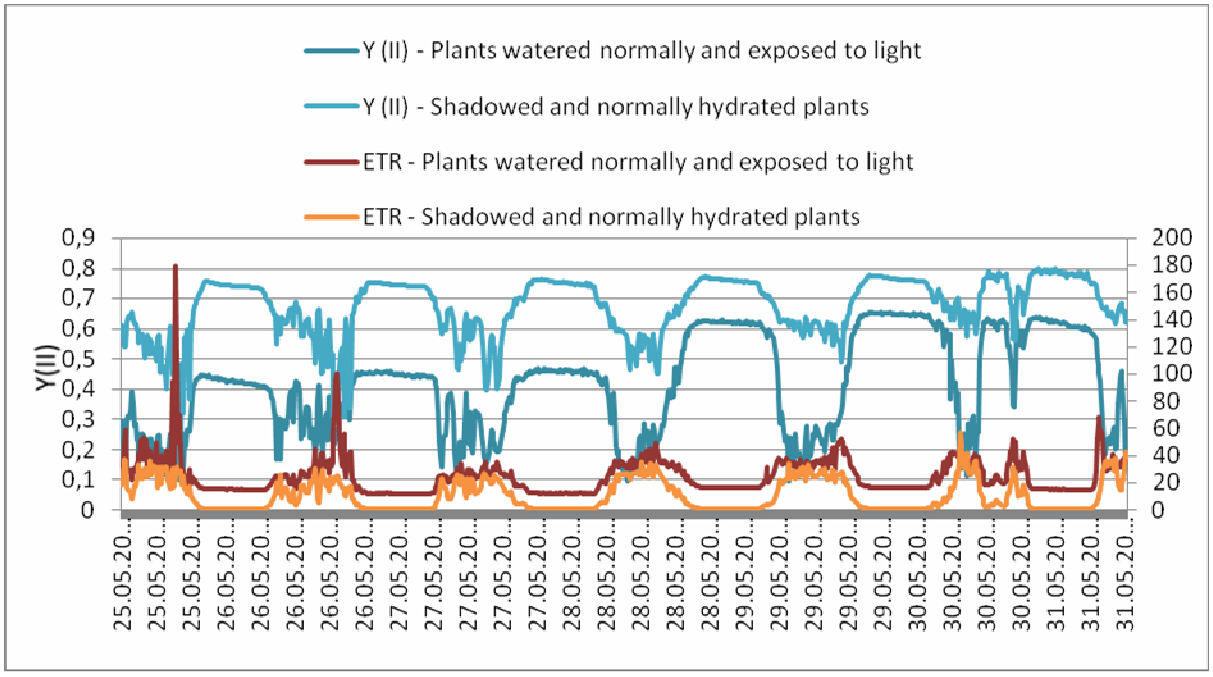

Fig.4 Dynamics of parameters that characterize the photosynthesis yield

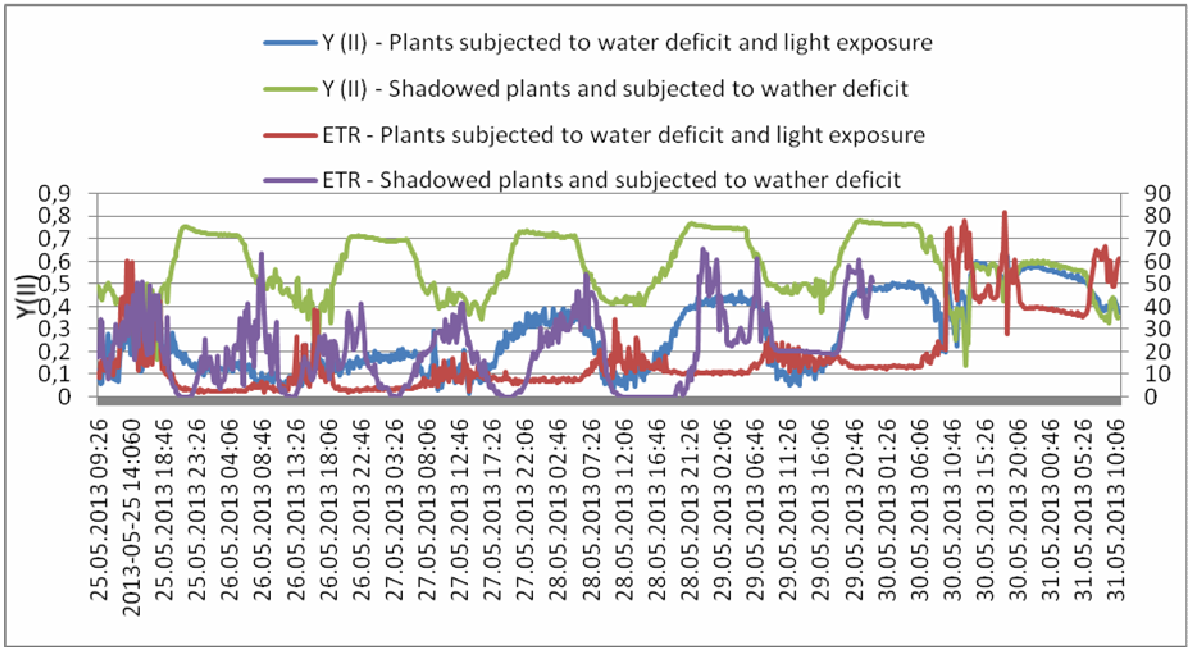

Fig.5 Dynamics of parameters that characterize the photosynthesis yield

The phenomenon of fluorescence green leaves and their photosynthetic activity relationship was studied and demonstrated for the first time by Kautsky in 1930 and analyzed in detail by Lichtenthaler (1992) and Govindjee (1995). The kinetics of fluorescence induction has two components: (a) a rapid increase in chlorophyll fluorescence in a few seconds up to a maximum Fm and (b) a slow decline to noticeably lower values defining the steady state F in 4-6 minutes at the onset of a light pulse. The rapid increase and slow decrease of chlorophyll fluorescence have become an essential signature of photosynthesis. This is a way to set different parameters of chlorophyll fluorescence in order to analyze functional photosynthetic apparatus [3,4,8,9,12,18].

Conclusions

Relevant conclusions regarding the influence of abiotic factors on plants were drawn from this study.

Concomitant use of integrated sensors systems to monitor environmental factors and physiological processes in plants enables an analysis of the influence of each environmental factor on plants by individually changing them and doing a further monitoring of physiological processes.

Thus sensor systems are the ideal support for preventive monitoring and at the same time provides all the necessary data for making decisions regarding crop management.

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RAGWEED (*Ambrosia artemisifolia*) AS A BIOLOGICALLY ACTIVE HERB

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Abstract
Nowadays in Hungary nearly 5 million hectares of agricultural area was infected with ragweed (Ambrosia artemisiifolia). According to the public opinion the ragweed is a weed. From agricultural and public health point of view it is exceptionally dangerous plant. The ragweed cause multi-millon euro damage for the country in every year. The damage caused by ragweed is multiple. The direct agricultural damage is due to the absorption of nutrients and water needed by plants for growing which results in a supplementary cost of weed control which increases the cost of production. The ragweed causes damage not only in agriculture, but also induces a significant problem in human medicine also. More than 30% of the Hungarian population shows some degree of hypersensitivity symptoms against ragweed pollen. Almost the only known is the pollen allergy, from the biological effects of ragweed. Despite of more than two decades of socio-sized defense, a lot of effort and financial investment don't delivered desired results the spread of ragweed did not stop. Unfortunately, hindered the success of defense by the fact that the great social ragweed anti-funded civil society "movements" are not managed by professionals experienced in botany. For this reason use many of the incorrect solutions, such as mowing propagation, which is not effective enough, expensive procedure and the petrol engine mower exhaust emissions, cannot be neglected. Ragweed experiments have been carried out mainly with pollen in connection with terms of allergy. So far the other biochemical experiments and studies with these plants were the scientific horizons of public life. The ragweed induced agricultural and health problems there is no a comprehensive solution.
The motivation in choice of subject was to reduce the environmental impact of ragweed.
The useful properties of ragweed the general population in Europe is practically unknown.
In Canada, the ragweed for hundreds of years are used as a herb in relieve.

Keywords: ragweed, Ambrosia, antibacterial, antifungal

Introduction

The wormwood ragweed (*Ambrosia artemisiifolia*) causes a lot of problem in the world. It can be found in varying degrees on the agricultural areas. The theme of European significance level, in 2008, Hungary hosted the first international conference on ragweed (First International Ragweed Conference, September 10 to 13, 2008.). Mowing is not effective defense against ragweed.

Béres (2004) carried out experiments in mowing. The ragweed mowed once in May, more staminate flowers will produce by the end of August, than unmoved. This is due to mowed plant stems do not destroyed. After cutting the buds in the axils in petioles of the leaves, the plants sprout and bloom abundantly. Significant amounts of pollen is produced by the end of the summer once mowed (in June) and mowed twice (in May and June) ragweed population as well. Number of flowers reduced significantly on three times (May, June and August) mowed areas, but three times mowing can't destroy the plant. It is an expensive procedure and the petrol engine mower exhaust emissions cannot be neglected [4]. We are looking for another solution for the problems, which is cost-effective way of defense. The manual harvesting has proven to be most effective. Our aim was to develop products from harvested plants, which can be used for example in organic agriculture as herbicides, fungicide or insecticide. The useful properties of ragweed in Europe are practically unknown. In Canada, the ragweed for hundreds of years is used as a herb to treat of health problems. In this paper we present the tests on biological activity of the extracts against *Botrytis cinerea*-NCAIM F.00744, and *Curtobacterium flaccumfaciens pv. betae* B01612 in vitro.

Botrytis cinerea (teleomorph: Botryotinia fuckeliana)

Taxonomy:
Kingdom: Fungi
Phylum: Ascomycota,
Subphylum: Pezizomycotina,
Class: Leotiomycetes,
Order: Helotiales,
Family: Sclerotiniaceae,
Genus: Botryotinia.

Botrytis cinerea is a plant pathogen (airborne) with a necrotrophic lifestyle attacking over 200 crop hosts worldwide. *B. cinerea* is most destructive on mature or senescent tissues of dicotyledonous hosts; however it generally gains entry to such tissues at a much earlier stage in crop development and remains quiescent for a considerable period before quickly rotting tissues when the environment is conducive and the host physiology changes (Figure 1.). After the harvesting the fungus causes serious damage. The symptoms appear on the apparently

healthy fruits during the storage and sales. However, *B. cinerea* also causes huge losses in some field- and greenhouse-grown horticultural crops before the harvest, or even at the seedling stage in some hosts. Some monocotyledonous hosts are also susceptible to attack by *B. cinerea*. The fungus growths of the hot and humid weather benefit. *B. cinerea* is hard to control because it has a variety of modes of attack, diverse hosts as inoculums sources, and it can survive as mycelia and/or conidia or for long periods as sclerotic in crop residues [2,5,8].

Figure 1. Symptoms on raspberry fruit

Curtobacterium flaccumfaciens pv. betae B01612

Bacteria in Curtobacterium genus is in "Irregular, Nonsporing Gram-Positive Rods" following Bergey's Classification of Bacteria. *C. flaccumfaciens* is a Gram-positive soil bacterium that causes disease on a variety of plants. *Curtobacterium flaccumfaciens pv. betae* is a bacteria, which infects red beet (*Beta vulgaris L.*) inducing wilt and silvering leaves [1,3].

Experimental Methods

The ragweed was collected with roots, before flowering manual method. Therefore it can prevent the production of pollen. The plant roots removing from the soil is much more efficient than mowing. The plant drying takes 2-3 weeks depending on the weather. The dried plant was minced on crop grinder. The dried plants can be stored for years without damage. To obtain the biologically active plant substances by extraction is a relatively simple and inexpensive procedure. Different solvents are suitable to extract of ragweed substances (containing any plant part). Concentration of the extract was by vacuum distillation (Figure 2.). The extract is dark green color, slightly oily texture, and strong-smelling liquid. Its aroma is already known herbal preparations similar the most. We tested the antifungal and antibacterial activities of ragweed extracts in laboratory experiments. We investigated cultures in Petri-dishes (purred agar plates). In studies, we dose the substrates of the plant extract in

different quantities to the medium ("poisoned agar" method). This way we examined the inhibitory effect of the ragweed extracts against fungi and bacteria [6,7].

Figure 2. Vacuum distillation apparatus.

At the fungal experiments we measure the average diameters of *Botrytis cinerea* colonies depending on the days on potato dextrose agar (PDA). At *Curtobacterium* in every Petri-dish we set up the initial plate count (10^3 pieces cells per Petri-dish) with Bürker chamber, then counting the grown colonies. We used a spread plate technique on bouillon agar for bacteria.

Results and Discussion

Our results suggest that wormwood ragweed contains biologically active substances, which inhibit the growth of fungi, depending on the concentration of active ingredients of the plant, and the time varies depending on the inhibitory effect. The minimum effective concentration was 150 mg active substance per Petri-dishes (Table 1. and Figure 3.). This amount is for 5 days inhibited the *Botrytis cinerea*. At 350 mg active agent per Petri-dish 8 days was needed the colonies began to grow. We have detected full fungicidal effect at 400 mg agent per Petri-dish above do not have developed fungus under the observation. The inhibitory effect of ragweed has been clearly demonstrated in our experiments.

Just as can see (Table 2.), in the ragweed extract-free control Petri-dishes the day after the inoculation has already begun in the growth of bacteria. Two days were needed for bacteria in order to 150 mg and 250 mg doses to begin to grow. At 350 mg and 400 mg doses the growing only began in the eighth day, which is very good. We detected full bactericidal effect at 450 mg, 500 mg, 550 mg and 600 mg agent per Petri-dish.

Table 1. Average diameters of *Botrytis cinerea* colonies on poisoned agar.

Ragweed extract (mg active agent/15 cm^3 medium)	Average diameters of *Botrytis cinerea* colonies on poisoned agar (mm)									
	2	5	7	8	9	12	14	16	20	23
0	18	78	90*	90	90	90	90	90	90	90
150	0	4	10	16	25	49	69	90	90	90
200	0	3	9	21	30	56	76	90	90	90
250	0	0	8	16	22	39	58	80	90	90
300	0	8	16	25	32	47	55	75	90	90
350	0	0	0	2	5	27	42	62	87	90
400	0	0	0	0	0	0	0	0	0	0
450	0	0	0	0	0	0	0	0	0	0
500	0	0	0	0	0	0	0	0	0	0

*: 90 mm is the maximum diameter in the Petri-dishes.

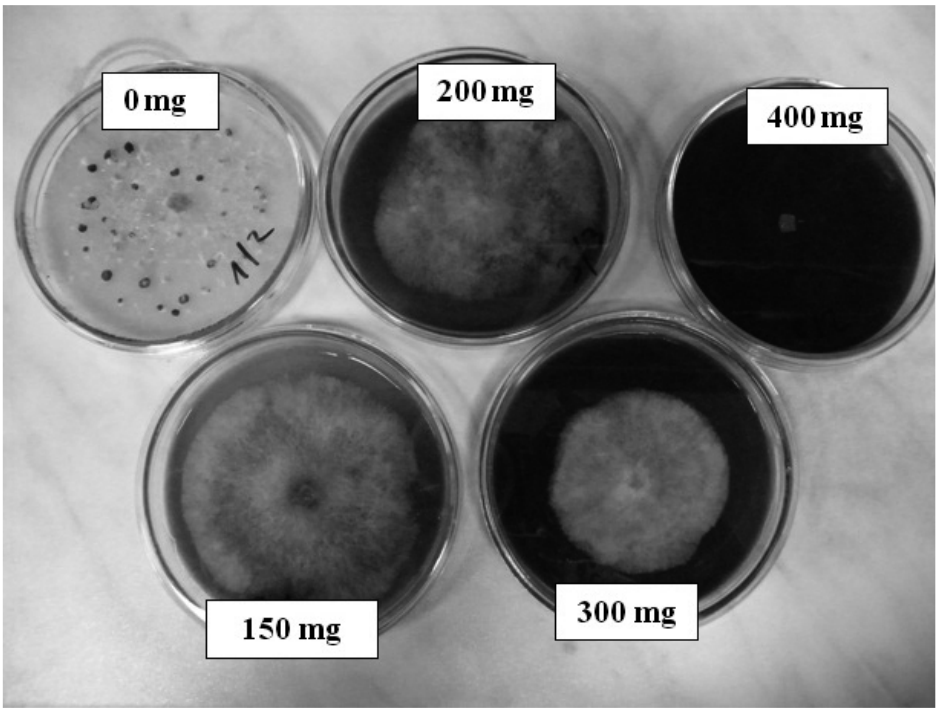

Figure 3. *Botrytis cinerea* 14 days after the inoculation. The PDA mediums in Petri dishes containing different amounts of ragweed extract.

Table 2. Number of *Curtobacterium flaccumfaciens pv. betae* colonies in the different experimental conditions with spread plate technique.

Ragweed extract (mg active agent/15 cm^3 medium)	Average number of colonies grown in the past day, depending on the days of inoculation								
	1	2	5	8	12	14	16	19	22
0	*	*	*	*	*	*	*	*	*
150	0	*	*	*	*	*	*	*	*
250	0	58	*	*	*	*	*	*	*
350	0	0	0	3	3	4	4	4	4
400	0	0	0	2	3	3	3	4	4
450	0	0	0	0	0	0	0	0	0
500	0	0	0	0	0	0	0	0	0
550	0	0	0	0	0	0	0	0	0
600	0	0	0	0	0	0	0	0	0

***: Uncountable amounts of colonies**

Conclusions

The wormwood ragweed (*Ambrosia artemisiifolia*) from year to year millions of lives made difficult by the effects of allergens. Pollens not only locally, but from the origin reaching several kilometers (spreading by the wind) can cause nuisances. In addition, do not forget the other damages caused by ragweed. Organic growers probably will use our extracts in plant protection. The ragweed extract does not contain allergenic proteins (harvesting before flowering), so it is not dangerous for humans. To avoid confusion, we do not intend to cultivate *Ambrosia artemisiifolia*, because, unfortunately, there is plenty of it.

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INVESTIGATION AND ANALYSIS OF ACID MINE DRAINAGE IMPACT TO THE MINING PROCESS IN CRNAC MINE

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Abstract

The paper presents the results of the impact analysis of mining waters from the ore deposit „Crnac" to the environment. The research process included hydro geology explorations about: aquifers type, ground waters occurrences (on the surface and in the depth), their yields and chemical compositions. The mineralogy and microstructure determination of the ore body, performed by SEM-EDS analysis and XRD analysis before and after the mining process, demonstrate the increased rate of pyrite decomposition due to the oxidation reaction and presence of bacteria. The chemical analyze results of the mining waters reveal a certain degree of aggressive impact to the equipment, demonstrated in practice, mainly on the rail lines for ore and equipment transport.

Key words: Pb-Zn deposit, mining waters, chemical composition, mineralogy composition, pyrite oxidation

Introduction

The region of Northern Kosovo has large mineral deposits and ore bodies, which have been exploited for centuries. In the municipality of Leposavic, lead-zinc bearing ores occur in mineralized areas of Rogozna and Kopaonik. Significant mineral deposits are Belo Brdo, Crnac, Koporić, Žuta Prlina and Jelakce. In 1999 the mineral exploitation in those mines was closed, excepting Belo Brdo and Crnac. In the area of the mine Crnac, the fissured type of aquifers is present. By the geological analysis the rock massive type was determined, as well as the porosity of the water bed. The drainage flow "Gnježdane" collects all waters from Crnac mine, as well as those from the old mines, which amounts were estimated from a maximum of 30 L / s to the minimum 0. l L / s. Mine waters flow directly into Jošanička river, left tributary of the River Ibar.

The ore deposit "Crnac" occupies the part of the mountain range Rogozna, covering locations Vučja Lokva, Gnježdane, Plakaonica, Duboka, Bare and Zminjak, around 15 km on the west from the municipality center of Leposavić. Some more detailed research on the area of Rogozna (localities of Crnac and Plakaonica) has been performed in 1957 and 1968. The mine has a regular production. The mining reserves, from categories $A+B+C_1$ are calculated at 2 200

000 tons. The mineralization is deposited in amphibolic rocks in the form of veins. The average composition of lead and zinc in the ore is 9-11%. The range and form of the ore veins occurrence, as well as terrain configuration have influenced the research methodology, consisting in combined mining works and exploration drilling [7].

In the opening and the development of the mineral deposit, there are ground waters occurring influencing mining works and production [5]. The chemical composition of the ground waters in the solid ore deposits is determined by the ores composition, therefore different ore deposits are characterized by different ground waters compositions. The ground waters from sulfide deposits are characterized by high sulfate concentrations and low pH values (acid waters) as well as high heavy metals concentrations. The mining waters from sulfide deposits are aggressive and have impact to the environment [1].

The greatest consequence of acid mine drainage (AMD) is water pollution, having as consequences contaminated drinking water, damage to aquatic flora and fauna, and corrosion of man-made infrastructure.

Microorganisms like bacteria and archaea significantly affect AMD. When metal sulfides, usually pyrite, that are contained in rock are exposed to water and air, an oxidation reaction takes place. Microbes speed up the decomposition of these metal ions. Microorganisms also play a huge part in the bioremediation of AMD. Techniques that are being researched include using metal-immobilizing bacteria, biocontrol with bacteria and archaea, and bioleaching [3].

Experiment

For the observation of the hydrogeology of the rock formations and the terrain of the Pb-Zn ore deposit „Crnac", as well as the definition of the yield regime and flow direction and its impact to the deposit hydrology, the hydrologic mapping of the wider zone was performed. The investigated area was limited on the "Gnjezdanski potok" area and the water yield, temperatures and pH values have been determined for the ground water [6].

The qualitative and semi-quantitative analyze of ore body have been made using an JEOL JSM-6460 scanning electron microscope with energy dispersive spectrometry - EDS (Oxford Instruments). Samples are polished and coated with Carbon, having a thickness (nm) of 20.0 nm and a density of 2.25 g/cm^3. All quantitative results below 2 sigma have been set to zero, as tresholding.

Mineralogy compositions of ore body samples are determined by using a X-ray diffractometer for powder PHILIPS PW 1710 under the following conditions: wave length CuKα = 1,54178 Å, within the range of 5-70^o 2θ.

Chemical compositions of the waters inflow and water drainage have been determined using AAS (Atomic Absorption Spectrometry) method.

Results and discussion

Geology forms and tectonic fabric conditioned hydrogeology characteristics of the ore field. The following water table types can be seen: compact spring type (sypars and slope wash), cavern water table type (scarns, hornfels, rhydacite, andensite, granodiorite, serpentined peridotite) and conditionaly waterless terrains (marled-clayed flysch sediments). From the rock massives of fissure porosity (cavern water table type, conditionaly waterless terrains), through the fissures, cracks, paraclases and paraclases areas, the mine waters penetrate in mining works of ore field. The waters from the mining works run off by gravity and now are appearing on the surface, the most often on the undermines.

It is very important to determine the parameters of rocks fractures, because they have impact to their water bearing, and they can be defined by different methods. For this research it has been used the photo geology method, because the fact elements can be connected logically during the interpretation so the researcher's subjective opinion is excluded. The parameters of the water bearings of rocks with fissure porosity are taken from a previous study done by the authors [8]. The results of the hydrology mapping have showed that all formations are extremely physically damaged, covered by decomposed deluvial deposits.

On the mapped area some large number of springs was determined, but the flow was always under 1 L/s. The adit "Gnježdane" drains all the waters from the "Crnac" deposit, as well from the old works. The mining waters are being directly discharged into Josanicka river, left tributary of the Ibar river [4]. The water samples previously analyzed are taken once a year, in November, at the open pit entrance, and represent the overall composition of the waters being drained from the Pb-Zn „Crnac" mine. They present great anomalies in the heavy metals content, as they are collected from the different places, mixed with industrial waters, and having aggressive reactions with the tools in the pit. For this study the following parameters of the water on the entrance were monitored: temperature, pH and flow. The temperature values were within the limits of 18^{0}C to 19^{0}C, the yield was between 0.1 L/s and 3 L/s, and the pH value was within the interval of 6.6-7.5.

3.3. Physical and Chemical Characteristics

In order to investigate an influence of the mining process to the acidity of mine drainage some three samples of ore body from Crnac mine have been taken. The first one, sample 1 was from undisturbed ore body; sample 2 was taken from mining in progress, and sample 3 was from the ore body largely influenced by acid mine drainage waters. As presented in the Fig. 1 the undisturbed ore body has a very coarse structure, and as shown in Fig.2 it consisted mainly of pyrite, galenite and quartz.

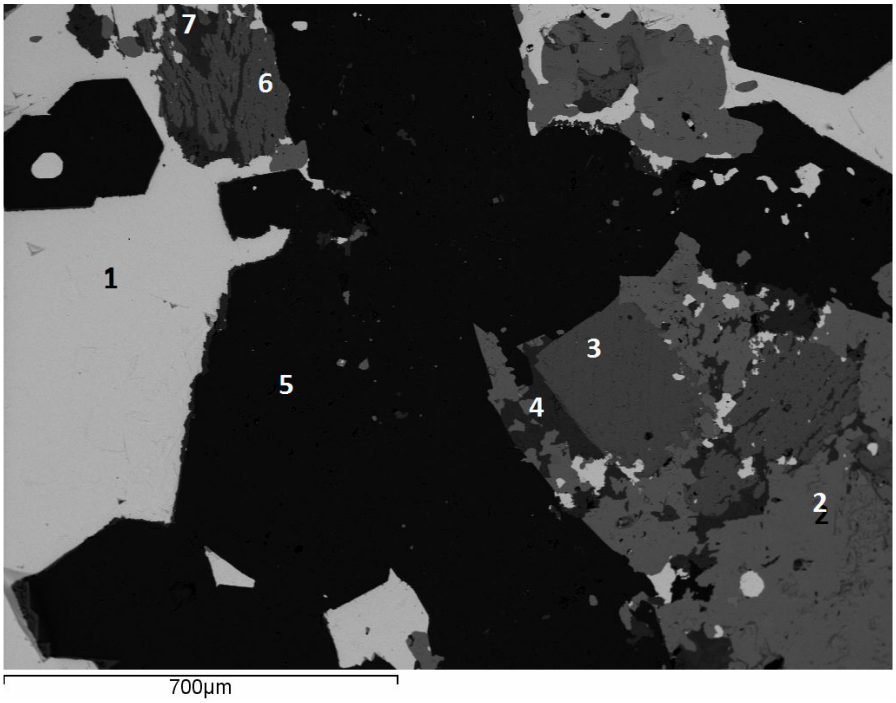

Fig. 1 Scanning Electron Micrograph image of undisturbed ore

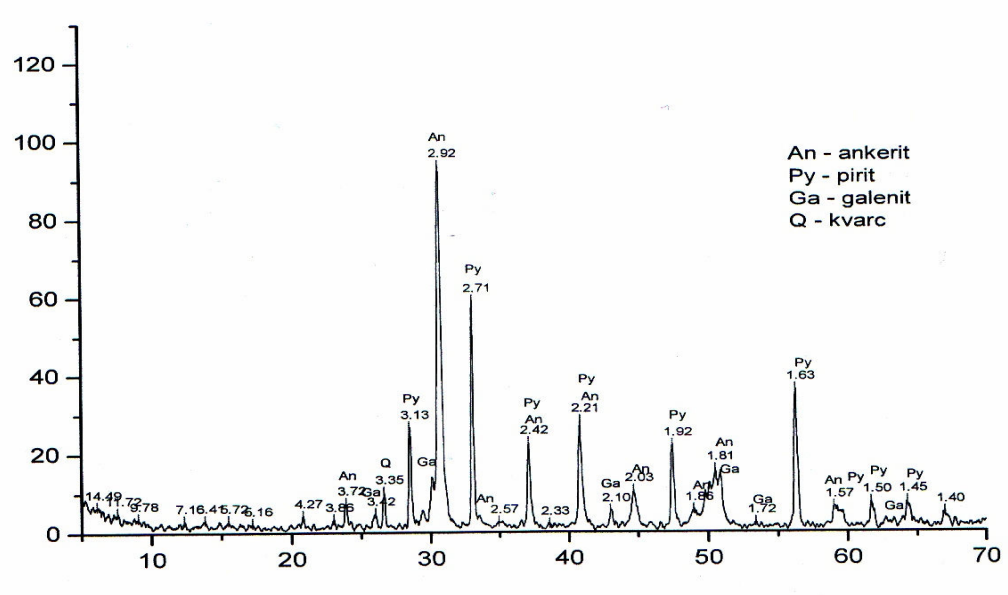

Fig. 2. XRD analysis of undisturbed ore

Pyrite oxidation occurs naturally at a slow rate in undisturbed rock. However, the acidity created is buffered by water. Because mining exposes more surface area of these sulfur-bearing rocks, additional acid is produced that is beyond the water's usual buffering capabilities.

When enough oxygen is available either from dissolved oxygen in the water or the atmosphere, further oxidation of ferrous iron (Fe^{2+}) to ferric iron (Fe^{3+}) occurs:

$$4Fe^{2+}(aq) + O_2(g) + 4H^+(aq) \rightarrow 4Fe^{3+}(aq) + 2H_2O(l)$$

Ferric iron (Fe^{3+}) can either precipitate as ochre ($Fe(OH)_3$), the reddish-orange precipitate observed in acid mine drainage waters:

$$2Fe^{3+}(aq) + 6H_2O(l) <\rightarrow 2Fe(OH)_3(s) + 6H^+(aq)$$

or it can react directly with pyrite to make additional ferrous iron and hydrogen ions:

$$FeS_2(s) + 14Fe^{3+}(aq) + 8H_2O(l) \rightarrow 15Fe^{2+}(aq) + 2SO_4^{2-}(aq) + 16H^+(aq)$$

Overall, these reactions release hydrogen ions, which decreases pH leading to an acidic environment [5].

3.4. Oxidation of Pyrite

Exposing pyrite to oxygen and water leads to an oxidation reaction, where hydrogen and sulfate ions and soluble metal cations are created:

$$2FeS_2(s) + 7O_2(g) + 2H_2O(l) \rightarrow 2Fe^{2+}(aq) + 4SO_4^{2-}(aq) + 4H^+(aq) .$$

The simulation run by the PHREECQ programme has given the results presented in Fig. 3.

Acid mine drainage is affected by characteristics such as pore size, particle size, permeability, and mineral composition of the materials being oxidized. The size of particles directly influences the surface area of rock exposed to weathering and oxidation. Surface area and particle size are inversely related. This characteristic may let air and water penetrate further, thereby exposing more substance to oxidation and ultimately generating more acid. Conversely, fine grain substances may prohibit air and water flow, but they also have more surface area exposed to oxidation. Another important factor, air circulation is impacted by wind, barometric pressure changes, and perhaps convective gas flow due to the heat created in the oxidation reaction. Over time as substances weather, particle size is decreased, exposing more surface area and affecting the physical characteristics of the unit.

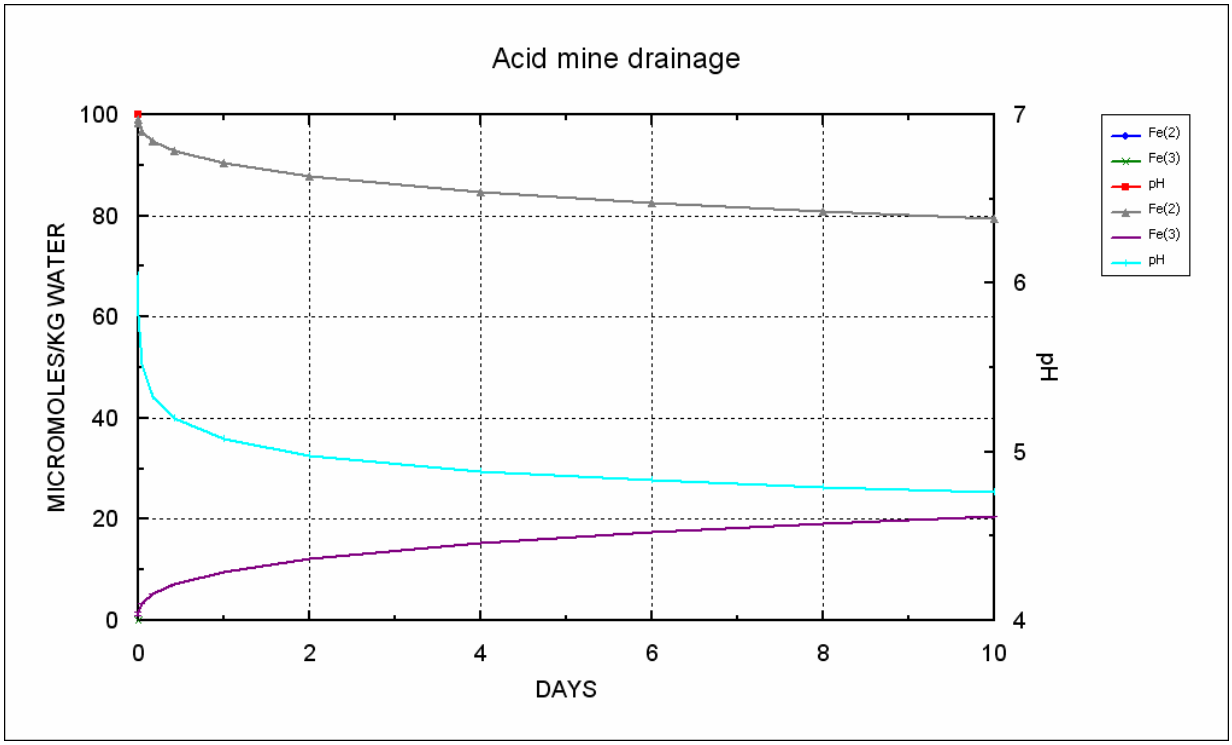

Fig. 3. Acid mine drainage composition in time

After mining process is involved in the area, the structure is disturbed and deep crevices between crystals are observed, enabling air and water to penetrate deeper and exposing more surface area to oxidation as shown on Fig. 4.

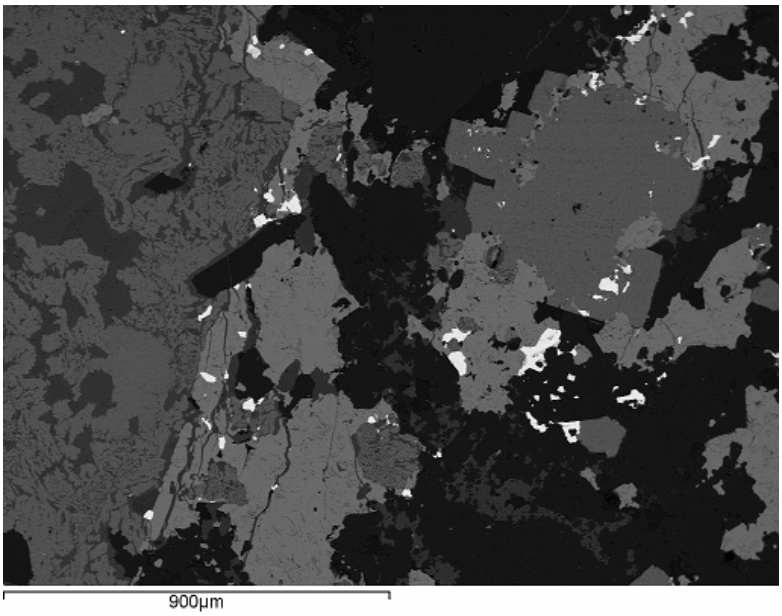

Fig. 4 Scanning Electron Micrograph image of disturbed ore

Water and oxygen availability are the most important factors though. Both materials are essential to create acid drainage. Atmospheric oxygen is needed to drive the oxidation reaction, particularly to maintain the quick bacterially catalyzed oxidation at pH values less than 3.5. When the oxygen concentration in pore spaces of mining materials is less than one or two percent, the rate of oxidation is notably reduced. The chemical composition of the seeping water compared to the chemical composition of water inflow from the ground water occurred in Crnac mine are presented in Table 1.

Table 1. Chemical composition of the water and acid mine drainage

Parameter	Water inflow the open pit	Acid mine drainage
pH value	7.50	2.6
Electric conductivity (μS/cm)	880	28,400
Chlorides Cl^- (mg/l)	10.63	2.7
Sulfates SO_4^{-2} (mg/l)	0	18947.2
Calcium Ca (mg/l)	160.32	412
Potassium K (mg/l)	0	0.04
Magnesium Mg (mg/l)	187.26	3446
Manganese Mn (mg/l)	0.01	971
Iron Fe (mg/l)	0.02	701
Sodium Na (mg/l)	0.02	2.61

Chemical composition, structure and mineralogy composition are changed in the same ore body after it was exposed to acid mine drainage water. As shown in Fig. 5 and Fig. 6 the total amount of pyrite is dissolved, and remained iron is in the form of siderite, after 90 days of exposure.

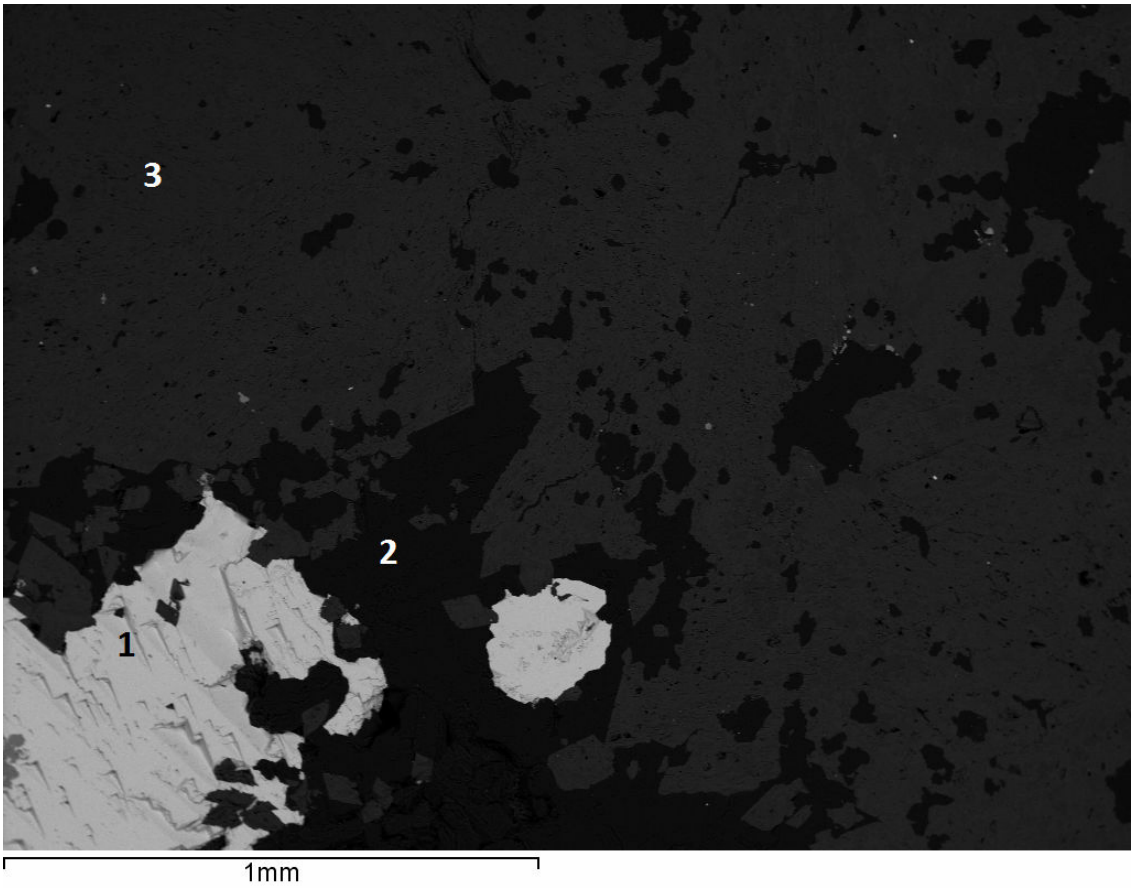

Fig. 5 Scanning Electron Micrograph of ore exposed to acid mine drainage

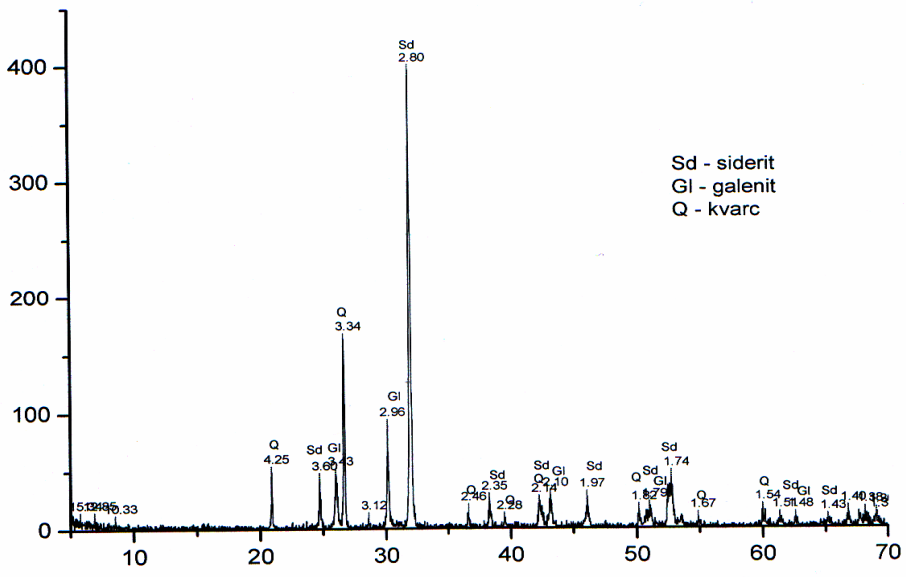

Fig. 6 XRD analysis of the ore exposed to acid mine drainage

Conclusion

The results of investigation showed that mining waters in Crnac mine are aggresive to the mining equipment and rail lines for ore and equipment transport. For the detailed analysis of the acidity of mining waters chemical and mineralogy analyse of ore body are conducted. Based on these results it can be concluded that the total content of pyrite is dissolved by mining waters, and acidity is affected by the presence of *Acidithiobacillus ferrooxidans*. In udisturbed ore body, where pyrite oxidation occurs naturally at a slow rate, the acidity created is buffered by water. In disturbed ore body the reactions lead to total dissolution of pyrite and formation of acid mine drainage with very low pH values.

Acknowledgement: This research was conducted as a part of the project III 43007 which was supported by the Ministry of Education and Science of the Republic of Serbia.

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USE OF BIOGAS FOR COMBINED HEAT AND POWER PRODUCTION

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Abstract:
The paper presents the reasons for which biogas is considered more and more a possible solution for the world energy crisis. Thus, it is shown what types of feedstock and other material wastes can be used in biogas production. Another presented topic is the application of digestate as fertiliser.

Key words: biogas, digestate, waste, biomass

Introduction

The use of biogas for combined heat and power production is a standard application for the main part of the modern biogas technologies in Europe. Biogas is also upgraded and used as renewable biofuel for transport in some European countries, where networks of gas upgrading and filling stations are established and operating. Biogas upgrading and feeding into natural gas grid is a relatively new application, but the first installations in Germany and Austria are feeding "biomethane" into the natural gas grids. A relatively new utilisation of biogas, in fuel cells, is close to the commercial maturity in Europe and USA.

Integrated production of biofuels (biogas, bioethanol and biodiesel) alongside with food and raw materials for industry, known as the concept of biorefineries, is one important research area today, where biogas provides process energy for liquid biofuel production and uses the effluent materials of the other processes as feedstock for anaerobe digestion. The integrated biorefinery concept is expected to offer a number of advantages related to energy efficiency, economic performance and reduction of emissions. A number of biorefinery pilot projects have been implemented in Europe and around the world, and full scale results will be available in the years to come.

Materials and method

This study is a survey on the scientific and official papers for evaluating the status and trends of biogas use.

Results and discussions

One of the main advantages of obtaining biogas is that various types of feedstock can be used for the production of biogas: animal manure and slurries, crop residues, organic wastes from dairy production, food industries and agroindustries, wastewater sludge, organic fraction of municipal solid wastes, organic wastes from households and from catering business as well as energy crops. Biogas can also be collected, with special installations, from landfill sites.

One main advantage of biogas production is the ability to use "wet biomass" types as feedstock, all characterised by moisture content higher than 60–70% (such as sewage sludge, animal slurries, flotation sludge from food processing etc.). In recent years, a number of energy crops (grains, maize, rapeseed), have been largely used as feedstock for biogas production in countries like Austria or Germany. Besides energy crops, all kinds of agricultural residues, damaged crops, unsuitable for food or resulting from unfavourable growing and weather conditions, can be used to produce biogas and fertiliser. A number of animal by-products, not suitable for human consumption, can also be processed in biogas plants.

Storage and application of liquid manure, animal dung and many organic wastes are sources of persistent, unpleasant odours and attract flies. Anaerobe digestion and its result, the digestate, reduces these odours by up to 80% (Figure 1). Digestate is almost odourless and the remaining ammonia odours disappear shortly after application as fertiliser.

Application of digestate as fertiliser, compared to application of untreated manure and slurries, improves veterinary safety. In order to be suitable for use as fertiliser, digestate is submitted to a controlled sanitation process.

Depending of the type of feedstock involved, sanitation can be provided by the anaerobe digestion process itself, through a minimum guaranteed retention time of the substrate inside the digester, at thermophilic temperature, or it can be done in a separate process step, by pasteurisation or by pressure sterilisation. In all cases, the aim of sanitation is to inactivate pathogens, weed seeds and other biological hazards and to prevent disease transmission through digestate application.

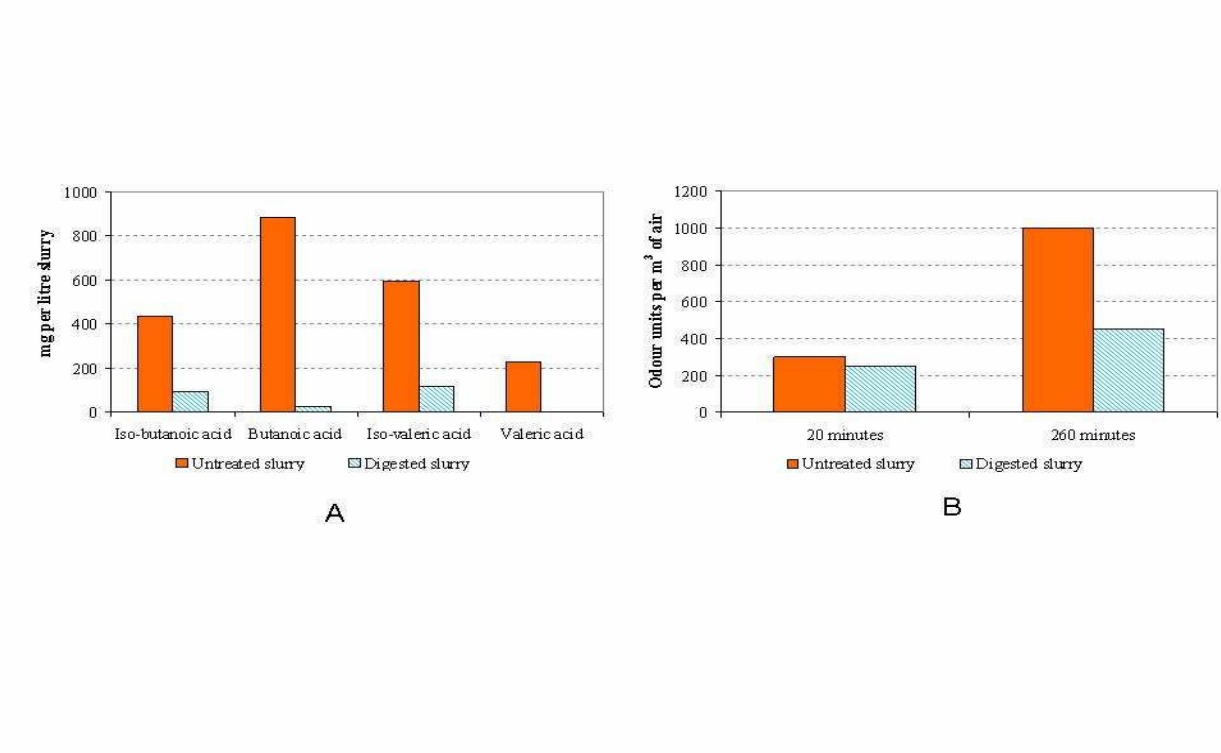

Figure 1. A: Concentration of odours (smelling volatile fatty acids) in untreated slurry and in digested slurry B: Odour concentration in air samples collected above the fields, after application of untreated slurry and digested slurry (HANSEN et al. 2004)

Anaerobe digestion state and development trends

The world markets for biogas increased considerably during the last years and many countries developed modern biogas technologies and competitive national biogas markets complemented by substantial governmental and public support. The European biogas sector counts on thousands of biogas installations, and countries like Germany, Austria, Denmark and Sweden are among the technical forerunners, with the largest number of modern biogas plants. Important numbers of biogas installations are operating also in other parts of the world. In China, it is estimated that up to 18 million rural household biogas digesters were operating in 2006, and the total Chinese biogas potential is estimated to be of 145 billion cubic meters while in India approximately 5 million small-scale biogas plants are currently in operation. Other countries like Nepal and Vietnam have also considerable numbers of very small scale, family owned biogas installations.

Most biogas plants in Asia are using simple technologies, and are therefore easy to design and reproduce. On the other side of the Atlantic, USA, Canada and many Latin

American countries are on the way of developing modern biogas sectors and favourable political frameworks are implemented alongside, to support this development.

In such an international context, in our country too there are many biogas plants and their number is increasing permanently. Important research efforts combined with full scale experience are carried out around the world, aiming to improve the conversion technologies, the operational and process stability and performance. New digesters, new combinations of anaerobe digestion substrates, feeding systems, storage facilities and other equipment are continuously developed and tested.

Alongside the traditional anaerobe digestion feedstock types, dedicated energy crops for biogas production were introduced in some countries and the research efforts are directed towards increasing productivity and diversity of energy crops and assessment of their biogas potential.

Cultivation of energy crops brought about new farming practices and new crop rotation systems are about to be defined, where intercropping and combined crop cultivation are subject of intensive research as well.

Biogas potential

The existing biomass resources on our planet can give us an idea of the global potential of using biogas as source of energy, begining on a household scale to a village or other comunity scale.

Figure 2. Municipal solid waste supplied to a German biogas plant

Substrates containing high amounts of lignin, cellulose and hemicelluloses can also be co- digested, but a pre-treatment is usually applied in this case, in order to enhance their digestibility.

The potential methane yield is one of the important criteria of evaluation of different anaerobe digestion substrates (Figure 3). It is noticeable, that animal manure has a rather low methane yield. This is why, in praxis, animal manure is not digested alone, but mixed with other cosubstrates, with high methane yield, in order to boost the biogas production. Common cosubstrates, added for co-digestion with manure and slurries, are oily residues from food, fishing and feed industries, alcohol wastes, from brewery and sugar industries, or even specially cultivated energy crops.

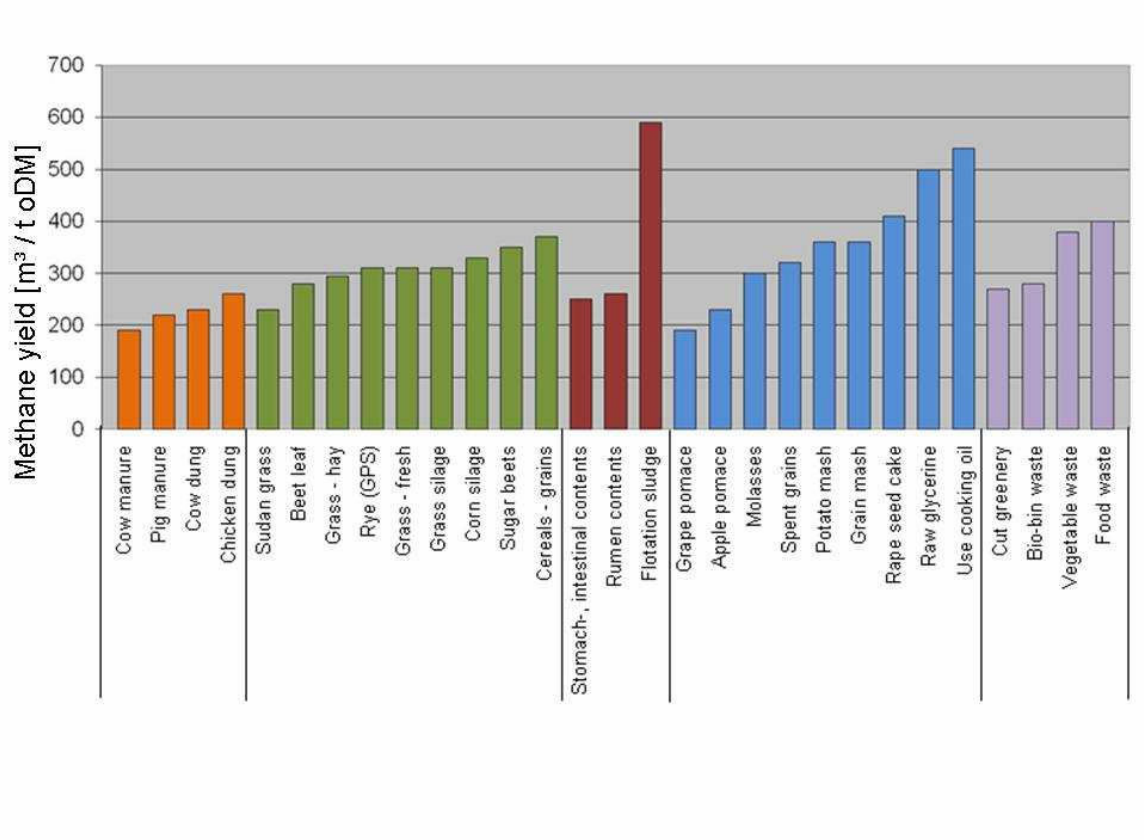

Figure 3. Benchmarks for specific methane yields (PRAßL 2007)

Conclusions

In the global quest of alternative sources of energy, biogas is a promising solution, along with other biofuels, such as bioethanol and biodiesel, due to its advantages. The main advantage of biogas is that it can be obtained from materials which are usually wasted, such as many of animal by-products which are not suitable for human consumption. Another

advantage is that the anaerobe digestion, the process through which biogas is obtained, and the digestate, the resulted product is valuable, because it can be used as fertiliser. Also, digestate is almost odourless and the remaining ammonia odours disappear shortly after application as fertiliser. In the future years, in our country too, the number of biogas plant will permanently increase, due to its advantages and the results obtained.

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RESEARCHES ON HYDROGEN USE AS ALTERNATIVE FUEL FOR VEHICLES

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Abstract

In the general quest for new alternative fuels, the possibility of using Hydrogen as fuel for vehicles is a subject which must be researched. Thus, this paper wants to research the technical possibilities of using and storage Hydrogen as fuel in vehicles. There are known 3 technical possibilities of storage: in pressure tanks, in cryogenic tanks and in containers with metallic hydrides. From these possibilities, we must choose considering the advantages presented by each of them. The storage in cryogenic tanks has the most favorable mass rate, but it is complicated and expensive. The containers with metallic hydrides present the advantages of the lowest primary energetic consumption, they accept simple and efficient supplying systems. The paper also studies the possibility of producing Hydrogen in vehicles and presents the advantages of using it as fuel. Even if until now, Hydrogen has not been mostly used as fuel, in the future it can become a viable alternative of the classic fuels.

Key words: alternative fuels, Hydrogen storage

Introduction

The use on larger and larger scale of alternative fuels leads to the quest of other fuels, most of them being more friendly with the environment and easy to be found. Next to biodiesel, bioethanol and biogas, the possibility of using Hydrogen as fuel, especially for vehicles, is one of the most favourable, that is why it is worthy to be investigated. In this respect, one of the main problems which raises in the case of using Hydrogen as fuel for vehicles is the possibilities of storage it in the vehicle. There are 3 methods to storage hydrogen at vehicles board: in pressure tanks, in cryogenic tanks and in container with metallic hydride. In the last years, there have been searched ways of Hydrogen storage in batteries with micro-spheres of glass or in metal pores environments, as well as the use of some organic liquid bearers.

The cryogenic tanks have the most favourable mass report, except the fuel tanks of oil origin. But such a tank is complicated and expensive, it needs a great energy consumption for liquefaction, it presents a certain degree of insecurity, especially at filling, and the filling system becomes more expensive and more complicated. Beside, there are important loses at

transport, supply and during storage. The hydrides have the advantage of the smallest energetic consumption, they accept simple and cheap supplying systems, have a big security degree, but they have a big mass report, which reduces the radius action of the vehicle [6].

Unlike the cryogenic tanks, the Hydrogen storage in gas state in cylinders or in hydrates needs smaller primary expenses, and their value decreases with the storage pressure. The most economic process from the available ones consists of combined metal hydrates. In the case of auto-vehicles, the couple Ti-Mg-Ni allows to reduce the specific rolling cost with 5-12 % when functioning with hydrogen and with 15-22 % when mixtures are used.

Materials and Methods

In the case of storage Hydrogen in containers with metallic hydrides, there are many metallic couples which have properties of retaining Hydrogen in different densities, varying between 1-10 % of the absorbed material mass.

In order to choose the most suitable material for storing Hydrogen at the vehicle board it must be considered that the specific hydride to have a specific mass as small as possible, to assure an absorption capacity as high as possible, to be dense, to present a reduced degree of insecurity through ignition and explosion, to have a favourable characteristic of modifying pressure within the temperatures of 20-200° C and to be as less expensive as possible. Using hydrides couple for storing hydrogen at the vehicle board would bring the following advantages:

- High efficiency due to reduced primary energetic consumption
- Supplying systems of simple tanks, cheap and not dangerous, due to the supplying pressure of 0,2-1,0 MPa.
- Mass report tank - fuel to values which do not influence the vehicle mass and allow reaching some acceptable action radius, especially in urban traffic.
- Theoretically unlimited reliability, because the researches made so far did not show a dependence of absorption capacity of hydrides of the number of cycles of loading-unloading.

- Because the hydrides have a selective absorption character, in perspective could use the existing supplying gas network, in which could be also introduced the Hydrogen needed in road transport

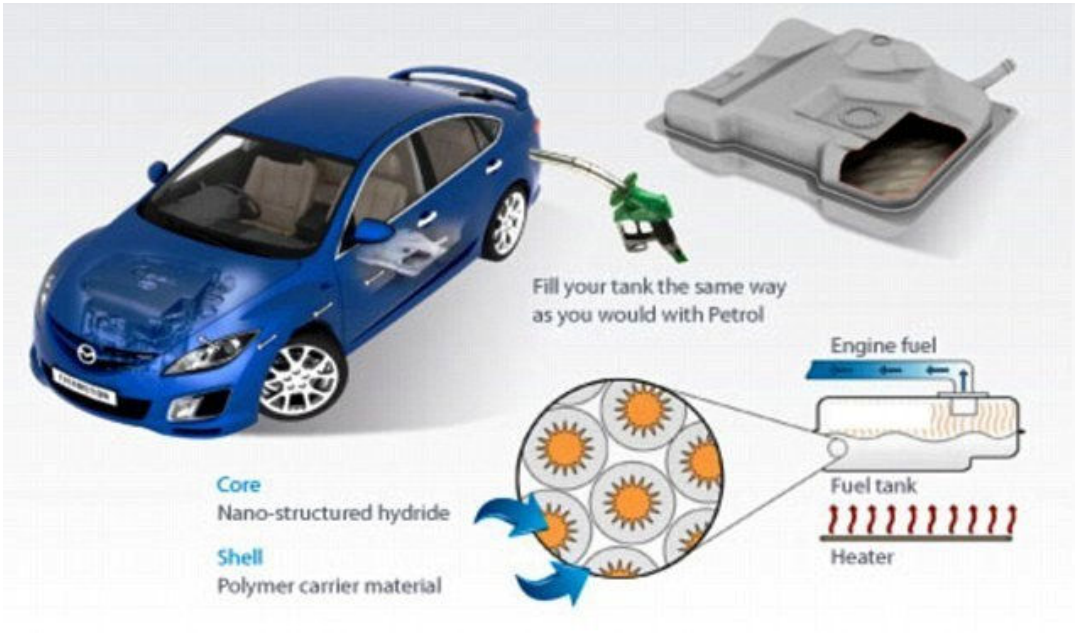

Fig.1. Tank of supplying with Hydrogen at vehicles board [4]

Producing Hydrogen at vehicles board

The solution which presents a real interest for transportation is offered by the reaction of substitution of Hydrogen from the water molecule, with the help of a substance which can be later regenerated. From these can be distinguished Aluminium and some components of Carbon and Silicon. The mixture of water vapours and Hydrogen can be used as it is, but in this case the engine power is reduced with up to 60 %, compared to using gasoline.

That is why it is preferred the previous separation of water vapors and the engine supplying only with Hydrogen. For this, after leaving the reactor, the mixture water vapors-Hydrogen, with a great energy potential, is released on a turbine wall, then enter in a separator where, through cooling, water is condensed and is again lead to reactor and Hydrogen is sent in the engine with internal burning.

Fig. 2. The cell of producing Hydrogen at vehicles board [1]

Such an installation has a power increased with 50-60 % compared to the engine with internal burning which uses gasoline.

Forming of the mixture fuel-air

Forming of the mixture fuel-air can be made inside or outside the cylinder. In all cases, the equipments of forming the mixture must answer the engine demands, defined by the dosage characteristic for the stabilized regimes and the respect of the consumption index in transit regimes. In the case of exterior forming of the mixture, either is pure Hydrogen, or the combination Hydrogen- gasoline, an equipment is used named mixer- dispenser.

This procedure is distinguished through constructive simplicity, ways of easy adjustment and a reduced price.

The sizing of the dosage elements with gasoline and Hydrogen depending on pressure can be made considering the pollution provisions or the requests of the fuel consumption. The experiments showed that, due to the very large flaming domain of hydrogen, the 2 conditions can be fulfilled simultaneously.

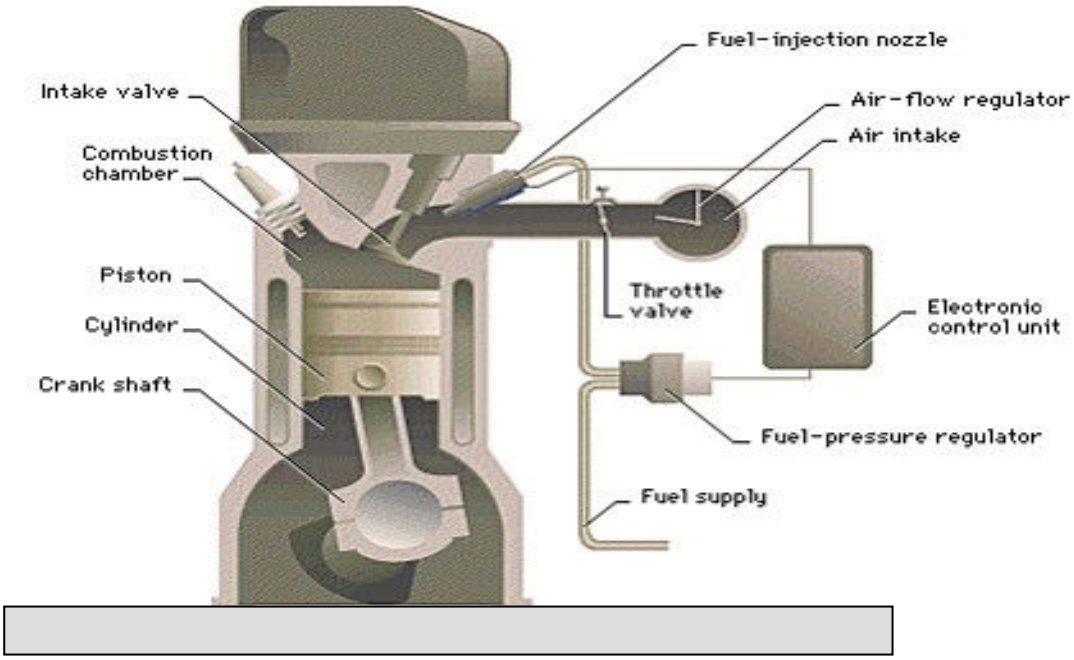

Fig.3. Formation of the mixture fuel – air at engines with compression ignition [3]

The benefits of using Hydrogen

- The reducing of the fuel consumption up to 30-50 %, assuring the increase of the power and efficiency of the engine
- The reducing with 30-50 % of engine wear, due to the purity of the mixture fuel and Hydrogen [3]
- The decrease of the pollution degree, through the massive reducing of emissions and through reducing the noise produced by the functioning of the engine [5]
- It does not present any danger in exploitation.

Compared to GPL system, Hydrogen present many advantages such as [4]:

- The price much lower of this device, compared to an installation GPL
- The space used for this device is very small, because it does not need a tank of Hydrogen storage
- The simplicity and reliability of this device is a strong argument

Conclusions

In this paper we wanted to show that Hydrogen can be used as fuel in vehicles and that it can be stored at the vehicle board. From the 3 known technical possibilities of storage of Hydrogen, the cryogenic tanks have the most favorable mass rate, but it is complicated and expensive. The hydrides present the advantages of the lowest primary energetic consumption, they accept simple and efficient supplying systems.

We also showed the benefits of using Hydrogen as a fuel, one of the most important being the reducing of the fuel consumption up to 30-50 %, compared to using the conventional fuels as well as the decrease of the pollution degree.

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ECO-ECONOMIC GOALS INCLUDED IN THE POLICIES OF THE EU WESTERN COUNTRIES

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Abstract

The twentieth century was characterized by steady growth favored mainly by industrialization, all other factors being derived. The XXIst century is one of change, a leap in awareness planning against cumulative negative effects. Mankind feels the adverse effect of progress as pollution and climate change. The dark side of progress was partly overlooked by until recently, but since the confirmation of the grim realities, countries have agreed to take proactive measures in environmental, energy and transport so that future progress to be in mutual relation to the sustainable development. The purpose of this paper is to analyze, in terms of European norms and regulations, the eco-economic policy objectives designed to sustain and restore the ecological balance without adversely affecting economic growth and social welfare.

Keywords: economic policy, sustainable development, economic system western European, environment

Introduction

Environment is affected by human activities. The effect is cumulative, negative externalities among coalitions in which the most dangerous is pollution (air, water and soil). One of the main current problems lies in the use of limited resources so as to achieve the objectives of economic policy. Add global warming (temperature rose to 2°C compared with pre-industrial levels, requiring a reduction of carbon dioxide emissions by two-thirds by the year 2100). Rich countries are forced to rethink how to support competitiveness by promoting green industry, while developing countries will support growth with new technologies, cleaner, even if green growth remains a religion rather than a reality.

Eco-objectives included in the European policy

Eco-targets are found, increasingly more in the measures taken by economic policy [Holzer Verena Leila, 2005].

EU 2020 strategy is a three-way one [Meyer Hermann, 2011]:

- Smart growth (knowledge-based economy, innovation, education and digital society);
- sustainable growth (measures to reduce emissions of greenhouse gas emissions, increase resource efficiency and competitiveness);
- inclusive growth (economy able to provide jobs, social and territorial cohesion).

Sustainable development means to satisfy needs of current generations without harming future generations in meeting their needs [Holzer Verena Leila, 2005].

The concept of sustainability includes three aspects:

- Environmental sustainability - involves preserving the natural environment;
- Social sustainability - social cohesion requires the opportunity for people to make decisions independently, outside the formal institutional framework;
- Economic sustainability - with the concept of efficiency in static and dynamic form, seen as a way of searching for the tools necessary to achieve the objectives of economic policy.

Environmental sustainability is important to ensure the economic and social sustainability because the environment is a supplier of natural resources. Raw materials and industrial production provide the basis of any other economic activity.

Environment is the receiver of emissions from economic activity, its immanent value to improve the quality of life and at the same time, is the basis of life and work on earth. Sustainable use of the environment implies that the natural rate of regeneration of the resource to exceed the consumption and assimilation ability to excel wastage rate.

The key objectives of the European sustainable development are:

- Environmental protection, by increasing decoupled from negative externalities of economic activities;
- Ensuring equity and social cohesion, human rights, cultural diversity, equal opportunities, reduce inequalities and eliminate discrimination;
- Economic welfare and ensuring high standards of living;
- Making commitments in an international context.

European environmental policy agenda originally featured a small number of countries such as Austria, Denmark, Germany, Netherlands, Sweden and the UK. Other members agreed the policy for environmental measures conditioned of receiving agricultural subsidies for regional development [Tol S.J. Richard, 2011]. Environmental policy is included within other policies that directly interfere, especially energy and transport.

For the years 2020 and 2030, the EU has established a number of strategic objectives in line with current and future challenges, in particular climate change and the need for clean energy.

A common objective priority to environmental policy, sustainable development, energy and transport is limiting greenhouse gas emissions and their negative effects on the environment and climate.

Given the current pace of economic and industrial development until the end of the century is likely to increase with temperature 6°C, consisting consequences of violence in climate, reductions in drinking water, drought, food shortages, destruction of flora and fauna, sea level rise, planetary imbalance that is economically, environmentally and socially general.

From 1990 to 2007, emissions of greenhouse gases increased by 25%. By the commitments made by the EU wants to change the trend by 2020. Emissions of greenhouse gases must be halved by 2050 compared with 1990. Climate change will lead to a welfare reduction of 6% of PNB by 2050 involving a reduction in global economic growth on average by 0.15% per year [Kulessa E. Margareta, 2007]. Reduction of greenhouse gas emissions at a cost equivalent to 0.06% and 0.19% of EU [Kulessa E. Margareta, 2007]. PNB, Costs equivalent to 0.19% of PNB will be recorded only if the EU achieves eco-goals themselves.

Environmental policy has developed in recent decades and is one of the most important policies. [Michaelowa Axel, Krause Karsten, 2000]. The start was given by the Framework Convention on Climate Modification (Framework Conventions on Climate Change) in the United Nations Convention on Environment and Development in 1992, culminating in the Kyoto Protocol in 1997, in which were set emission reduction targets greenhouse gases by industrialized countries in transition. The Kyoto Protocol has provided two stages.

Initially, the objectives were targeted in 2012, representing the so-called 2008-2012 commitment period, a first initiative by an international convention on environmental issues [Michaelowa Axel, Krause Karsten, 2000]. ith only a few exceptions, including the U.S. and Canada, developed countries have agreed to adopt measures for environmental protection despite the difficulties related to awareness of environmental objectives. Through the Kyoto Protocol, the EU has assumed the responsibility for reducing emissions by 8% by 2012 compared with 1990.

The second stage set in the Kyoto Protocol covers the period from 2012 to 2020. Coverage of the stage is smaller than the previous one because only the EU, Norway,

Switzerland, G77 and some other states have assumed environmental responsibilities [Riley Alan, Bastien Alex, Rauscher Daniele, 2012]. A parallel agreement, which does not consider the pollution tax, will involve the developed and developing states which have not made commitments under the Kyoto Protocol, such as the USA, Canada or Japan.

In March 2007, the EU Council reformulated environmental objectives, the Commission proposes the following objectives need to be achieved by 2020 compared with 1990 [Kulessa E. Margareta, 2007]:

- The EU will reduce emissions of greenhouse gases by 30% compared to 1990, differentiated according to the degree of development of each individual member;
- If other countries will do similar concessions, the EU will reduce emissions of greenhouse gases by 20%;
- The share of primary energy consumption will increase by over 20% in total energy consumption;
- Total energy consumption will be reduced by 20% due to increasing energy efficiency;
- The share of biofuel consumption will increase to 10% from 5.75% (2010) total hydrocarbon consumption.

Targets for reducing greenhouse gases were set differently for each individual member in order to allow the cohesion countries in the period, considering that at the time of conclusion of the Kyoto Protocol Greece, Ireland, Portugal and Spain were the countries with the lowest incomes in the EU their targets were not so ambitious as those for the high-income countries, as presented in Table 1 [Sven Bode, 2007].

Since 1991, the Commission proposed a delineation of the obligations of Member States on three levels: 5% for Denmark, Germany and the Netherlands, 15% for states in that time in the cohesion period and maintain constant emission rest states. The proposal was not accepted by all members, so that was not applied.

In 2005, the EU began to implement a pilot scheme covering about 40% of carbon dioxide emissions. The scheme came into its first operation stage in 2005 and the second, in 2008, starting with commitments under the Kyoto Protocol. The scheme was developed and revised so that in 2013 it entered a new stage in which environmental policy measures will be geared towards transportation fuels, renewable energy, energy performance of buildings, energy efficiency and energy services. The EU has proposed that by 2020, renewable energy

will represent 20% of the total as a result of greater use of biofuels in transport through carbon capture and storage and energy efficiency.

Table nr. 1

Kyoto targets and allowed gap compare to the objective for each State Member (Minus 20% for all)

State Member	The target set for 2008-2012 (compared with 1990) (%)	The gap(%) as against Kyoto after aplication(-20%) (%)
Austria*	- 13.0	-7.0
Belgium*	-7.5	-12.5
Bulgary	-8.0	-12.0
Cyprus**	-	-
Czech Republic	-8.0	-12.0
Denmark**)	-21.0	1.0
Estonia	-8.0	-12.0
Finland*	0.0	-20.0
France*	0.0	-20.0
Germany*	-21.0	1.0
Greece*	25.0	-45.0
Hungary	-6.0	-14.0
Ireland*	13.0	-33.0
Latvia	-8.0	-12.0
Lithuania	-8.0	-12.0
Luxembourg*	-28.0	8.0
Malta**	-	-
Netheralnds*	-6.0	-14.0
Poland	-6.0	-14.0
Portugal*	27.0	-47.0
Romania	-8.0	-12.0
Slovakia	-8.0	-12.0
Slovenia	-8.0	-12.0
Spain*	15.0	-35.0
Sweden*	4.0	-24.0
United Kingdom**)	-12.5	-7.5

Source: Sven Bode, 2007, „European Burden Sharing Post – 2012", *Intereconomics*, march-april, pp. 72-76
Note: *) according to the agreement of 1998; **) no targets were set by the Kyoto Protocol.

In March 2007, the European Council has assumed an independent commitment to reduce greenhouse gas emissions by 20% by 2020 compared to 1990 and expressed its intention to reduce by 30% if other countries industrialized will assume similar responsibilities. The EU supported the objectives set by the Kyoto Protocol through an internal agreement to reduce emissions differentiated by members.

For the period after the interval 2012 - 2020 already discussing a new agreement. Negotiations will last until 2015, and the agreement will enter into force in 2020 [Riley Alan, Bastien Alex, Rauscher Daniele, 2012].

Growth in terms of protecting the environment requires a set of actions and goals whose convergence is geared toward: developing specific markets (energy, natural gas, oil, uranium, coal), promoting renewable with green certificates, efficient use of energy by means

of white certificates, non-discriminatory access to transmission infrastructure development energy, thermal and gas, changing structures intensive industries etc.

Reducing greenhouse emissions is an ambitious goal that requires commitment through a single agreement, comprehensive, global and finding a balance between the three pillars of energy policy: competitiveness, security of supply and sustainability, without neglecting any of them.

Conclusions

Industrialization, consumption growth, population growth and negative externalities caused reduced amount of resources and disrupting the ecosystem. Protecting the environment has become a priority, as well as commitments in each country.

Responsibilities are easier to take than observed, the associated costs to unbearable levels. Sustainable development is a goal to which even potential economies cannot afford to ascend easy. The division of responsibility, global and regional, is natural and necessary. The European Union readiness to act, along with other individual countries, to ensure future sustainability. In this respect, the 2020 Strategy objectives and action steps mark doomed to restore at least some ecological balance. Future economic policies of the EU eco-action insert whatever typology and its sector destination.

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THE IMPACT OF LAND USE ON SUSTAINABLE DEVELOPMENT IN THE RURAL AREA OF SIBIU DEPRESSION

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Abstract
The development of rural area is constantly a complex research theme only considering the study of elements that characterize the authentic villages with the aim of sustainable development and to keep them unspoiled. The paper highlights the natural resources as basic elements in the characterization of authentic motherland and is focused on the study of land use in the development of rural area of Sibiu Depression. This is because as a whole, the rural area of Sibiu Depression was under the predominant agricultural activity, closely associated with other activities such as forestry, and lately tourism, leisure, fishing and hunting. The results show the contribution of each agricultural sectors of the inhabitants, the problems facing the rural economy and are grounding measures to solve them

Keywords: development, economy, territorial, resources, rural, sustainable

Introduction

Romania is one of the most "rural" country from United Europe, because of the natural resources and the population that lives in rural area which has a maintained high share (45% – over 10 million of inhabitants) as with all, in present we are assisting to a decline of this because of demographic and economic problems. This situation must be seen as an advantage, because rural areas are favorable places for human activities for living and sustainable development.

In the rural area development, special attention should be paid to elements that characterize the authenticity villages such as individuality and specificity. One of these elements is represented by the natural resources. Their components defines the nature of the work scrutinized in predominantly rural area and the potential for generating economic diversity waiting to be improved (Iagaru,2012). It looks like we can meet rural areas characterized by the predominance of livestock farming, forestry, field activities, touristic, leisure, fishing and hunting. In the rural area of the Sibiu Depression we meet this kind of areas where one of the above mentioned activities is predominate, but generally we can discuss a dominance of farming and a potential generator of economic diversity waiting to be harnessed. In this context with this study we would like to point out the impact of land use

change on the sustainable development of land use to farming and rural area, the problems that are experienced by the rural economy and the necessary measures to solve the problems.

Objectives. Methodology and the method of research

The research method of the countryside must be in concordance with the research objectives and purposes. The major objective of research is to highlight all inhabitants activities, all problems are facing rural economy and measures for solving them.

In using the methodology and research method it was taken into account that the majority of school methodology insist to be used in parallel the study of some one of social-economic and complementary qualitative and qualitative methods for adding value. The methods and techniques of the strategic management are used by the responsible factors of the rural development, to have an overview and to identify the factors with a critical implication on rural area. The research methodology is able to surprise the territorial area peculiarities reported the development of food industry as case study (Yin, 2003, Hammersley, 2003, EC, 2009). The reality of research in the rural area of Sibiu Depression from the land structure starts with the study of statistics and the literature in the field (reports, strategies, studies, monographs) continues with a direct research to collect data about uncovered problems with information in official documents.

Result and discussion

The land structure in the rural areas of Sibiu Depression is dominated by the forest with a surface of 61,84 thousands ha that represented 52,15 % of the total land of Sibiu Depression forthe year 2010 (Table 1). High values at the administrative level is registred in the area of Tălmaciu (12,84 mii ha), Cisnădie (8,89 thousands ha), Rășinari (8, 56 thousands ha), Boița (6, 26 thousands ha) and Gura Râului (6,22 thousands ha).

Agricultural area of the rural area of Sibiu Depression totalized and represent the total land existing in that mico-region. Localities where agricultural area registred high values in agricultural activities with a significant share are as following: Tălmaciu (5,29 thousands ha), Șelimbăr (5,07 thousands ha), Șura Mare (4,98 thousands ha), Rășinari (4,04 thousands ha).

Tabel 1.

Land structure in the Sibiu Depression

Method of use	Sibiu Depression Thousands		Mun. Sibiu	Orașul Cisnădie	Orașul Tălmaciu	Boița	Cristian	Gura Râului	Orlat	Poplaca	Rășinari	Șadu	Șelimbăr	Șura Mare	Șura Mică
	ha	%	ha	Ha	ha	ha	ha	ha	ha	ha	ha	ha	ha	ha	ha
Total land	**118.57**	**100**	**12.16**	**13.86**	**18.53**	**10.02**	**7.12**	**10.55**	**5.90**	**3.27**	**12.79**	**4.70**	**7.23**	**7.49**	**4.95**
A.Agricultural area	***49.65***	***41.87***	***6.34***	***4.39***	***5.29***	***3.60***	***3.12***	***3.88***	***2.05***	***1.29***	***4.04***	***2.04***	***5.07***	***4.98***	***3.56***
Arable	16.99	34.22	3.65	0.75	0.89	0.32	1.65	0.92	0.70	0.41	0.31	0.52	3.01	1.72	2.14
Pastures	20.90	40.09	1.73	2.29	3.74	2.22	0.94	2.05	1.05	0.66	1.89	0.59	1.58	1.38	0.78
Hay	9.33	18.79	0.77	0.51	0.67	1.06	0.44	0.91	0.30	0.22	1.83	0.92	0.47	0.85	0.38
Live nurseries vineyard	0.16	0.3	-	-	-	-	0.01	-	-	-	-	-	-	0.12	0.03
Orchards and nurseries	2.23	4.49	0.19	0.83	-	-	0.08	-	-	-	-	-	0.01	0.92	0.20
B.forest and other Forestry land	***61.84***	***52.15***	***2.65***	***8.89***	***12.84***	***6.26***	***3.50***	***6.22***	***3.60***	***1.87***	***8.56***	***2.49***	***1.58***	***2.18***	***1.20***
C. Construction	***3.90***	***3.29***	***2.29***	***0.38***	***0.15***	***0.04***	***0.27***	***0.07***	***0.08***	***0.04***	***0.09***	***0.08***	***0.22***	***0.09***	***0.10***
D. Roads and railways	***1.66***	***1.40***	***0.56***	***0.12***	***0.12***	***0.05***	***0.12***	***0.08***	***0.06***	***0.03***	***0.06***	***0.06***	***0.21***	***0.12***	***0.07***
E. Water and ponds	***0.88***	***0. 75***	***0.15***	***0.06***	***0.12***	***0.06***	***0.07***	***0.12***	***0.06***	***0.01***	***0.03***	***0.04***	***0.12***	***0.01***	***0.03***
F. Degraded and unproductive lands	***0.79***	***0.67***	***0.18***	***0.03***	***0.02***	***0.02***	***0.06***	***0.18***	***0.06***	***0.03***	***0.02***	***0.01***	***0.05***	***0.11***	***0.02***

The existing agricultural area in the rural area from Sibiu Depression shows a structure oriented for pasture, arable and meadow wheares vineyards and orchards are poorly represented (fig 2).

Analysis of land use within the agricultural category. highlights its dominance of areas occupied by pastures (20.9 thousands ha) holding a share of 42.09% of total agriculture. followed by arable (16.99 thousands ha) with a share of 18.79% and meadow (9.33 thousands ha) whose share is 18.79%. This shows that agricultural activities conducted in rural areas researched are oriented to livestock due to the large share of pasture owned by 60.88%.

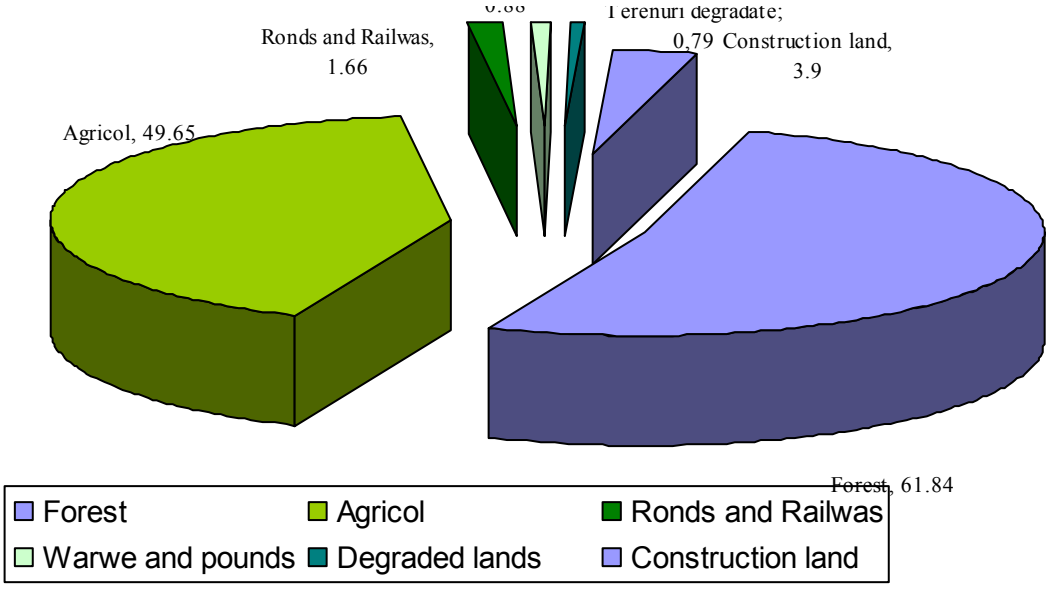

Fig. 1. Graphical representation of the land use, in 2010, in the Sibiu Depression

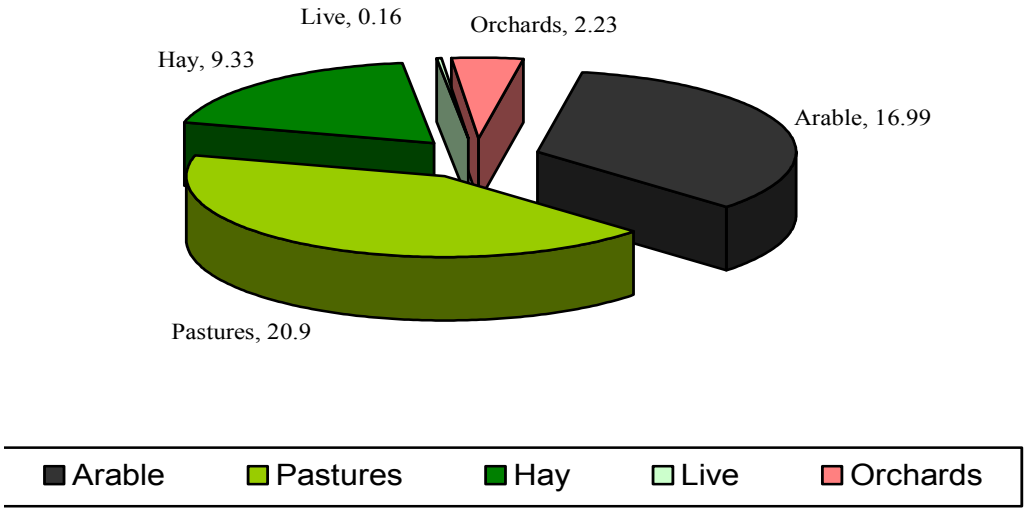

Fig. 2. Graphical representation of the agricultural area, by use, in 2010, in the Sibiu Depression

Analyzing these land use categories in the towns highlights the existence of large arable land for Șelimbăr (3,01 thousands ha), Șura mică (2,14 thousands ha), Șura Mare (1,72 thousands ha) and Cristian (1,65 thousands ha), the large areas occupied by pastures in rural in Tălmaciu (3,74 thousands ha), Boița (2,22 thousands ha), Gura Râului (2,05 thousands ha) and Rășinari (1,89 thousands ha), that the large areas occupied by meadows in rural Boița (1,06 thousands ha), Rășinari (1,83 thousands ha), Sadu (0,92 thousands ha), respectively Gura Râului (0,91 thousands ha). This analysis shows that agriculture is a traditional activity in Sibiu Depression, and is generally the main activity and source of income for rural inhabitants.

Focused on meeting domestic demands, agriculture benefits from important natural and diversified potential, but is still at the beginning of a long and difficult process of modernization and restructuring leading to efficiency and better exploitation of important agricultural potential of the basin. The performance of the agricultural sector in Sibiu Depression is not up to the agricultural potential of the area although there are numerous concerns of the group of experts and competent bodies in this regard. One of the factors that hinder performance in agriculture is the fragmentation of ownership in small plots (4,68 – 4,90 ha), higher than the national average (3,45 ha) (Table 2). It must, however, need to merge their holdings larger areas, in order to move to a modern agriculture.

Table 2

Used agricultural area and used agricultural area that lies in average at an agricultural exploitation

Development Region/ County	**Agricultural area*(ha)***	**Agricultural area used *(ha)***	**Utilised agricultural area, which lies on average (*ha)***	
			On a farm agricultural	**On a farm farm using agricultural area**
Central Region	**1.901.554**	**1.626.141.11**	**4.13**	**4,34**
Sibiu	305.458	243.718.23	4,79	4,97
Sibiu Depression	47.495	37.754,84	4,68	4,90

Source: General Agriculture Register of the Minsitry of Agriculture, 2010.

The analysis of the land in the rural area of the Sibiu Depression, looking on its impact on the development and diversification of economic activities highlighted a number of specific issues.

This leads to the general conclusion that the progress of the economic activity, in the rural areas is always done in relation with the specific of the territory and supported the rural community who gives life and maintains the rural of the Sibiu Depression.

Conclusions

Through the actions of identifying existing problems in rural areas studied and proposing some measures to solve them in the direction of capitalization of the territorial specificity, the study is grounding reasons for sustainable development and diversification of economic activities. The analysis of the land use in the rural area highlights that the traditional occupations of the inhabitants is livestock and an important percentage of this area is occupied by pastures and hayfields in total utilized agricultural area confirming that it is an important branch of the rural economy. Balanced distribution of the two major categories of the land structure is an argument that made the premises of a rural economic diversification so that rural areas from Sibiu Depression and it should not be labeled predominantly agricultural area but one with a sharp economic diversity. The potential generator of economic diversity revealed in the rural area of Sibiu Depression is a premise of developing non-agricultural activities, especially industrial and service based on complementarity to agriculture.

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THE IMPACT OF THE CURRENT SITUATION ON THE DEVELOPMENT OF FOOD INDUSTRY WITHIN THE ROMANIAN RURAL AREA

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Abstract
Rural development is politically coordinated through the Common Agricultural Policy and, according to the European Strategy document "Europe 2020", it is focused on finding the best solutions to economic, environmental and territorial issues. This paper is focused on describing the reality of the rural area in Sibiu Depression, using the case study methodology, regarding the sector of food industry. The results obtained are relevant to be used as a background doscumentation for further adopting strategic options for the development of this sector from the perspective of food industry.

Keywords: food, development, economy, industry, rural, strategy

Introduction

Considering its size and population, Romania is an important EU member state, but its level of economic and social development recorded a significant gap compared to other member states, notably compared to the EU-15. This situation is demonstrated by the gross domestic product per capita (GDP per capita) expressed in relation to the purchasing power standard (PPS), which in 2010 was lower by approximately 55% compared to the EU average, which places Romania on the second from last place. Hence, the need for a change to place Romania on the appropriate rank position relative to the size, number of inhabitants and natural resources. Changes can take place by supporting rural development in taking the most efficient steps, considering the principles of sustainability of existing natural resources based on a research process upon the reality of rural areas. Researching rural areas is a problem as current as back in the year 1938 and the words of the illustrious sociologist Dimitrie Gusti are as valid now as they were then: "In the current era of intense organizing of our nation, researching the Romanian reality is particularly necessary. The effective actions require thorough documentation... I'm sure that only diagnoses based on researches of the kind undertaken by teams can provide the documentation needed for tracing a complete plan to

organize the national life". The paper addresses only one sector in the development of the rural economy, namely the most advanced component of food manufacturing industry in the countryside. The motivation for this choice is based on the following elements: traditional farming is an activity supported by an adequate endowment of the rural area with natural resources, agrifood industry is an important sector for the rural economy whose productivity is even lower than the average EU-27 level, the growth level in the employed population, the share of value added and labor productivity is higher than the EU 27 average (2.3%, 6.3%, 7.1% versus 2.2%, 2%, 1,5%) which indicates its potential in achieving a sustainable development of rural areas.

Objectives, methodology and research method

The research method within the rural area must be consistent with the objectives and research purposes. The major objective of the research is the development of strategic options for development in rural areas through the food industry, based on the principle of sustainability, aimed at increasing the availability and distribution of food, increasing income and purchasing power of rural residents. The choice of methodology and research method was made taking into account the fact that most methodology schools insist that the study of a certain socio-economic reality should "use in parallel and complementarily quantitative and qualitative methods to achieve extra knowledge." Methods and techniques of strategic management are used by responsible decision makers of rural development in order to obtain an overview and thus, identify the critical factors impacting the rural areas. One research methodology capable to capture regional specificities related to the development of the food industry is the case study (Yin, 2003 Hamersley, 2003 EC, 2009). Research of reality in the rural area of Sibiu Depression in terms of developing the food industry begins with a study of statistics data and of literature in the field (reports, strategies, studies, and monographs), it continues with a direct research to collect data regarding certain uncovered problems with information in official documents. The resulting information is used in the SWOT analysis (Strengths, Weaknesses, Opportunities and Threats) to highlight strengths and weaknesses, opportunities and threats (Ilieş 2008). To highlight new problems and increase the quality of information, there were organized semi-structured interviews with key local stakeholders and structured interviews to collect data on successful initiatives.

Results and discussion

Food industry represents an important traditional branch of the manufacturing industry in rural areas of Sibiu Depression. The synergy between the food industry and the primary agricultural production of vegetal origin, but especially that of animal origin, represents the vector of economic development in rural areas able to offer significant potential for development. The situation of evolution of establishments manufacturing food industry in rural areas of Sibiu Depression reveals both a high share among the processing units (30% of total manufacturing units) as well as a slight increase in 2010 (32 units) compared to 2007 (27 units) showing the following distribution by category of activity (table 1).

Table 1

Distribution within Sibiu Depression of processing units specialized in activities belonging to food industry

Region/ city/ commune	Production, manufacturing preserving meat and meat products		Manufacturing and preserving fruits and vegetables		Manufacturing dairy products		Manufacturing bakery and farinaceous products		Manufacturing other food products		Total	
Year	2007	2010	2007	2010	2007	2010	2007	2010	2007	2010	'09	'10
City of Sibiu	20	18	2	-	15	10	68	57	32	18	137	103
City of Cisnădie	5	3	-	-	-	-	4	3	1	5	10	11
Tălmaciu	-	-	-	-	2	1	3	3	1	-	6	4
Boiţa	-	-	-	-	-	-	1	3	-	-	1	3
Cristian	3	-	-	-	1	1	1	2	-	1	5	4
Gura Râului	1	2	-	-	-	-	-	-	1	-	2	2
Orlat	-	-	-	-	-	-	1	1	-	-	1	1
Poplaca	-	1	-	-	-	-	-	-	-	-	-	1
Răşinari	2	2	1	-	-	-	-	2	3	3	6	7
Sadu	-	-	-	-	-	-	1	1	-	-	1	1
Şelimbăr	-	-	-	-	-	1	2	3	2	2	4	6
Şura Mare	-	-	-	-	4	2	-	1	-	-	4	3
Şura Mică	-	-	-	-	1	1	1	1	1	2	3	4
Total Sibiu Depression	31	26	3	-	23	16	82	77	41	31	180	150
Total Rural Area	6	5	1	-	6	5	7	14	7	8	27	32

Data are processed based on statistical data of the National Statistic Institute

Most units are of the type that produce bakery and pasta products which in 2010 (14) show a 100% increase compared to 2007 (7 units). These are followed by units specialized in dairy products whose number in 2010 (5) remained close to the year 2007 (6) and by units specialized in production, processing and preserving of meat and meat products whose development was static in the sense that if in 2007 there were 6 units, in 2010 there were 5.

The results obtained enabled a brief SWOT analysis (Table 2) whose interpretation shows that natural resources represent the most important factor in development, especially for tourism, agro tourism, agricultural products, food industry and wood industry. An important role in a better capitalization of the above mentioned, is played by the physical infrastructure and by the information and communication technologies.

Table 2

Brief SWOT analysis

	STRENGTHS		**WEAKNESSES**
PT 1	Natural resources favorable to sustainable agriculture	PS1	Low level of knowledge to attract funds for development
PT 2	Traditional brands on a national and international level	PS2	Development strategies of agrifood industry are not adapted on local specificity
PT 3	Animal breeding tradition	PS3	Poor educational infrastructure
PT 4	Industrial parks within the communes of Selimbar and Sura Mica	PS4	Decreasing acreage and number of animals
PT 5	Existing natural ressources favorable to agritourism and sustainable rural tourism	PS5	Few jobs for youth with higher education studies
	OPPORTUNITIES		**THREATS**
O 1	The opportunity of accessing national and European funds for agriculture and food industry	A 1	Lack of initiatives to support businesses in rural area
O 2.	The opportunity of accessing funds for the development of non-agricultural sector.	A 2	Poor ability of local decision makers to create partnerships and to attract European funds and implement projects
O 3	The opportunity of accessing funds for the development of the physical infrastructure	A 3	Low interest in partnerships between agricultural producers
O 4	The opportunity of accessing national and European development funds for tourism and agro-tourism	A 4	Lack of policies and strategies to promote and suppot the products obtained in the rural area

The results obtained are relevant for the development of policy options in order to implement them and lead to sustainable development of rural areas in terms of food industry.

Promote the development of agro-food industry in rural areas by attracting investment within the physical infrastructure and the information and communication technologies. Attracting investment within the physical infrastructure, respectively, the information and

communication technologies will enable the increase in the attractiveness of rural areas and the efficient use of natural resources and environmental protection.

Improve the educational infrastructure for a better understanding and development of good entrepreneurial skills. Education is one of the essential elements of rural development, therefore it should be supported more extensively in order to create the premise for entrepreneurial skills development, for a better understanding of the principles of sustainable development and the need for economic diversification.

Promote certain initiatives to support businesses in rural areas. It is the strategic option that provides the basis to solve the problems in rural area, the cooperation between state institutions and small enterprisers and the educational institutions as well; supporting the products and/or services on the market, stimulating the observation of sustainable development principles; supporting business start-ups.

Conclusions

Approaching certain of strategic options focused towards the promotion of information and consulting services, namely the cooperation between entrepreneurs, public authorities and universities is directly related to the development of economic activities in the investigated rural areas.

Creating individual organizations together with other support systems enables the support of the rural population in their effort of identifying and solving the problems related to the development of rural area, in terms of food industry.

Implementing, at a community level, the need of individual involvement in the process of a development in partnership with the government, contributes to the development of the food industry in rural areas.

The strategies approached lead to a sustainable development of agro-food industry in rural areas of Sibiu Depression, as they are directed towards the model of the European Union which is comparable from a structural point of view.

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ENDOCRINE DISRUPTORS AND THEIR EFFECTS ON ENVIRONMENT AND LIFE QUALITY

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Abstract
Human and animal exposure to chemicals with high potential to interfere with the endocrine system becomes a particularly global issue, because it can lead to serious repercussions on the health of living organisms, by affecting the reproductive processes, as well as growth and development. The presence of these substances, called "endocrine disrupters" in food, water, air and soil raises big questions about the still unknown effects on future generations, great attention being given to study the effects of these substances on environment and life quality. Therefore, to improve current deficiencies in this area, this study highlights the main types and sources of substances with endocrine activity, as well the importance of identifying the presence of such substances in the environment, especially in water.

Keywords: endocrine disruptors, health effects, environment quality

Introduction

In the 21st century, in all the developed and developing countries from all over the world, the fate of the environment has become a critical issue. Industrial chemicals play a key role in providing a wide range of products and services that support our lifestyle. However, even small amounts of some chemicals can endanger human health and the environment.

Many chemicals of natural or anthropogenic origin, present in the environment are suspected to become substances affecting the endocrine system, called "endocrine disrupting chemicals" (EDCs). An increasing concern regarding exposure to these substances has started since the mid-1990s [1]. Their presence in the environment has raised the issue of implementation and assessment strategies for such chemical products affecting the endocrine system. To meet these needs, a number of programs were created with the purpose of inclusion of such endocrine disruptors in the list of dangerous chemicals.

Classes and types of EDCs

There are many varieties of chemical classes of endocrine disrupting chemicals including: drugs, pesticides, compounds used in consumer products, industrial products, and

even some chemicals produced botanically. Table 1 shows a list of classes of substances with endocrine effect.

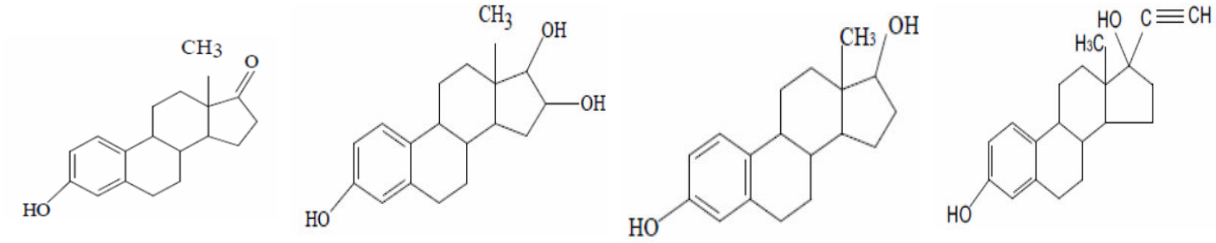
Table 1. List of some chemical classified as EDC (adapted from [2])

Steroids	Alkylphenols	Polyaromatic compounds	Oxygenated Organic Compaunds	Pesticides
17α-etinilestradiol	Nonylphenol	Polyclorinated biphenyls (PCB)	Phthalates	Atrazine
17β-estradiol	Nonylphenol ethoxylate	Flame retardants	Bisphenol A	Linuron
Estrone	Octylphenol	Polyaromatic hydrocarbons (PAH)		Hexacloro-benzene
Mestranol				Pentacloro-phenol (PCP)
Diethylestilbestrol (DES)				

Endocrine active drugs including substances used to improve fertility (diethylstilbestrol) as well as for contraception and hormone therapy (synthetic estrogens) have experienced a significant development. Estrogen steroids identified as important pollutants of the environment are natural estrogens: estrone, 17β-estradiol, 17α-estradiol, estriol and the synthetic estrogens: 17α-ethinylestradiol and mestranol. Table 2 summarizes the physicochemical properties for some of them, and in Figure 1 their chemical structures are presented.

Table 2. Physicochemical properties of estrogens (adapted from [3, 4])

Substance	CAS number	Chemical formula	Molecular weight	Log Kow	Vapor pressure (mm Hg)	Water solubility (mg/L at 20 °C
Estrone (E1)	53-16-7	$C_{18}H_{22}O_2$	270.4	3.43	$2.3*10^{-10}$	13
17β-estradiol (E2)	50-28-2	$C_{18}H_{24}O_2$	272.4	3.94	$2.3*10^{-10}$	13
Estriol (E3)	50-27-1	$C_{18}H_{24}O_3$	288.4	2.81	$6.7*10^{-15}$	13
17α-etinilestradiol (EE2)	57-63-6	$C_{20}H_{24}O_2$	296.4	4.15	$4.5*10^{-11}$	4.8



(E1) (E3) (E2) (EE2)

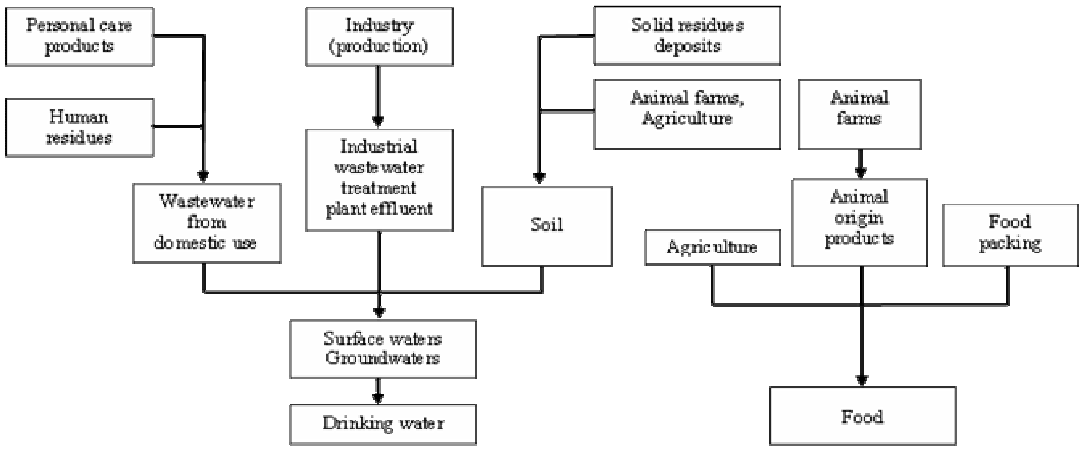
Figure 1. Estrogenic hormone structures

Knowing the chemical properties of natural and synthetic hormones is important for understanding their behavior in the environment. Estrogen steroids have relatively low water solubility and low vapor pressures, indicating low volatility of these compounds. Therefore estrogens are non-volatile organic compounds, liposoluble and tend to be absorbed on the organic materials and to accumulate in biotic or in sediments [5].

According to Table 1, it can be seen that the synthetic hormone EE2 has the highest octanol-water partitioning coefficients (log Kow) which demonstrates its high bioaccumulation factor.

Sources of EDCs input into the environment

The results of numerous studies on the presence of endocrine disruptors in municipal effluents, surface waters and sediments [6] led to the inclusion of EDCs in environmental monitoring assessments. The most important sources of intrusion of endocrine disruptors in the environment are the effluents of treatment plants.



1. (b)

Figure 2. Routes of transmission of EDCs through drinking water (a) and food products (b) (modified from [2])

Numerous organic micro-pollutants (e.g. pharmaceuticals and cosmetics) are not completely degraded in the mechanical and biological stage of treatment plants and thus they can reach surface waters [7] and groundwater, posing a significant risk to human health through the consumption of drinking water [8].

Food is an important mechanism by which people are exposed to pollutants. In Figure 2 the main routes of transmission of EDCs in the environment are presented, especially through drinking water (Figure 2.a) and food products (Figure 2.b).

The presence of estrogenic substances in drinking water has been studied by many researchers from different countries. For example, the most widely used synthetic estrogen is 17α-ethinylestradiol, a pharmaceutical compound used in oral contraceptive pills which was detected in relevant concentrations (≤ 1-15 ng/L) in effluent treatment plants, surface water, and active and degraded sludge [9].

Also in the last 20 years, the use of antibiotics and concentrates in animal feed has been done on a large scale to achieve maximum productivity, resulting in large amounts of organic waste, especially manure. For example, swine and poultry farms eliminate estrogens excreted in the urine at a rate of 70-96 % as polar glucuronic acid or sulfate conjugates [10].

Analytical detection method

To assess ECDs in various environmental matrices, combinations of both chemical and biological methods of analysis can be used. For any analytical method used for the detection of existing pollutants in various environmental matrices, their capacity to give an answer in a timely, accurate and reliable way is very important.

The most sensitive and reliable analytical methods of analysis to determine estrogenic compounds in different environmental matrices are: GC-MS, LC-MS and MS-MS. Table 3 indicates the analytical methods of analysis used in different countries to determine the synthetic estrogen EE2.

To analyze the samples using the GC method, a prior step called derivatization is required, implying a longer time for sample preparation, and representing also a source of error of the method.

By introducing the MS-MS type of detection, the performances of chromatographic methods were significantly improved by a more precise identification of the interested analytes and by a decrease of the detection limit. The UV analysis methods GC-FID and

HPLC are generally not recommended for the assessment of the estrogens in environment due to low selectivity and sensitivity. The usual analytical methods require additional effort (such as sample concentration) to detect the pollutants at low levels.

Table 3. Analytical method used for EE2 determination (adapted from [11])

Country	Analytical method*
France	[C_{18}] GC/MS
The Netherlands	[SDB-XC] GC/MS-MS
USA	[SDB-XC] HPLC/RIA
Germany	[Ethinylbenzene-DVB] GC/MS
Italy	[C18] GC/MS-MS [OASIS] LC/MS-MS
U.K.	[C18] GC-MS [C18] GC/MS-MS

*[Solid-phase extraction (SPE): C18, SDB-XC, Ethinylbenzene-DVB, OASIS] Analysis (gas or liquid chromatography (GC or LC)/mass spectrometry or tandem spectrometry (MS or MS-MS)

The immunoassay methods are capable of detecting chemicals at very low levels and are used successfully in the environmental analysis. An example of the immunoassay methods used in the analyze environmental matrices (air, water, food, soil) are Enzyme-Linked Immunosorbent Assay (ELISA) [12].

Endocrine disruptors - human and wildlife health

Among the effects of endocrine disruptors on human health are a number of reproductive disorders, changes in hormone levels, fetal loss, menstrual problems, early puberty, mental and behavioral problems, impaired immune system function, and various types of cancer.

A number of studies on the effects on the individual level as a result of exposure to exogenous hormones have demonstrated changes in the development and reproduction of fish. S. Pawlowski and collaborators [13] have studied the effect of EE2 on the species of minnow (Pimephales promelas), noting changes in parenchymal areas at ovarian and ultra-structural changes in the liver in the case of female exposure to concentrations of 3 ng/L.

Numerous studies conducted on a zebra fish species, have shown decreased levels of androgens, as well as the feminization of males and a decrease in egg fertilization.

Recent studies have shown that the presence of EE2 in aquatic environments at concentrations up to 2 ng/L affects important processes taking place during the growth and development of species of fish (gonad development, egg production, embryo mortality) and concentrations of 5 ng/L led to a total collapse among species of minnow [14].

Conclusions

Numerous chemicals considered to have endocrine disrupting effects act on humans and on the environment leading to development of numerous adverse effects on their health. Currently, there are numerous gaps regarding the information related to physical and chemical properties of substances with endocrine activity and related to concentrations to which humans and animals are exposed at the same time.

These compounds are present in complex matrices and in different concentrations, leading to the need of highly sensitive analytical methods selection for their determination. Also, the sources and routes of exposure to substances with endocrine effects need further investigation, because besides food, new sources of exposure e.g. electronics recycling processes, dump sites and indoor environment were identified.

Human and animal health depends on the ability to grow and reproduce normally, and this will not become possible without a healthy endocrine system.

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MEANS AND TOOLS FOR CONSERVATION OF AGROBIODIVERSITY IN PAKISTAN

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Abstract
The present study reviews the current status of Plant Genetic Resources related to the traditional knowledge in Pakistan. State and uses of agrobiodiversity, in situ and ex-situ conservation national programs, policies and legislation, regional and international collaboration in order to better access of genetic resources, sharing of benefits arising out of their fair use and farmers' rights, and contribution of Plant Genetic Resources management for food security and sustainable development are surveyed in this paper. Therefore, plant genetic resources for food and agriculture (PGRFA) provide the biological basis for world food security and to support the livelihoods of every person on Earth. Properly managed, these resources need never be depleted, for there is no inherent incompatibility between conservation and utilization. Emphasis has been made on the international conventions such as the Convention on Biological Diversity (CBD) and the International Treaty on Plant Genetic Resources for food and Agriculture (ITPGRFA or Plant Treaty) which have been working extensively for the conservation of plant genetics resources for human use and its role in value addition to income generation for rural communities. The main purpose of this study was to evaluate the importance of traditional knowledge related to PGRFAwith a specific focus on sweet basil on the district or local level in Pakistan which is near to the edge of vulnerability due to unaware of any scientific work and language problem.

Keywords: Biodiversity Conservation, Medicinal Plant, Ocimum basilicum, Pakistan, Plant Genetic Resources, Traditional Knowledge

Introduction

The continuously increasing world population puts a major pressure on the global agriculture to achieve food security for over a billion hungry people in the world and the resources with which to feed these people are becoming scarcer. Yet today with 7 billion people the challenge of overcoming shortfalls in food production and unavailability of resources for future generation is still exist (FAO, 2009a). At the same time the problem of adequate nutrition is even more dramatic. Out of several hundred thousand known plant species only 120 are cultivated for human food and among them 15 are responsible for 90 %

of the world's food energy intake (World Bank, 1996), three edible plant wheat, rice and maize are the staple foods for nearly two-third of the world's people (UNEP, 1995; FAO, 1996c). Our dependence on a narrow range of crops for the food and energy intake raises serious concerns about the sustainability of feeding the world today and in the future (FAO, 1996; Raschke and Cheema, 2008). Moreover, in the countries of Asia and Africa where the majority of the people is struggling to increase the standard of living in the face of poverty and rapid population growth by maintaining the level of productivity using the environmentally sustainable systems (FAO 2010).

In response to the growing threats posed by the human activity to the biodiversity, there are at least two Conventions working together for the conservation of biodiversity at the policy level: the Convention on Biological Diversity (CBD) and the Plant Treaty (The International Treaty on Plant Genetic Resources for Food and Agriculture or ITPGEFA). The Convention on Biological Diversity is an international agreement entered into force on 29 December 1993 and adopted at the Earth Summit in Rio de Jeneiro 1992. The main objectives of this convention are, stipulated in the provision of art.4 *the conservation of biological diversity, sustainable use of the components of biological diversity and fair and equitable sharing of the benefits arising out of the utilization of genetic* resources [The Convention on biological diversity: http://www.cbd.int/].

Based on this political commitment on conservation and sustainable use of biodiversity, the Commission on Genetic Resources for Food and Agriculture was established under the FAO [http://www.fao.org/home/en/: FAO (1983)] in 1983 and the voluntary International Undertaking on Plant Genetic Resources was adopted. The Treaty entered into force on 29 June 2004 [http://www.planttreaty.org/] and is jointly committed with the achievement of the CBD objectives considering crops species and habitats.

The provisions of Art- 5 [http://www.planttreaty.org/] are clearly stating that the Parties are obliged to survey the status of conservation of biological diversity. Ex-situ conservation of biological diversity outside their natural habitat includes gene banks which use tissue culture, green house and cryopreservation as different tools. In this case the preservation process stops the evolution of the genome of the target species and not available to the farmers. In contrast, in situ conservation or on farm conservation by farmers is claimed to be dynamic, with crops adapting to changing environmental conditions and allow the farmers to manage variations in crops varieties as well as continually available as needed (Cleveland *et al*., 1994).

By 2010, the target aimed to achieve a significant reduction of the current rate of biodiversity loss at the global, regional and national level as a contribution to poverty alleviation and to the benefits of all life on the earth have been failed to some extent. Therefore in 2010 the CBD adopted the Aichi Targets for 2020 [https://www.cbd.int/sp/] during the 10th Conference of the Parties from Nagoya Japan manifesting preoccupation of contracting parties for this subject.

In becoming a signatory to the CBD in 1994 (Report, 1999) [http://www.cbd.int/reports/search/?country=pk] and Plant Treaty on 6 June 2002, Pakistan has endorsed the global priority accorded to biodiversity conservation and sustainable use. Still in Pakistan, local traditional communities are mostly depending on these traditional plants, crops and crop varieties and their use as part of their livelihood that biodiversity bring even the Green Revolution started in 1968 and impose a rapid progress for that time. Presently, the biodiversity policy of Pakistan is implemented through the Government Policy run by Ministry of Environment, Local Government and Rural Development, which was earlier, named as Ministry of Environment, Forestry and Wildlife was established in 1994. This was the first level of administrative structure and as a secondary level, is responsible for coordination of development and implementation into the country's Conservation Strategy. The third level is already working under the national level in order to enhance the conservation of traditional knowledge.

Traditional knowledge (TK) refers to knowledge embedded in the cultural traditions of regional, indigenous, or local communities which does not belong to any single individual but the property of the whole community, as TK is unable to separate from their cultural values, spiritual beliefs and customary legal systems. It has recently acquired attention in a number of international forums on the matters as diverse as food and agriculture, the environment, human rights, health care and indigenous issues including aspects of trade and economic development. The people of these ethnic and rural communities of Pakistan and other region of the world have preserved the traditional knowledge belonging to medicinal and aromatic plants growing around them and transferred this knowledge from generation to generation through traditional stories. These plants are extensively used for the treatment of common diseases and conditions and the principle source of medicine in Pakistan since ancient times, now becoming more popular for the treatment of some kind of ailments (Ekka and Dixit, 2007).

Unfortunately the traditional knowledge of medicinal and food plants of traditional communities is fast disappearing from the face of the world due to changes in traditional culture. For the protection of such resources of plants for future prospective and generations there is an urgent need for further development and documentation of indigenous knowledge. On the other hand various intergovernmental bodies like the Convention on Biological Diversity (CBD), the World Intellectual Property Organization (WIPO), the Food and Agriculture Organization of the United Nations (FAO), the World Trade Organization (WTO) and the United Nations Conference on the Trade and Development (UNCTAD) are working on the intellectual property rights concerning TK of the indigenous and local communities (Lettington and Nnadozie, 2005).

As we know, that plant genetic resources is not enough and self-sufficient for a country; depends on other countries and regions for genetic diversity in crops. Through this Treaty and its Standard Material Transfer Agreement it is possible that countries can share benefits fairly arising from the use of these resources and has for the first time been practically implemented at the international level. Today, the Treaty is the legal and technical instrument specifically designed for this purpose.

The scope of this study was to apply new methods and tools for the assessment of the plants genetic resources especially those of traditional use in terms of policy, regulatory framework and applied standards for the process and for the scientific / research levels. Furthermore, to improve the crop tolerance especially to abiotic stress including salt tolerance by creating new biodiversity of plants along with its characterization to meet the future demand more emphasis has been made on the conservation (both *in situ* and *ex situ*) of sites rich in agro-biodiversity. For this purpose, a case study was conducted on the ocimum basilicum in order to access its medicinal uses and traditional knowledge related to them.

Therefore, there is great need for the development of new strategies for biodiversity conservation which have to include the proper evaluation of socio-economic impact on traditional communities. To support and promote the agro-biodiversity, productive policies and institutions are needed for sustainable use of agro-biodiversity such as legal frameworks and regulations including development strategies legislation, and agricultural policies.

Material and Methods

Political commitments and legislative analysis

The evaluation of capacity building needs in terms of political commitments and regulatory framework for the plant biodiversity conservation in Pakistan. For this scope it was studied political commitments of officials in Pakistan in direct relationships with two relevant international treaties such as: The Convention on biological diversity (CBD), The International Treaty on Plant Genetic Resources for Food and Agriculture (The Plant Treaty).

For this reason the strategic action plans for the implementation of these treaties was surveyed for opportunities and gaps based on the Albert Humphrey' SWOT analysis (Strengths, Weaknesses, Opportunities, and Threats) regarding the traditional knowledge conservation and further support in development for the sustainable use of biodiversity.

Survey in the district Rajan pur

In order to collection of information from local community, 4-visits were arranged during July and September 2013. The area focused was four villages named as Kotla Hussain, Murghai, Muhab Ali and Shahpur. The focus people were local farmers, plant collectors and local Hakims.

Questionnaires and Interviews:

Information was also collected by filling out the Questionnaire forms having information for the local names, parts used and ethnomedicinal uses of plants. Interviews were conducted and recorded on these forms.

Genetic resources related to the traditional knowledge analysis

In line with the Guidelines developed by the Bioversity International [http://www.bioversityinternational.org], a questionnaire was developed which was applied in Kotla Hussain, Murghai, Muhab Ali and Shahpur villages of district Rajan pur.

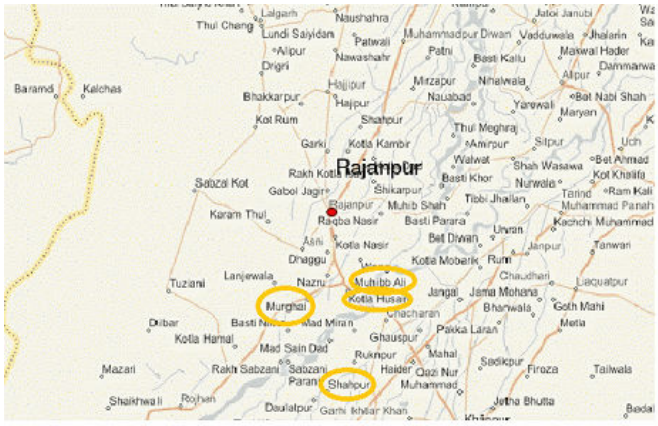

Fig 1: Location of Villages in district Rajanpur
Source: http://www.weather-forecast.com/locations/Rajanpur

Results and Discussion

Presently, in the developing world where many small scale farmers still make extensive use of the plant genetic diversity present in their surroundings for home consumption, as dietary source, provision of medicines. In future, Biodiversity at all four levels such as molecular, genetic, species and ecosystems proved to become more and more valuable for supporting food security. A direct connection in between the richness of biodiversity and ensuring food security is today supported at the highest political agenda.

To feed the global population the agricultural production systems need to focus more on the effective management of agro-biodiversity and safeguard the environment. As the agro-biodiversity comprises the variety, variability of genetic resources of plants, animals and microorganisms extensively used for food, fodder, fiber, fuel and pharmaceuticals (FAO, 1999). The future developers should take into consideration the today interlink between the traditional knowledge and the conservation and sustainable use of biodiversity – and in this case of traditional knowledge related to plant diversity.

In Pakistan a variety of wild plants are being used for medicinal and aromatic purposes but these medicinal plants face many threats due to the unawareness of local people and authorities of that area where medicinal plants grow. However, local people do not know how to conserve medicinal plants due to unawareness of any scientific work and language problem. They remain ignorant from any suggestion given by experts and authorities about medicinal plants. Other threats faced by medicinal plants are mainly heavy grazing, careless uprooting and over cutting for fuel wood consumption (Qureshi & Ahmad, 1996; Husain *et al*., 2008).

In present situation, there was immediate need to conduct studies at local regions or district level to conserve this precious knowledge by applying the strategic rules. It will be of outmost importance for local communities and therefore new tools and methods should be developed and adopted in order to survey all genetic resources and develop new strategies for their further conservation and sustainable use. These resources serve as the plant breeder's most important raw material and the farmer's most essential input. They are therefore essential for sustainable agricultural production.

Diversity largely depends on the climate and soil of that area, our investigation started with climate and soil of studied area which constituted on four villages. The indigenous knowledge of local traditional uses was collected through questionnaire and personal interviews.

Climate and General Soil Conditions

The climate of the district was extremely hot in summer up to 42 to 49 °C while in winter it was very cold due to nearness to Koh Suleman range of mountains. The land was plain except some hilly portions. A large area of the district was barren and uncultivated so far (Table 1).

Table 1: District at a Glance

Population (2013 est)	1,589,037
Male	836,293 (53%)
Female	752,744 (47%)
Rural	1,358,439 (85%
Urban	230,598 (15%)
Tehsils	4
Area (Sq km)	12,318

Source: Mouza Statistics of Punjab: 2008, Agriculture Census Organization

The genetic resources of plants and animals were the main source of income for the people living in those villages.

Employment statistics given in Table 2 showed that most of the people belonged to that areas involved in agriculture sector in order to fulfillment of their basic needs and livelihoods.

Table 2: Employment Statistics in district Rajanpur

Gender	Quantification	Service	Agriculture	Trade	Industry	Business	Emigrants	Labour
Male	Mostly	1	364	3	_	1	_	36
	Some	257	75	169	33	254	104	377
	None	193	12	79	418	196	347	38
Female	Mostly	2	198	_	_	26	_	102
	Some	113	119	30	4	92	23	254
	None	336	134	421	447	333	428	95

Source: Mouza Statistics of Punjab: 2008, Agriculture Census Organization

The survey for genetic resources inventoried are

- Plant genetic resources including Crops, Fruits and Vegetables

- Traditional knowledge related to the conservation and sustainable use of Ocimium basilicum
- Livestock's Animals including buffalo, goat, sheep, horse and camels.

Plant Genetic Resources

A). Main Crops

Cotton (*Gossypium* spp.), Wheat (*Triticum aestivum*) and Sugarcane (*Saccharum officinarum*) were the main crops grown in the district. Besides, Ground Nut (*Arachis hypogaea),* Gram *(Cicer arientinum*), Guar Seed (*Cyamopsis*), Rice (*Oryza sativa*), Jawar (*Sorghum bicolor*), Bajra (*Pennisetum americanum*), Maize (Zea mays), Moong (*Vigna radiate*), Mash (*Vigna mungo*), Masoor (*Lens culinaris*), Rape (*Brassica napus*) and Mustard (*Brassica nigra*) Seed and Oil Seed such as Sunflower (*Helianthus annuus*) were also grown in minor quantities in the district.

B). Main fruits

Mango (*Mangifera indica*) and Citrus (*Citrus medica*) were main fruits grown in the district. Besides, Guava (*Psidium guajava*) and Dates (*Phoenix dactylifera*) were also grown in minor quantity in the district.

C). Main Vegetables

Onion (*Allium cepa*) and Matter Green were main vegetables grown in the district. Besides, Turnip (*Brassica rapa*), Ladyfinger (*Abelmoschus esculentus*), Carrot (*Daucus carota*), Cauliflower (*Brassica oleracea*), Tomato (*Lycopersicon esculentum*), Garlic (*Allium sativum*) and Potato (*Solamum tuberosum*) were also grown in the district in minor quantities.

In this study, data of 24 plant species was presented and main emphasis was given on the traditional plants. It was found that local people of that area had and still have rich heritage of traditional knowledge about these plants mentioned in the table below. The information regarding their common names, botanical names and parts used for medicinal purposes given in the Table 3. It was noted that all plants have imperative role in our daily life and local community heavily dependent for food and curing of ailments (Fig. 2).

Table 3: Plant genetic resources and traditional knowledge related to these plants.

Botanical name	***Family***	***Common name***
***Moringa oleifer* L**	**Moringaceae**	**Sohanjana**
Used parts	Leaves, roots, seeds, bark, fruits, flowers	
Ethnomedicinal uses	Used in intestine infections, headache and migraine, arthritis, skin disease, hair fall breathing diseases and diabetes	

Azadirachta indica	**Meliaceae**	**Neem**
Used parts	Leaf, bark and flower	
Ethnomedicinal uses	Used in intestine infections, headache and migraine, arthritis, skin disease, hair fall breathing diseases and diabetes	
***Acacia Arabica* L**	**Leguminosae**	**Kikar**
Used parts	Leaves, fruits, gums	
Ethnomedicinal uses	Used in eczema, diarrhea, ulcers and as coagulant. Gum is a demulcent.	
Phoenix dactylifera	**Arecaceae**	**Khajur, Date**
Used parts	Fruit	
Ethnomedicinal uses	General body weakness	
Withania somnifera	**Solanaceae**	**Ak San,**
Used parts	Whole Plant	
Ethnomedicinal uses	Asthma, fever, constipation and eye diseases, painful swellings and ulcer.	
Triticum aestivum	**Poaceae**	**Wheat**
Used parts	Grains	
Ethnomedicinal uses	Used as food and rich source of vegetable proteins	
Mangifera indica L.	**Anacardiaceae**	**Mango**
Used parts	Leaf & Seed	
Ethnomedicinal uses	Ear ache, Vomiting	
Citrus aurantiifolia	**Rutaceae**	**Citrus**
Used parts	Leaves and fruits	
Ethnomedicinal uses	Used to lower blood pressure, prevents scurvy and kidney stones	
Saccharum officinarum	**Poaceae**	**Sugarcane**
Used parts	Whole plant	
Ethnomedicinal uses	To treat skin and urinary tract infections, as well as for bronchitis, heart conditions, loss of milk production, cough, anaemia, constipation as well as general debility.	
Gossypium arboreum	**Malvaceae**	**Cotton**
Used parts	Seeds and leaves	
Ethnomedicinal uses	Headaches, dysentery are treated with an infusion of seeds and leaves. For spots and skin conditions.	
Eucalyptus globulus	**Myrtaceae**	**Eucalyptus**
Used parts	Leaves	
Ethnomedicinal uses	Seasonal rhinitis, hay fever, allergies, coughs, colds and chronic respiratory mucous production.	
Musa acuminata	**Musaceae**	**Banana**
Used parts	Fruits, stem and leaves	
Ethnomedicinal uses	Used for anemia, constipation, diarrhea, depression, ulcer and for allergic effects	
Salvadora oleoides	**Salvadoraceae**	**Wan, Pilu**
Used parts	Fruits, flowers, leaf and root bark	
Ethnomedicinal uses	Useful in cough, purgative, enlarged spleen, rheumatism and fever	
Albizzia lebbeck	**Mimosaceae**	**Siris**
Used parts	Bark	
Ethnomedicinal uses	Inflammations, boils, cough, eye infections, flu, gingivitis, lung problems, pectoral problems, tonic, abdominal tumors, hernia, secondary infertility.	
Citrus limon	**Rutaceae**	**Lemon**
Used parts	Fruit	
Ethnomedicinal uses	Toothpowder for teeth diseases and in infections	
Punica granatum	**Punicaceae**	**Anar, Pomegranate**

Used parts	Exocarp of fruit	
Ethnomedicinal uses	Dysentery and menstrual irregularities	
Dalbergia sissoo	**Mimosaceae**	**Tali, Rosewood**
Used parts	Bark	
Ethnomedicinal uses	Nose bleed	
Acacia nilotica (L.)	**Mimosaceae**	**Keekar**
Used parts	Pod	
Ethnomedicinal uses	Gonorrhea	
Brassica oleracea	**Brassicaceae**	**Cauliflower**
Used parts	Leaves, fruits and roots	
Ethnomedicinal uses	Used for cancer prevention, anti inflammatory, digestive support, treatment of cardiovascular diseases	
Ficus carica	**Moraceae**	**Fig**
Used parts	Fruits	
Ethnomedicinal uses	Gastric problems, inflammation, and cancer.	
Lawsonia inermis	**Lythraceae**	**Henna**
Used parts	Seeds, leaves, flowers	
Ethnomedicinal uses	Antipyretic, intellect promoting, constipating, intermittent fevers, insanity, amentia, diarrhoea, dysentery and gastropathy, greyness and falling of hair	
Ziziphus mauritiana	**Rhamnaceae**	**Beri**
Used parts	Fruits, leaves, barks, roots, seeds, flowers	
Ethnomedicinal uses	To halt nausea, vomiting, and abdominal pains in pregnancy. Powdered seed and fruit are used to treat chronic diarrhoea, jaundice, fever and dysentery.	
Brassica campestris	**Brassicaceae**	**Sarson, mustard**
Used parts	Leaves, roots, flowers	
Ethnomedicinal uses	Used for skin diseases, snake bite, leaves and roots used as vegetables and oil for cooking.	
Trigonella foenum-graecum	**Fabaceae**	**Fenugreek**
Used parts	Leaves, roots, flowers, seeds	
Ethnomedicinal uses	Used to cure the Inflammation, Sinus Problems, Ulcers, Uterine, stomach Problems. Women used for ease of childbirth and to increase milk flow. Used in different cuisine and as vegetable	

In this regard the TK associated to the plant genetic resources should be seen as a process and the management of the components of this process. This means that based on each plant genetic resources use should be identified and the process with the management of all components of the process of collecting up to the traditional uses (Antofie, 2011).

Nowadays, medicinal and aromatic plants occupy a prominent position in all around the world because of the continuous and increasing demand for their products. Likewise, *Ocimum basilicum* is also a medicinally important plant in this concern. The most important species of genus *Ocimum* is *Ocimum basilicum* L. belonging to the plant family Lamiaceae and its subfamily is Nepetoideae and usually named as common basil or sweet basil (Charles, 2013).

Fig 2: *Triticum aestivum, Brassica campestris, Ziziphus mauritiana* and *Mangifera indica* were the common food and fruit plants of four villages of district Rajanpur.

Basil is a popular and an annual herb, 20-60 cm plant height with white and pink flowers. The useful parts of the plants are leaves and seeds, these highly aromatic leaves used either fresh or dried for spice or as a flavoring and for culinary. Different parts of basil plants are commonly used as flavoring in variety of dishes like in tomato, soups, salads, sauce, sausages and minced beef. It comprises 65 species, adapted to growth in warm conditions and originally it is native to India and other countries of Asia (Omidbaig, 2005).

There are 150 species of *Ocimum basilicum* being utilized as a source of essential oils mainly in industries, perfumery, dental and oral products, and traditional ritual and medicine. At district level basil was studied for its traditional knowledge in the four villages of district Rajanpur given below some important information for its uses in Table 4.

Our findings regarding traditional uses of basil were in according to the uses which have been reported by Zolfaghari *et al*. (2013) made this work more scientific for future conservation policies at local, regional, national as well as international levels.

The term animal genetic resources (AnGR) was used to include all animal species, breeds and strains that are of economic, scientific and cultural interest to humankind in terms of food and agricultural production for the present or the future.

Animal Genetic Resources

Table 4: Traditional knowledge related to Sweet Basil

Plant parts	Medicinal uses by tradition/culture	Local people's suggested health benefits
Leaves	• Water of boiled leaves can prevent vomiting, nausea, flue and cough • Chewing leaves is very efficient in curing fever and cold • Basil used for blood purification	Relieves gastrointestinal discomfort in the intestines Basil tea can be used for the treatment of kidney stones, heart and respiratory disorders
Seeds	• Soaked seeds in water make drinks called by local people as falooda or sherbet very effective in laxative • These kinds of drinks used to relieve indigestion and help curb appetite	• Digestive health • Intestinal support
Other	• Pregnant women used to cure vomiting • Used for treatment of headache, toothache and throat infections • Used as germicide and insect repellent • Paste of leaves used for removing hair dandruff	Basil can be helpful to increase immune function, and disease prevention

Over past decades domestic animals were kept in villages as a source of food, as a means to pulling ploughs and carts, as a source of fertilizers and fuel. Animals are sold both live and dead for meat and wool. However livestock animals have become important social and cultural elements, essential in maintaining much traditional and religious life of those people who depend upon them. Animals such as camel, goat and yak and diversity in animal genetic resources available to the farmers and other human communities and the resulting products make it possible to survive in wide range of environments, from the hot and humid tropics to arid deserts and extremely cold arctic or mountainous regions (FAO, 1998).

To enhance awareness of the many roles and values of animal genetic resources, global strategy is needed which will provide a frame work for better use of, develop and conserve these resources at local, national, regional and global level and to mobilize the financial support necessary to develop and implement the Strategy. For implementation of global strategy, systematic and effective planning is required, as is increased capacity building, especially in developing countries including Pakistan where most of the world's animal genetic resources are found in order to conserve these irreplaceable resources for global food security and rural development. Response to the global loss and decline of animal and plant

genetic resources, immediate national and international action is required to conserve and sustainable use of these resources (FAO, 1999).

Common species include cattle, sheep, goats, chickens, horses, buffalo, but many other domesticated animals such as camels, donkeys, ducks, rabbits etc. were important to different cultures and regions of the the whole district (Fig. 3). There were more than 40 species of animals that have been domesticated (or semi-domesticated) during the past years which contribute directly (through animal products used for food and fibre) and indirectly (through functions and products such as draft power, manure, transport, store of wealth etc which was described in Table 5. Those that were not sold produce milk and eggs that can be used to feed the family or raise money for other ventures.

Fig 3: Local buffaloes, goat, hen and sheep in Pakistan, used for multipurpose and festivities.

But there are no specific programs are developed for the involvement of local communities in the decision-making process regarding specific genetic technologies, but an ordinance was approved which includes procedures for public consultation, allowing local communities and small farmers to express their points of view. The value and enhanced use of such knowledge helps to promote the cultural identity and to achieve the social and development goals.

At the end of this study, we assessed a degree to which conservation benefited indigenous communities as means to combat poverty ecological degradation. Main focused on the connections and the provision of the CBD Article 8 (j) that specified the importance of protecting indigenous and local community's traditional knowledge and practices.

Table 5: Livestock's Animal and their Uses in daily Life

Species	Types and number of breed	Main utility
Cattle	- Eight breed of Cattle 1. Sahiwal 2. Red Sindhi 3. Bhagnari 4. Dhanni 5. Lohani 6. Rojhan 7. Kankraj 8. Crossbreds	Dairy Milk, Meat and skin
Buffalo	- Two breed of Buffalo Nili-Ravi (Nili Ravi)Kundhi Azi Kheli	Dairy Milk, Meat and skin
Poultry	- Three breed of Poultry 1. Lyallpur 2. Silver Black 3. Aseel.	Dairy Eggs and Meat
Sheep	- 28 breed of Sheep Bakkarwal Balkhi Dumbi Gojal Kaghani	Dairy Milk, Meat, Wool, Skin
Goat	- 25 breed of Goat Barbari Chapper Teddy Pak Angora Bikaneri Kaghani	Dairy Milk, Meat, Skin
Camels	Four breed of Camel	Dairy
Horses	One breed of Horse	Transportation, Polo, Racing
Donkeys	---	Transportation
Mules	---	Transportation
Yak	One breed of Yak	Ploughing, Transportation

Conclusions

The Pakistan had and has plenty of natural resources to eradicate hunger but need to mobilize political will and build the necessary institutions, policies and to ensure that key decisions on investment levels. From this present study, it was conclude that conservation of such traditional knowledge is very valuable.

In future, Traditional knowledge will provide potential indicator for biological activities and a useful leads for scientific research, being the key to identifying those elements in a plant with a pharmacological value that is ultimately destined for the international markets.

To initiate conservation based activities, strengths and weakness should be identified. Major problems in study area were poverty, lack of awarence of alternatives, lack of skills, lack of marketing opportunity as well as heavy human and animal pressure and absence of any working institutes etc. Unfortunately, local people was unable to promote their traditional knowledge regarding to plant genetic resources due to lack of adequate education and health care this was the basic gap exist there.

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URBAN WASTE WATER TREATMENT IN ROMANIA

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Abstract

Waste water from households and industry represents a significant pressure on the water environment, due to loadings of organic matter and nutrients, as well as of hazardous substances. Given the high share of the population living in urban areas, a significant part of wastewater is collected of sewage connected at public wastewater treatment plants. Level of treatment prior to discharge and of the sensitivity of the receiving waters determine the extent of impact on aquatic ecosystems. Types of treatment and compliance with the Urban Wastewater Treatment Directive (91/271/EEC) are considered representative indicators for the purification level and potential improvement of water environment. This paper presents the evolution of the wastewater treatment process in Romania for the period between 2007 and 2011,based on the data obtained for elaboration of the Annual Report on the State of the Environment in Romania in accordance with the State of the European Environment Repor.

Keywords: wastewater and sewerage networks, urban waste water treatment

Introduction

Urban wastewater treatment indicator quantifies the connectivity level of the population at the wastewater collection and treatment systems. Also, the indicator shows the efficiency of national programs on wastewater treatment, the efficiency of existing policies to reduce discharges of nutrients and organic substances, as well as stage of implementing the requirements of Directives regarding wastewater treatment (91/271/EEC and 98/15/EC) at national level.

Datasets underlying the estimation of this indicator are:

- national population connected to urban wastewater treatment plants;
- industrial and domestic wastewater volume and generated pollutants quantities;
- industrial and domestic wastewater volume and quantities of pollutants collected into drains;

- wastewater volume and quantities of pollutants discharged into natural receptors without treatment;
- wastewater volume that is subjected to purification and quantities of pollutants present in the effluents of treatment plants;
- urban wastewater treatment plants, industrial and independent; sludge volume by type of processing; and others.

Materials and methods

As a member country of the European Union, Romania is required to improve the quality of the environmental factors and fulfill the requirements of the European acquis.

To this end, Romania has adopted a series of action Plans and Programs at national and local level, all consistent with the Position Paper of Romania from the Accession Treaty, Ch. 22, the most important being: the National Development Plan, the National Reference Framework for the programming period 2007-2013 and the Environment Operational Sectoral Programme. Also, were developed Plans for the Environmental Protection, at regional level and at local level, all economic agents have been forced to develop and implement compliance plans.

Directives regarding Wastewater Treatment (91/271/EEC and 98/15/EC) aim to protect the environment from the adverse effects of urban waste water discharges and provide standards/levels of treatment which must be achieved before the discharge of these waters into receptors.

Diminishing of pollution generated by various sources (punctiform and diffuse, urban, industrial and agricultural) achieved after the implementation of the Urban Wastewater Treatment Directives and of the IPPC Directive should be considered integrated part of the objectives of the Water Framework Directive (2000/60/EC), which aims to achieve by 2015 a good ecological and chemical status for all European water bodies.

Wastewater Treatment Directives have been fully transposed into Romanian legislation by Government Decision no. 352/2005 amending and supplementing Government Decision no. 188/2002 approving the rules on the conditions for discharge of wastewater into the aquatic environment. Thus, have been included in the Romanian legislation including requirements for compliance with the negotiated transition periods for collection and treatment systems (assumed by Romania in the Accession Treaty, Ch. 22 - Environment, Water Quality), as well as sensitive area status for the entire Romanian territory.

Government Decision no. 352/2005 includes three technical normative on: collection, treatment and discharge of urban waste water (Technical Norms NTPA 011), the conditions of the wastewater discharge to sewerage networks of the localities and directly into treatment plants (NTPA 002) and loading limits with pollutants of industrial and urban wastewater at the discharge into the natural receptors (NTPA 001).

Short-term strategic ojectives –Horizont 2015

Improvement of waste water infrastructure by ensuring sanitation services in most urban areas by 2015 and establish effective regional structures for the management of wastewater services.

Proposed targets for 2015 (according to Directives 91/271/EEC, 98/15/EC and 2000/60/EC) are:

- increasing the connection degree of agglomerations with more than 2,000 p.e. at sewer systems by extending sewer networks (from 69,1% of the population equivalents connected in 2013 to 80,2% in 2015 and 100% in 2018);
- increasing the connection degree of agglomerations with more than 2,000 population equivalent at treatment systems by building new wastewater treatment plant and by rehabilitation of existing ones to achieve a coverage of 60,6% p.e. in 2013, 76,7% p.e. in 2015 and 100% p.e. in 2018;
- increasing of properly treated wastewater volume to 60% in 2015;
- achieving good chemical and ecological status for all water bodies.

Medium- term strategic ojectives –Horizont 2020

According to the objectives agreed in the Treaty of Accession to the European Union, localities with over 2,000 inhabitants will be granted access to sewerage systems and wastewater treatment in proportion of 100% starting with 2018. Process of improving sanitation services and wastewater treatment in smaller rural areas will continue.

Long- term strategic ojectives –Horizont 2020

Significant approaching of Romania to the average in that year of the EU countries in terms of sustainable development indicators.

Results and discussions

Sanitary protection and wastewater treatment are the main challenges for a healthy environment, both in urban and in rural areas. Uncontrolled discharge of wastewater creates a threat to public health and the environment. Vulnerable groups (children and elderly) of the population are particularly affected by hydric diseases, but also adults suffer afterwards, which can considerably influence the economic development of the region.

Surface water quality is directly influenced by discharges of sewage, untreated or insufficiently treated from point sources, urban, industrial and agricultural. The impact of these sources of pollution on natural receptors depends on water flow and of its loading with polluting substances.

Statistics compiled and presented annually in the "Summary of water quality in Romania" prove that the wastewater from urban areas have the greatest impact (Figures 1 and 2).

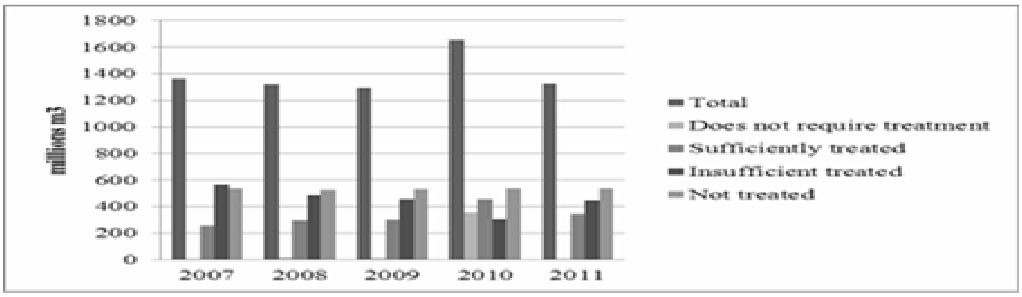

Figure 1. The total volume of urban wastewater discharged into the natural receptors in 20072011

(Source: National Administration "Romanian Waters" Synthesis of water quality in Romania 2011)

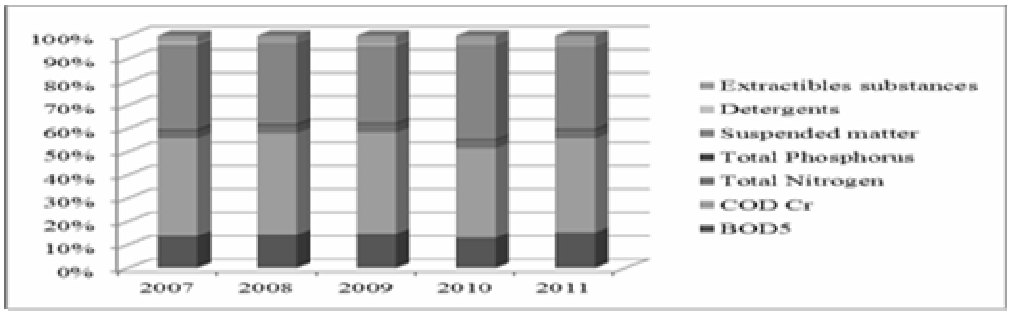

Figure 2 . Pollutants loading (%) discharged from agglomerations into natural receptors

(Source: National Administration "Romanian Waters" Synthesis of water quality in Romania 2011)

Although in 2011 the wastewater loading with pollutants was reduced substantially compared to 2007 (about 21,5% BOD_5, 32,13% COD-Cr, 24,85% TN; 32,88% TP, 30, 87% of suspended matter, 76% detergent and 4,2% extractables substances), discharges of urban

wastewater continues to have the largest impact on surface water quality, especially in terms of pollution with organic substances (BOD_5 and COD-Cr) and nutrients (nitrogen and phosphorus).

In Romania have been identified 2,605 agglomerations of which 516 agglomerations are equipped with sewage systems and only 21 of them are in accordance with the requirements of Directive 91/271/EEC.

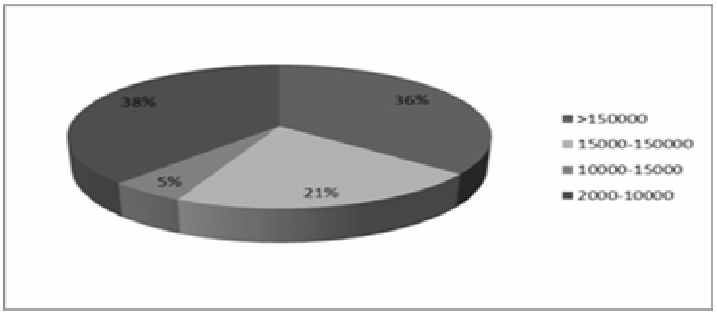

Figure 3. The distribution of the organic loading according to the size of the agglomerations
(Source: National Administration "Romanian Waters", "Realization stage of works for urban wastewater treatment and capacities placed into operation for human agglomerations 2011")

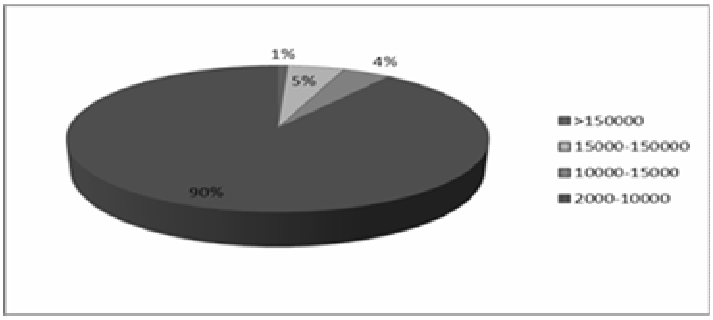

Figure 4.Distribution of population on human agglomerations
(Source: National Administration "Romanian Waters", "Realization stage of works for urban wastewater treatment and capacities placed into operation for human agglomerations 2011")

Compliance deadlines regarding the connection of the human agglomerations to wastewater collection systems are presented in Table 1.

Table 1. Predicted situation for sewage systems until the end of implementation term of the Directive

Year	Surface waters		Coastal waters		Total	
	No. of agglomeration	Total p.e.	No. of agglomeration	Total p.e.	No. of agglomeration	Total p.e.
2010	359	15437048	8	826211	367	16263259
2013	196	2181777	1	32390	197	2214167
2015	497	2993491	1	4828	498	2998319
2018	1542	5296926	1	3509	1543	5300435
Total	**2594**	**25909242**	**11**	**866938**	**2605**	**26776180**

(Source: National Administration "Romanian Waters", "Realization stage of works for urban wastewater treatment and capacities placed into operation for human agglomerations 2011")

Compliance deadlines regarding the connection of the human agglomerations to wastewater treatment systems are presented in Table 2.

Table 2. Deadline for compliance for Romania with the requirements of Directive 91/271/EEC concerning urban waste water.

Type of agglomeration	Number of localities	Number of equivalent inhabitants	Degree of connection to wastewater treatment plants (%)	Deadline for compliance
2.000 – 10.000 p.e.	2346	10192231	38,08	**31.12.20018**
10.000 – 150.000 p.e.	241	7012655	26,20	**31.12.2015**
> 150.000 p.e.	22	9562512	35,72	**31.12.2015**
Total inventory	**2609**	**26767398**	**100**	**31.12.2018**

(Source: National Administration "Romanian Waters", "Realization stage of works for urban wastewater treatment and capacities placed into operation for human agglomerations 2011")

Under the Directive, the Urban Waste water treatment level is established by the pollutant load of raw sewage and the type and quality of the receiver. Performance of wastewater treatment plants is evaluated based on five parameters: biochemical oxygen demand (BOD_5), chemical oxygen demand (COD-Cr), total suspended materials (TSM) and dosed nutrients as total nitrogen (TN) and total phosphorus (TP). According to the report achieved by the National Administration "Romanian Waters", of those 1,637 treatment plants investigated in 2011, only 500 of them (30,5%) functioned properly, wastewater discharged respecting the quality standards imposed by GD No. 352/2005.

Implementation the requirements of urban wastewater directives implicitly will lead to a significant increase in the volume of sludge resulted from treatment plants of urban waste water. According to the National Plan for management of river basins in Romania, it is estimated that in 2018 will be obtained an amount of sludge of about 520850 tones dry matter / year compared to approx. 172529 tones dry matter / year, obtained in 2007.

Conclusions

In Romania, the European legislation in the field of wastewater treatment and discharge to the aquatic environment was transposed in 2002-2005 period, for aproving Norms on the state of discharge, completed and amended by Government Decision no. 352/2005. Final transition date for the implementation of the directive has been set for December 31, 2018.

Statistics compiled and presented annually in the "Summary of water quality in Romania" prove that the wastewater from urban areas have the greatest impact

Although in 2011 the wastewater loading with pollutants was reduced substantially compared to 2007 discharges of urban wastewater continues to have the largest impact on surface water quality, especially in terms of pollution with organic substances and and nutrients.

According to the report achieved by the National Administration "Romanian Waters" in agglomerations of 2000-10000 p. e:

- degree of connection to the collection system recorded an increase from 4,42% in 2007 to 11,25% at the end of 2011;
- connection degree to urban treatment plants increased from 3,95% in 2007 to 7,56% in 2011.

Currently, about 60% of population of Romania is connected to wastewater treatment plants. Targets to be achieved for the transition period - in 2013 - are about 69% for wastewater collection and approx. 61% for wastewater treatment, with ensuring compliance regarding wastewater collection of human agglomerations with more than 10 000 p.e.

The indicator tracks the progress of policies applied to reduce aquatic pollution caused by wastewater discharge.

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SOIL QUALITY IMPROVEMENT BY EXTENSION OF ORGANIC AGRICULTURE IN ROMANIA

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Abstract
Organic farming focuses on the use of appropriate management practices of natural resources, instead of introducing synthetic products and takes into account the fact that the peculiarities of each region require systems well suited to regional particularities. This can be accomplished by using, where possible, agronomic, biological methods and traditional mechanical instead of intensive, highly aggressive methods for the environment. The aim of this paper is to highlight the existence of the interconnections between measures to improve soil quality and measures to expand organic farming in Romania. It highlights the time evolution of the use of chemical fertilizers applied to soils and cultivated areas for organic agriculture trend in Romania.

Keywords: organic agriculture, soil management, crop management, natural fertilizers.

Introduction

„Ecological agriculture ", a term proposed for Romania by the European Union to define this system of agriculture is similar to terms „organic farming" or "biological agriculture" use in other Member States.

According to the definition proposed by the Codex Commission on Food, "organic agriculture is a production management system that promotes and improves the health of agro-ecosystem, biodiversity, biological cycles and soil biological activity".

Organic agriculture system has as theoretical basis using natural fertility of the soil and the factors that contribute to it. As the defining element, the system excludes the farming practice of using all natural non-renewable resources, including fossil energy. Nowadays, according to the European Union biological agriculture system is regulated by the Council Regulation 834/2007 on organic production and labelling of organic products and the Regulation 1804/1999 for the animal sector. Through ecological farming methods laid down

in accordance to Article 29 of the Regulation of the European Parliament and of the Council No. 1305/13 from 17 December 2013 the protection of natural resources can be supported, with positive effect on the quality of soil, helping to cease the degradation processes (4).

In Romania the regulatory framework is achieved by E.O no.34/2000 (detailed rules concerning organic production) and law no. 38/2001 related to production in organic farming.

The main objectives of organic farming are: obtaining agricultural products with high nutritional qualities, improve soil fertility and the elimination of all forms of pollution: soil, water and air.

Worldwide IFOAM and FIBL have presented, at the Biofach 2011, the latest data regarding organic farming: 37 million hectares of agricultural land was cultivated in 2010; the countries with the largest agricultural areas are Australia, Argentina and the U.S.

The highest growth of organic agricultural area has been reached at European level: 12% growth, representing nearly one million acres. Regarding the organic agriculture, FAO (FAO, 2011) highlights the following: "organic farming contributes to mitigate the greenhouse effect and global warming, through soil carbon storage. Many practices used in organic farming (e.g. incorporation of plant debris in the soil, the use of green crops and crop rotation, the ability of vegetables and pulse to fix nitrogen in the soil), increase the efficiency of soil carbon circuit, increase productivity and favors carbon storage".

Materials and methods

a) Soil quality

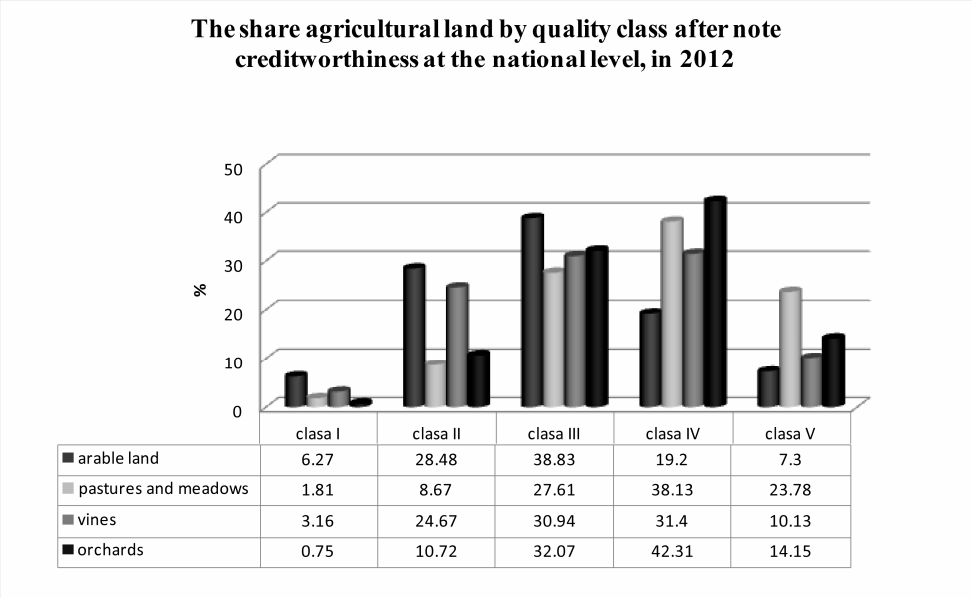
Soils offer a range of various ecosystem vital functions, play an essential role in the production of food and renewable materials such as timber, providing habitats for biodiversity both in the subsoil and the ground, by filtering and balancing the flow of water to aquifers, eliminate the contamination agents and reduce the frequency and risk of floods and droughts. They can contribute to the settlement of microclimate in compact urban environments, particularly where supporting vegetation. They can also provide aesthetic functions through landscapes.

Soil quality is, according to the definition given by Doran and Parkin (1994), the ability to operate inside the borders of an ecosystem in order to support biological productivity, maintaining the quality of the environment and ensuring the health of living beings and habitats. After the research and documentation made by the National Institute of Research and

Development for Environmental Protection, the quality of agricultural land includes both soil fertility and the behaviour of other environmental factors compared to plant (3).

From this point of view, agricultural lands are grouped into 5 classes of quality, differentiated by the average note of creditworthiness, by country (class I - 81-100 points - class V -1-20 points). Land quality grades indicate suitability for agricultural uses.The number of credit points is obtained through a complex operation of thorough knowledge, by expressing its suitanbility for the livelihoods of some plants, in normal weather conditions and rational use.

In Figure 1 is shown the share of agricultural land according to quality classes, after average creditworthiness note per country for 2012.



	clasa I	clasa II	clasa III	clasa IV	clasa V
arable land	6.27	28.48	38.83	19.2	7.3
pastures and meadows	1.81	8.67	27.61	38.13	23.78
vines	3.16	24.67	30.94	31.4	10.13
orchards	0.75	10.72	32.07	42.31	14.15

Figure 1. The share of agricultural land in Romania,by quality class, corresponding to the year 2012
[Source: I.N.C.D.P.A.P.M-IC.P.A and O.J.S.P.A]

The data presented in Figure 1 emphasize the following aspects:

- in general arable land comes under the quality classes II, III;
- pastures and meadows primarily come under the quality classes III, IV;
- vineyards mostly come under the quality classes II, III, IV;
- orchards mostly come under the quality classes III, IV, V.

b) Use and consumption of chemical fertilizers

The use of chemical fertilizers in agriculture during the period 2008-2012 is presented in Table 1.

As can be seen in Table 1, the highest value regarding the surface for the use of chemical fertilizers in agriculture has been recorded in 2010 (7092256 ha).

Table 1. The use of chemical fertilizers in agriculture during the period 2008-2012

Year	Chemical fertilizers used (tonnes active substance)				Fertilized area (ha)
	N	P_2O_5	K_2O	Total	
2008	279886	102430	15661	397977	6762707
2009	296055	100546	29606	426207	5889264
2010	305756	123330	51500	480586	7092256
2011	313333	126249	47362	486944	6893863
2012	289983	113045	34974	438002	6340780

Source: Ministry of Agriculture and Rural Development, Department of Agri-environment Policy, Land Improvements and Land Fund

c) Use and consumption of natural fertilizers

Organic farming does not use synthetical fertilizers and pesticides, stimulants and growth regulators, hormones, antibiotics and intensive systems of livestock. Natural fertilizer can be animal, vegetable or mixed origin such as manure, plant debris, sewage, seaweed, green manure crops destined to be buried and used as fertilizers.

To become natural fertilizers, these products previously pass through mineralization stage, which consists in changing the structure and texture of organic products in the presence of bacteria and enzymes.

Apart from the contribution in nutrients, natural fertilizers improve the microbial flora of soil, improve soil texture and favors the retention of water in the ground (3).

The quantity of natural fertilizers used in Romania during the period 2008-2012, as well as the share of areas where natural fertilizers are used towards the cultivated area are presented in Table 2 and the graph in Figure 2.

Table 2. The quantity of natural fertilizers used in Romania in the period 2008-2012 and the surface on which these fertilizers were applied

Year	Total fertilizer (tonnes)	Fertilized area (ha)	The share of surface application to cultivated area (%)
2008	11.725.220	494.412	5,25
2009	13.748.307	569.531	6,05
2010	15.231.715	600.052	6,37
2011	14.510.194	630.293	6,70
2012	13.292.617	605.694	6,48

Source: Ministry of Agriculture and Rural Development, Department of Agri-environment Policy, Land Improvements and Land Fund

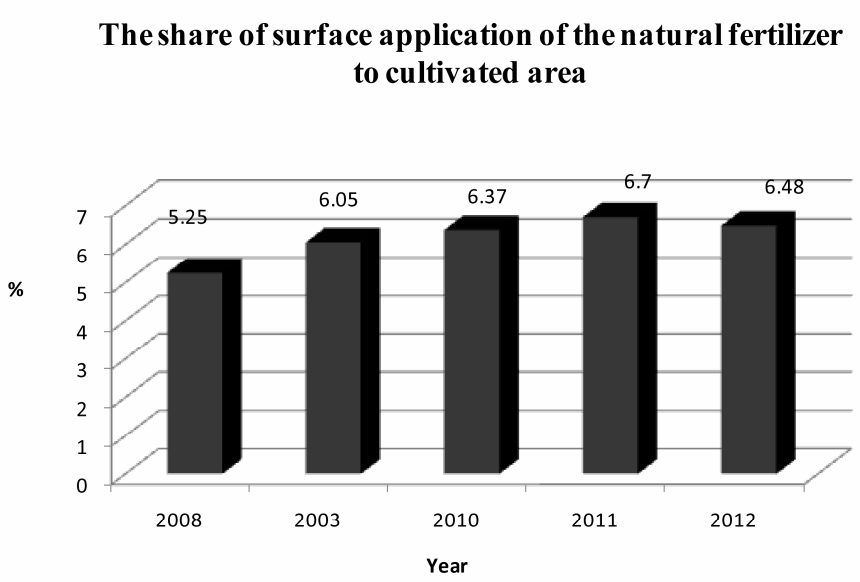


Figure 2.The time variation of the surface share where natural fertilizers were used

Source: Ministry of Agriculture and Rural Development M.A.D.R – D.P.A.I.F.F.F.

As can be seen from the graph in Figure 2, the share of areas where natural fertilizers were applied has constantly grown until 2011 and then a slight decrease has been recorded.

d)Organic farming in Romania

Organic or ecological agriculture represents one of the approaching methods related to sustainable agriculture and many techniques used (gathering internal crop, crop rotation, double digging, the integration of livestock with cereals) are practiced in different agricultural systems.

The identity of organic agriculture consists of:

- all treatments applied to the soil which use chemical fertilizers or synthetical ones are prohibited;
- is indicated or even mandatory crop rotation which „rest or enrich the soil".

The evolution of agricultural surfaces cultivated in ecological system reportedto the Romanian agricultural surface is shown in Table 3.

Table 3. Specific information regarding the agriculture cultivated in ecological system

Specific information	Year				
	2008	**2009**	**2010**	**2011**	**2012**
Number of operators registered in organic farming	4191	3228	3155	9703	15544
Romania's farming area (ha)	14702279	14684963	14634436	14621427	14615057

Total area cultivated in organic farming:	215257	239998	259999	567995	1370397
Crops on arable land	86454	110014	148033	147581	174643
Permanent crops pastures and meadows	46006	39232	31579	78197	105835
Permanent crops orchards and vines	1518	1869	3093	4166	7781
Collection of spontaneous flora	81279	88883	77294	338051	1082138

Source: Ministry of Agriculture and Rural Development, (http://www.madr.ro/ro/agricultura-ecologica/dinamica-operatorilor-si-a suprafetelor-in-agricultura-ecologica.html accessed in February 2014) and National Institute of Statistics (Database Tempo online)

This dynamic of the organic agriculture share is presented in Figure 3.

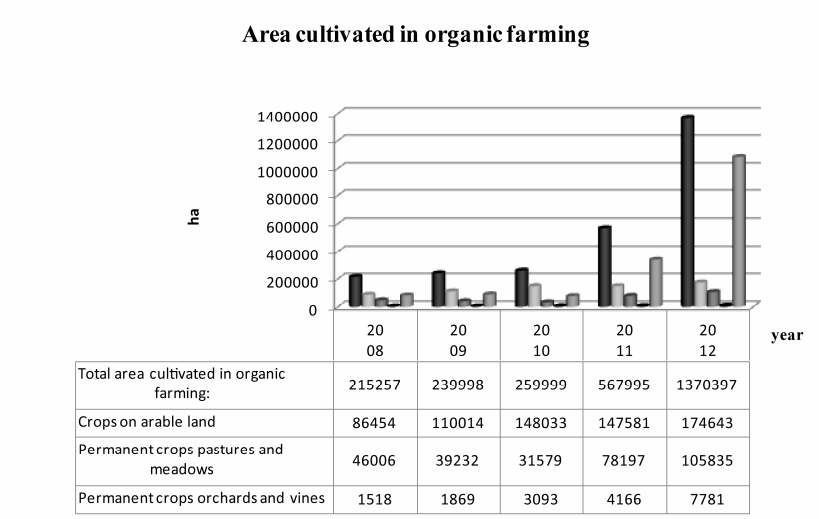


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Figure 3. Dynamic of the organic agriculture share in Romania, the period 2008 to 2012

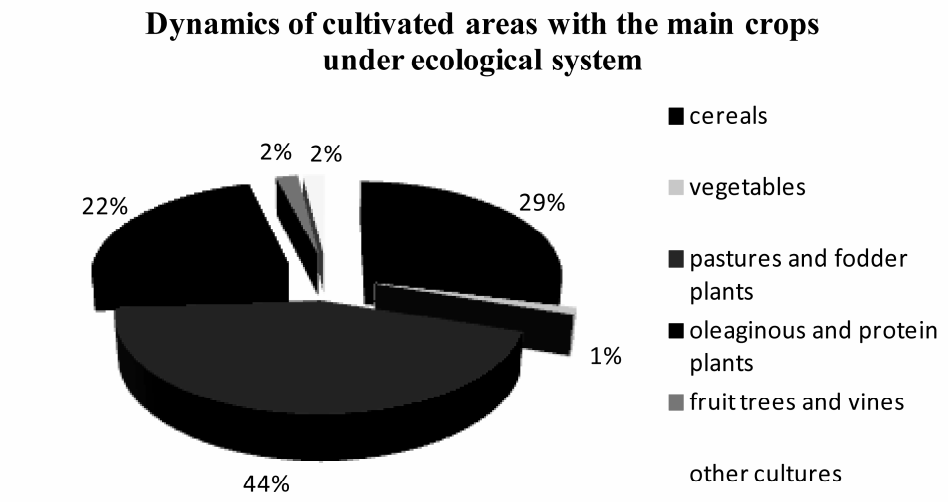

Figure 4.Dynamics of the main crops cultivated areas in ecological system

For 2012, the areas of pastures and fodder plants hold the largest share in the total area-44% (approx. 165.000 ha) followed by grain-29% (approx. 130.000 hectares),oilseeds and protein, 22% (105.000 hectares). Areas planted with fruit trees, vines and vegetables hold the lowest share 2%, respectively 1%.

In the year of 2012, the area cultivated in organic regime is 450.000 ha, while the crops of spontaneous flora are collected from a surface of approximately 520.000 ha.

Also in 2012, the areas cultivated in organic regime have increased by 2.4 times compared to 2011, representing about 9.4 % of the total agricultural area from Romania.

Results and discussions

Organic agriculture is fundamentally different from the conventional one.

The process and the procedures to obtain organic products are regulated by strict production rules and principles, starting from the quality needed for the soil until achieving the final product.

This system of agriculture can be adopted from own beliefs or influenced by the increasing demands regarding food safety, a healthier lifestyle and because of economical reasons.

Organic agriculture is a dynamic sector, which has experienced an ascending pattern in recent years in Romania.

As was proposed from the beginning, a comparison between the evolution of agricultural areas with chemical and natural fertilizers and evolution of organic surfaces during 2008-2012 is presented, in order to surprise if the measures taken to expand organic agriculture in Romania were reflected in traditional agricultural practices. The table below shows data regarding the areas of the three indicators (the use of chemical fertilizers, the use of natural fertilizers and organic agriculture).

Table 4. The areas with chemical and natural fertilizers and areas of organic agriculture during 2008-2012 (thousand hectares)

Surface (thousand ha)	2008	2009	2010	2011	2012
Surface of chemical fertilisers application	6763	5889	7092	6894	6341
Surface of natural fertilizers application	494	570	600	630	606
Agricultural area cultivated in ecological system	215	240	260	568	1370

Source: Ministry of Agriculture and Rural Development, Department of Agri-environment Policy, Land Improvements and Land Fund

The Figure 5 highlights the time variation in the period of 2008-2012 for the use of chemical and natural fertilizers compared to the time variation of the agricultural areas cultivated in organic regime.

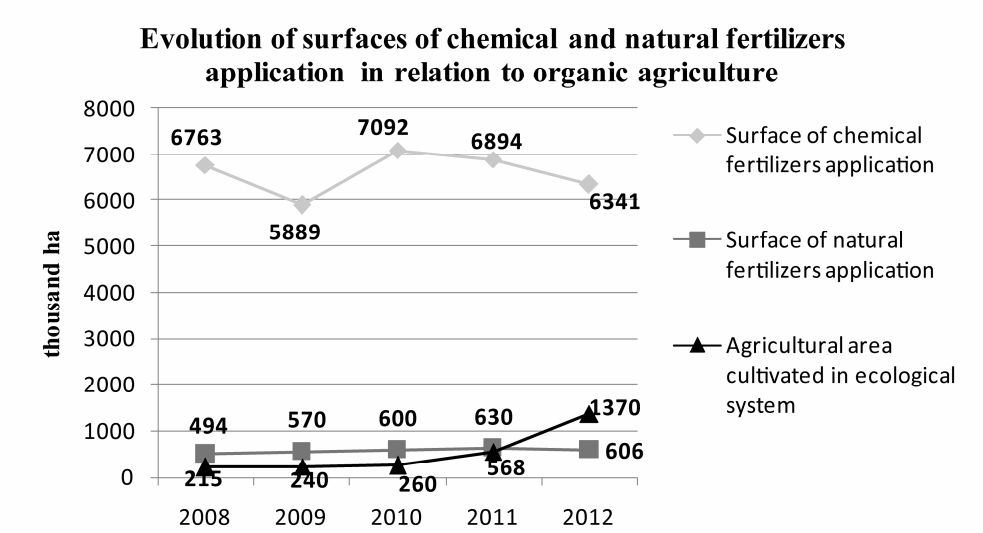

Figure 5. Evolution of surfaces with chemical and natural fetilizers in relation to organic agriculture

It can be observed that the areas cultivated in organic regime have a growing tendency, much more pronounced starting with 2011, as a result of the measures taken in order to encourage environmental practices of farm management and as a result of incentives granted to farmers.

Regarding the use of natural fertilizers, a slight variationcan be observed, but insignificant during 2008-2012. Thus, it can be stated that it has a relatively constant evolution which is not influenced by the expansion of organic agriculture.

The use of chemical fertilizers has seen a significant drop in 2009, the growth from 2010 exceeds the value from 2008 and after that the trend has decreased. The support for organic agriculture has become an important component of the rural development policy of the European Union.

Public goods and the environmental services that benefit from the positive effects of organic agriculture are (1):

- ✓ Fertility and soil functionality;
- ✓ Biodiversity;
- ✓ Water Quality;
- ✓ Reducing greenhouse gas;

- ✓ Rural vitality.

Besides the advantages listed above of organic agriculture, there are also drawbacks, such as:

- ✓ In organic agriculture productions per unit area are lower in comparison with conventional agricultural systems. The decrease in efficiency is recorded especially during the period of conversion from conventional agriculture to organic agriculture, a time being necessary until an ecological balance is restored at the the agricultural ecosystem level, after which the level of productions stabilises.
- ✓ The price of recovering organic agricultural products is higher than the one of conventional products.

Within the National Rural Development Strategy Program 2014-2020, organic agriculture is one of the main instruments to minimize water pollution within sustainable land management systems targeting fertilizers' management, crop protection management, water management and anti-erosion management.

Conclusions

In Romania, although is in its first phase, the organic agriculture is a certainty because of the:

- ✓ significant progress recorded in terms of cultivated areas within agro-organic system;
- ✓ increasing number of agro-organic operators;
- ✓ increasing volume and value of agricultural products and organic food;
- ✓ variety of agricultural products and organic food;
- ✓ increasing export of agricultural products and organic food;
- ✓ development and diversity of the internal market for organic food products.

Taking into account all these issues, it can be stated that an interconnection between the use of chemical fertilizers (decreasing trend) and the evolution of organic agricultural areas (upward trend) exists. Thereby, the organic agriculture can also be an efficient measure to improve soil quality, due to the reduction of chemical fertilizers.

If we take into account the benefits brought to the environment, organic agriculture can have a real significance related to economic and social planning in rural and urban areas.

Due to the high content of organic matter in the soil, a better retention and conservation of water in the soil is possible, leading to a less need for irrigation.

The development of the agricultural sector, assured by a sustainable agriculture is supported by subsidies or other incentives in order to favour the conversion to a organic agriculture and to stimulate the development of the sector as a whole.

The organic agriculture should be regarded as an integral part of a sustainable agricultural development and, at the same time, as a viable alternative to the traditional agriculture.

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IUCN RED LIST CATEGORIES AND CRITERIA FOR LEPIDOPTERA (INSECTA: LEPIDOPTERA) COLLECTED FROM DUMBRAVA SIBIULUI FOREST, ROMANIA

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Abstract
Currently, fauna and ecological analysis of the landscape in which the reserves and Forest "Dumbrava Sibiu" shows a great scientific interest and practical for biological research in Sibiu. The results can contribute substantially to assessing the status of conservation worldwide of insects and their evolution in the ecosystem studied, but also to establish their quantitative and qualitative changes over time. The data obtained and those resulting from private collections between 2000-2011 are integrated to achieve a more comprehensive study, which will be subject to further research on the evolution Macrolepidoptera over more than 120 years of research in the area of Forest "Dumbrava Sibiu". For some species have been listed by the IUCN recommended levels of endangerment in 2000 and 2001 Rákosy L.: extinct, taxon vulnerable, near threatened.

Key words: butterflies, Red List, Forest "Dumbrava Sibiului", IUCN, threatened species.

Introduction

This paper contains a checklist of all 58 butterfly species and their subspecies recorded to date in Romania including a classification according to IUCN categories of endangerment. It aims to work towards assessing the status of all native species against standard criteria based on the internationally accepted guidelines developed by the International Union for Conservation of Nature and Natural Resources (IUCN). Entomological biodiversity assessment level, national regional and local levels is an important goal in biological research. This work fits in this approach is a small part of a comprehensive study started several years ago in Oak Forest "Dumbrava Sibiu". The findings in Forest "Dumbrava Sibiu" allows obtaining recent data on the degree of endangerment of species in the studied area Macrolepidoptera but also on the specific structure and foundation of ways of protection and conservation status of "taxon": extinct, critically endangered endangered, vulnerable or potentially threatened. In order to fit in the category of research in this direction, we assumed

that classification according to IUCN in 2000 and 2010 (Rakosy, 2003). Forest Lepidoptera fauna of the area "Dumbrava Sibiului" began to be studied since 1880, the first species being collected by Daniel Czekelius, and are found in the Collection of Lepidoptera from Transylvania existence today in the Natural History Museum in Sibiu. This was followed by other amateur collectors who over time have contributed to more detailed knowledge of species of butterflies around Sibiu. Macrolepidoptere of Eugen Worell Collections (1900-1958), Viktor Weindel (1903-1964), Heinrich von Hannenheim Hann (1922-1964), Rolf Weyrauch (1949-1978), constituted a starting point for the present study. Our considerations on the flight periods of Macrolepidoptera collected from Forest "Dumbrava Sibiului" are based on research conducted over many years in this biotope (2001-2010), and this paper refers only to species that can be included in the classification under the IUCN system. The natural conditions and peculiarities of the investigated area have been presented in several previous works (Stancă-Moise, 2002, 2003, 2004, 2005, 2006, 2007, 2010). There is no doubt that the appearance of butterfly species in different moments in time exist sequences directly or indirectly linked with the climatic conditions of the area. Flight periods of biological features of each expressing lepidopteran species, and these periods are conditioned butterflies feeding activity but also by changes in biotope.

Material and method

To establish correlations between species density and number of samples in the study evaluations were performed by using the entomological collections from March to October during the years 2001-2012. The collected material was prepared, labeled inclusive with data about sex. The identified species are presented in carried out by preparing and preserving its contents label which determine the sex of each individual, preparation accordance with the taxonomic system proposed by Laszlo Rakosy, Marian Goia and Zoltan Kovacs (2003). Species listed in table 1 in systematic order belong to 12 families of Macrolepidoptera. In front of each species are listed serial numbers corresponding to the Catalogue of Lepidoptera in Romania, some observations and the degree of endangerment. Following abbreviations were used: **CR-** ***Critically endangered***, it is estimated that the survival of these species in the next 10-20 years is unlikely if not eliminate the factors that have caused this situation and after analysis of quantitative cost a decay rate of the population with at least 50% in the last 10 years. **EN-** ***Endangered***, endangered taxa when there is a critical stage of threat, but shows high risk or threat exctinction critical in the immediate future, it is estimated a probability of

about 20% extinction in the next 20 years, **VU-*Vulnerable***, a taxon is vulnerable when it is not in the critical threat or endangered, but have a high risk of exctinction or critical threat in the near future, **NT-*Near threatened***, includes taxa not included in CR, EN or VU but by worsening the degree of threat, it may take one or other of the three categories. This category largely replaces LR variant category IUCN 2000 Red List taxa without interest.

Results and discussions

The current assessment is based on the most comprehensive information on the distribution and status of butterflies ever available. The results confirm that butterflies are a highly threatened group of insects in Dumbrava Sibiului forest, with 76% of permanently resident species either, 24% Regionally Extinct or threatened (NT, CR, EN or VU).

Rich material collected from the Macrolepidoptere in Forest "Dumbrava Sibiului" area in 2001-2010 period includes 243 species, grouped into 17 Families and 163 Genera. After the systematic analysis against the IUCN categories on the degree of endangerment in the table below shows the list of species that can be framed (Table1). There were identified 36 Near threatened, 18 Vulnerable, 3 Critical endangered and 3 Endangered.

Conclusions

Great diversity of butterfly species in forest "Dumbrava Sibiului" in the period of 2001-2010 years and the presence of a total of 58 locally threatened species, classified in the IUCN system proposed at the national level, enables consideration of forest perimeter as an important biotope for this group of insects that must be protected.

Table1

IUCN RED LIST ABOUT LEPIDOPTERA (INSECTA: LEPIDOPTERA) COLLECTED FROM DUMBRAVA SIBIULUI FOREST

No. Ro*	No. K.&R.**	Taxa	Observations	Degree of endangerment
		FAMILY L A S I O C A M P I D A E		
3317	6742	Genus **M a l a c o s o m a** Hübner, 1820 (sin. Trichodia *Stephens,1827*; Clisiocampa *Curtis,1828*)		
3318	6743	**1.*Malacosoma neustria*** **(**Linnaeu**s,** 1758)		NT
3319	6744	**2.*Malacosoma castrensis castrensis*** (Linnaeus, 1758) sin. ***castrensis shardaghi*** Daniel, Forster& Osthelder, 1951	Report southern Dobrogea Daniel, Fostersi Osthelder, 1951 (Székely, 1994): Rákosy, Székely, 1996)	CR
3324	6754	Genus **M a c r o t h y l a c i a** Rambur, 1866		

3325	6755	**3.*Macrothylacia rubi*** (Linnaeus, 1758)		NT
3332	6770	Genus **P h y l l o d e s m a** Hübner, 1820		
3334	6773	**4.*Phyllodesma tremulifolia*** Hübner, 1810		NT
3335	6776	Genus **G a s t r o p a c h a** *Ochsenheimer, 1810*		
3336	6777	**5.*Gastropacha quercifolia*** (Linnaeus, 1758)		NT
3338	6779	Genus **O d o n e s t i s** (Germar, 1812)		
3339	6780	**6.*Odonestis pruni pruni*** (Linnaeus, 1758)		NT
3344	6785	**FAMILY S A T U R N I I D A E**		
3346	6787	Genus **A g l i a** *Oschenheimer,* 1810		
3347	6788	**7.*Aglia tau*** **(**Linnaeus, 1758)		
3349	6792	Genus **S a t u r n i a** *Schrank, 1802*		
3350	6793	**8.*Saturnia pyri pyri*** Denis & Schiffermüller, 1775		VU
3351	6794	**9.*Saturnia pavonia pavonia*** (Linnaeus, 1758) (sin. ***carpini*** [Denis & Schiffermüller], 1775)		VU
3356	6803	**FAMILY L E M O N I I D A E**		
3357	6804	Genus **L e m o n i a** Hübner, [1820]		
3360	6808	**10.*Lemonia balcanica*** (Herrich-Schäffer, 1847)		CR
		Family S P H I N G I D A E		
3374	6829	Genus **A c h e r o n t i a** Laspeyres, 1809		
3375	6830	**11.*Acherontia atropos*** **(**Linnaeus, 1758)		VU
3406	6875	**FAMILY H E S P E R I O I D E A**		
3437	6922	Genus **T h y m e l i c u s** Hübner, 1819		
3440	6925	**12.*Thymelicus acteon*** R*ottemburg,1775*		NT
3445	6938	**Family P A P I L I O N I D A E**		
3457	6957	Genus **I p h i c l i d e s** Hübner, 1819		
3458	6958	**13.*Iphiclides podalirius podalirius*** Linnaeus, 1758		VU
3459	6959	Genus **P a p i l i o** Linnaeus, 1758		
3460	3960	**14.*Papilio machaon machaon*** Linnaeus, 1758		EN
3461	6963	**Family P I E R I D A E**		
3463	6965	Genus **L e p t i d e a** Billberg, 1820		
3465	6967	**15.*Leptidea reali*** Reissinger, 1989	Species detected in many localities Transilvania,(Rákosy, 1996/3)	DD
3466	6969	**16.*Leptidea morsei*** Fenton, 1881**sin. morsei major** Grund, 1907		EN
3473	6992	Genus **A p o r i a** Hübner, 1819		
3474	6993	**17.*Aporia crataegi crataegi*** (Linnaeus, 1758)		NT
3475	6994	Genus **P i e r i s** Schrank, 1801		
3476	6995	**18.*Pieris brassicae brassicae*** Linnaeus, 1758		VU
3486	7010	Genus **C o l i a s** Fabricius, 1807		
3488	7014	**19.*Colias erate erate*** (Esper, 1805)		VU
3490	7017	**20.*Colias myrmidone myrmidone*** (Esper,1780)		VU

3491	7018	**21.*Colias crysotheme crysotheme*** (Esper, 1781)	VU
3493	7022	**22.*Colias alfacariensis*** Ribbe,1905(sin. **C. australis** Verity, 1911)	NT
3496	7027	**Family L Y C A E N I D A E**	
3501	7033	Genus **L y c a e n a** Fabricius, 1807	
3504	7036	**23.*Lycaena dispar*** (Haworth, 1802)	VU
3510	7043	**24.*Lycaena thersamon*** (Esper, 1784)	VU
3550	7111	Genus **M a c u l i n e a** Ecke, 1915	
3552	7113	**25.*Maculinea telejus*** (Bergsträsser, 1779) (sin. ***euphemus*** Hübner,1800)	EN
3553	7114	**26.*Maculinea nausithous*** (Bergsträsser, 1779) (sin. ***arcas*** Rottemburg, 1775)	CR
3555	7116	**27.*Maculinea rebeli*** (Hirschke,1904) (sin. ***xerophila*** Berber, 1946)	VU
3587	7196	**Family N Y M P H A L I D A E**	
3592	7201	Genus **A r g y n n i s** Fabricius, 1807	
3593	7202	**28.*Argynnis paphia paphia*** (Linnaeus, 1758)	NT
3597	7206	**29.*Argynnis niobe niobe*** (Linnaeus, 1758) (sin. ***cleodoxa*** Esper, 1789)	NT
3606	7219	Genus **C l o s s i a n a** Reuss, 1920	
3607	7220-	**30.*Clossiana euphrosyne*** (Linnaeus, 1758)	VU
3609		**31.*Clossiana selene*** ([Denis & Schiffermüller], 1775)	NT
3620	7249	Genus **A g l a i s** Dalman, 1816	
3621	7250	**32.*Aglais urticae*** (Linnaeus, 1758)	NT
3622	7251	Genus **P o l y g o n i a** Hübner, 1819	
3623	7252	**33.*Polygonia c-album*** (Linnaeus, 1758)	NT
3625	7254	Genus **A r a s c h n i a** Hübner, 1819	
3626	7255	**34.*Araschnia levana*** (Linnaeus, 1758) sin. ***propsa*** Linnaeus,1758	NT
3635	7269	Genus **M e l i t a e a** Fabricius, 1807	
3636	7270	**35.*Melitaea cinxia cinxia*** Linnaeus, 1758	NT
3637	7271	**36.*Melitaea phoebe*** ([Denis & Schiffermüller], 1775)	NT
3645	7283	**37.*Melitaea athalia athalia*** (Rottenburg, 1775) (sin. ***athalia mehadiensis*** Gerhard, 1822)	NT
3647	7285	Genus **L i m e n i t i s** Fabricius, 1807	
3648	7286	**38. *Limenitis populi*** (Linnaeus,1758)	VU
3655	7296	Genus **A p a t u r a** Fabricius, 1807	
3658	7299	**39.*Apatura iris*** (Linnaeus, 1758)	VU
3671	7320	Genus **C a e n o n y m p h a** *Hübner,[1819]*	

3675	7326	**40.*Caenonympha glycerion glycerion*** *Borkhausen, 1788*	NT
3688	7359	Genus **E r e b i a** Dalman, 1816	
3690	7363	**41.*Erebia euryale*** (Esper, 1805) (sin. ***euryale syrmia*** (Fruhstorfer, 1919))	NT
3695	7372	**42.Erebia aethiops aethiops** (Esper, 1777) (sin. ***aethiops fogarasica*** Warren, 1931, ***aethiops jigodini*** Popescu-Gorj, 1955, ***f. mesorubria***, Popescu-Gorj, 1955)	NT
3720	7478	**FAMILY D R E P A N I D A E**	
3726	7484	Genus **T e t h e a** Ochsenheimer, 1816	
3727	7485	**43.*Tethea ocularis*** Linnaeus, 1767	NT
3728	7486	**44.*Tethea or*** Denis & Schiffermüller, 1775	NT
3729	7487	Genus **T e t h e e l l a** Werny, 1966	
3730	7488	**45.*Tetheella fluctuosa*** **(**Hübner, 1803)	NT
3733		Genus **C y m a t o p h o r i m a** Spuler, 1908	
3734	7492	**46.*Cymatophorima diluta*** ([Denis & Schiffermüller] , 1775)	NT
3747	7506	Genus **D r e p a n a Schrank, 1802**	
3749	7508	**47.*Drepana falcataria*** Linnaeus, 1758	NT
3755	7514	**FAMILY G E O M E T R I D A E**	
3757	7516	Genus **A r c h i e a r i s** Hübner, [1823]	
3760	7519	**48.*Archiearis puella*** (Esper, 1787)	VU
3850	7664	Genus **A n g e r o n a** Duponchel, 1829	
3851	7665	**49.*Angerona prunaria*** (Linnaeus, 1758)	NT
3855	7673	Genus **L y c i a** Hübner, 1825	
3856	7674	**50.*Lycia hirtaria hirtaria*** (Clerck, 1759)	NT
4007	7968	Genus **G e o m e t r a** Linnaeus, 1758	
4008	7969	**51.*Geometra papilionaria*** (Linnaeus, 1758)	NT
4009	7970	Genus **C o m i b e n a** Hübner, 1823	
4010	7971	**52.*Comibena pustulata*** Hufnagel, 1767 sin. ***C. bajularia*** ([Denis & Schiffermüller, 1775])	NT
4016	7981	Genus **C h l o r i s s a** Stephens, 1831	
4018	7983	**53.*Chlorissa cloraria*** (Hübner, [1813])	NT
4019		**Genus P h a i o g r a m m a** Gumppenberg, 1877	
4020	7984	**54.*Phaiogramma pulmentaria*** Guenée, [1857] sin. ***etruscaria*** (Zeller, 1849)	NT
4031	8011	Genus **C y c l o p h o r a** Hübner, 1822	
4034	8014	**55.*Cyclophora annulata*** Schulze, 1775 Sin. ***annularia*** (Fabricius, 1775), ***C. omicronaria*** [Denis & Schiffermüller], 1775	NT
4037	8018	**56.*Cyclophora ruficiliaria*** (Herrich & Schäffer, 1855)	VU
4040	8022	**57.*Cyclophora punctaria*** *Linnaeus, 1758*	NT
5438	10373	**Family L Y M A N T R I I D A E**	

5467	10415	Genus **A r c t o r n i s** Germar, 1810	
5468	10416	**58.*Arctornis l-nigrum l-nigrum*** (Müller, 1764)	NT

*Corresponding serial number from the catalog of butterfly species Romania (Rákosy L., Goia M., Kovács Z., 2003)

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BIODEGRADABLE SHELL FOR GRANULATED SLOW-RELEASE SOIL FERTILIZERS

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Abstract

The conservative organic agriculture is a modern concept closely related to sustainable development of economy and a chalenge for the scientific research in the third millennium. Industrial development based on „geen chemistry" clean thechnologies to obtain value added products, valorization of natural renewable raw materials from local sources, environmental safety and human health protection are the major goals of the integrated agroindustrial management. One of the solutions to increase the return of biofuel manufacture is the complete processing of raw materials including the conversion of by-products and technological wastes into agro useful products as eco-efficient alternatives to synthetic agrochemicals. Present paper presents a new possibility to increase the bioavailability of core-shell soil fertilizers by covering granules with a biofilm of vegetal origin. The film-forming composition made of depleted microalgae biomass, grist or stems of oilseed plants, glycerol and other by-products or wastes from biodiesel manufacture will form a biodegradable shell after drying on granules, which after field application will gradually release the fertilizer from the core in soil and will act as a natural nutritious supplement.

Keywords: core-shell granules, slow-release fertilizer, biodegradable shell, biofilm

Introduction

In recent years, the planetary progression of pollution and obvious depletion of mineral resources, alarmed scientific researchers of developed countries and together with specialists and experts from various industrial fields have turned their attention to the great diversity of raw materials from renewable natural resources, especially on by-products and waste from processing technologies of industrial crops.

Reconsideration and valorization of renewable natural resources could be the best saving solution to the global problem of the third millennium, the ozone protective layer reduction and increased UV radiation at ground level with their negative consequences for biosphere and human health.

Excepting crops necessary for food products, organic agro-industrial waste was considered the ideal raw material to produce Biofuels as solids (firewood, pellets and chips),

liquid (bioethanol, biodiesel and crude oil) and gaseous (biogas). Production of biofuels has seen great development in recent years in most EU countries, in Romania there are over 30 manufacturers of biodiesel and bioethanol plants using energy supplied from renewable raw materials of agricultural abundance: sunflower, soybean, rapeseed, potato, corn, wheat, sugar beet and others. Producers of biofuels may benefit from cheap raw material as climatic conditions currently existing in Romania allow intensification and industrialization rapeseed cultivation, sweet sorghum and other crops with short vegetation, including aquatic plants.

Oilseeds became the first target for the extraction of vegetable oils, not only for preparing food and medicines, varnishes and paints, cosmetics and detergents, additives, and other industrial technologies aimed at replacing chemicals and fossil fuels. Compared to mineral oils, the use of vegetable oils offers the benefits of biodegradability and lack of toxic effects to beneficial organisms and environment.

Scientific research should conceive experimental models of processes in closed loop, the inputs of a technological flow are represented by the outputs of another, so that the loss of raw materials and energy to be minimized or even eliminated.

The development and implementation of efficient technologies, low-power, easily adaptable to existing user facilities and extended functionality, ensure cost reduction and economic competitiveness of Romanian biofuels on European market.

Growing interest of society to the use of biofuels will certainly lead to increased production, will require intensive cultivation of plant species needed to ensure raw material base and generate huge amounts of waste by-products of manufacturing and technology for which solutions should be found more efficient recovery, plus more insistent demand of the market for the development and diversification of agro-useful bioproducts with minimal impact on the environment and human health. Currently, large amounts of stems and meals results after pressing processes and / or fermentation in livestock are valued as animal feed. Stems and meals of seeds pressed for oil separation remain as technological wastes from the manufacture of biodiesel using *brassica* oilseeds and only a small part can be used as animal feed, knowing the toxic goitrogenic action of chemical constituents present in plant tissues against non-ruminant animals. In recent years, new technologies for biodiesel production from camelina and microalgae (Demirbas M.F. 2011, Huang G., Chen F., Wei D., Zhang X., Chen G. 2010) have been developed, generating significant amounts of depleted biomass after oil extraction, a valuable source of organic carbon, nitrogen, organic acids to be used as

nutritious supplement for crops, human and animals. Bioactive principles should be included in biocides, soil conditioners, soil preservatives and other added value products.

Green waste is biodegradable due to the biochemical mechanism of decay, which liberates carbon dioxide, one of the most active greenhouse gas emissions. Obviously, this type of waste origin is quantitatively non-limited since the development of the market economy has created many other powerful economic activities generating waste from industrial processing of renewable natural resources, which are currently discharged into the environment from lack of viable solutions for recovery. Improperly stored or spilled chaotic in the environment, organic wastes contaminate the soil, surface water, groundwater and air. By recovery and recycling of waste fractions in soil improvers, biodegradable components are incorporated into the soil and carbon dioxide released from putrefaction is captured and used by microbiotic fauna as an energy source for developing crops. Water swelling and bioactive components from other waste or byproducts fractions retained by immobilization in amphoteric fibrous matrix are released gradually, ensuring long residence time of active substances, soil stability and plant drought resistance. Energy plants harvested from these improved soils turn to biofuel plants, thus closing the cycle integrated agriculture-industry-agriculture in which carbon dioxide is sequestered and metabolized, helping to reduce greenhouse gases, increase resilience climate risks and natural disaster prevention.

Algae have been used for a long time as fertilizers for crops to improve water binding capacity and mineral composition of exhausted soils. Seaweed fertilizers used as additional positive effect due to their content of N, K and P seem to favor plant resistance to pests and diseases, inducing increased speed of seed germination. Growth regulators derived from microalgae were also obtained and microalgae biomass resulting from the process of manufacturing biodiesel from microalgae oil or depleted biomass after extraction of other useful principles should be considered valuable raw materials for improving and conservation of agricultural soil.

By-products obtained from the refining technology of oils, fatty acids, fatty acid esters or soap manufacture should be also exploited in soil fertilizers. For example, green technologies for processing agricultural oils involving non-toxic reagents remove a glycerin waste stream with great utility as a nutrient source for crop development and beneficial microorganisms in soil under organic farming. Crude glycerin from transesterification reactions is insoluble in methyl and ethyl esters of fatty acids, remaining in the lower phase (heavy) with traces of organic and inorganic contaminants. From this residue, glycerol may be

purified by conventional means for pharmaceuticals and cosmetics or used *per se* as a conditioner for agrochemicals.

The abundance and diversity of indigenous renewable natural resources should encourage targeting different sectors of the national economy towards sustainable development to meet the challenge of redefining industry and agriculture in the context of Romania's integration in the European Union.

Materials and methods

1. By-product recovery from industrial processing of oily biomatter

Effective management of technological wastes from agricultural oil refining could provide cheaper eco-friendly fertilizers for agronomic and horticultural markets.

A cost-effective and clean technology for obtaining fertilizers from agricultural oil refining process involves the following steps:

a) Refining crude oil with a potassium base (KOH or a potassium salt);
b) Acidification of the potassium soap stock with sulfuric acid (H_2SO_4);
c) Separation of acid oil from acid water

The acid water phase contain in this step nitrogen from gums in a small amount, P_2O_5 from phosphatides, potassium from potassium soap stock refining and sulfur from H_2SO_4 used for soap acidification to pH 3. The addition of phosphoric acid to pH 2 is for the best and a nitrogen base (NH_3 sau NH_4OH) or KOH should neutralize the acidic water to obtain a horticultural fertilizer. The optimum stability was obtained adding urea at the end of the neutralization step. Advanced concentration should provide solid core fertilizer.

The technology of manufacturing biodiesel could also provide valuable ingredients for eco-friendly fertilizers: crude glycerol with PK traces removed when KOH was used as catalyst for oil conversion, waste lignocelluloses remaining after oilseed pressing process, finely chopped stems of industrial crops and microalgae grown to produce lipids which contain proteins, carbohydrates and other valuable components in lipoprotein complexes.

The crude biomass from two microalgae species selected and grown (Velea S., Dragoş N., Şerban S., Ilie L., Stîlpeanu D., Nicoară A., Stepan E. 2009, Iancu P., Pleşu V., Velea S., 2012) for valorization of their high potential of producing lipids for biodiesel manufacture, *Scenedesmus opoliensis* (Velea S., Rovinaru C., Stîlpeanu D., Ghimiş S., Dragoş N., Bica A.,

Oancea F. 2013) and *Porfiridium purpureum* (Velea S., Ilie L., Filipescu L. 2011) was harvested, filtered, degreased and dried (Figure no. 1), to be characterized and included in the film-forming composition.

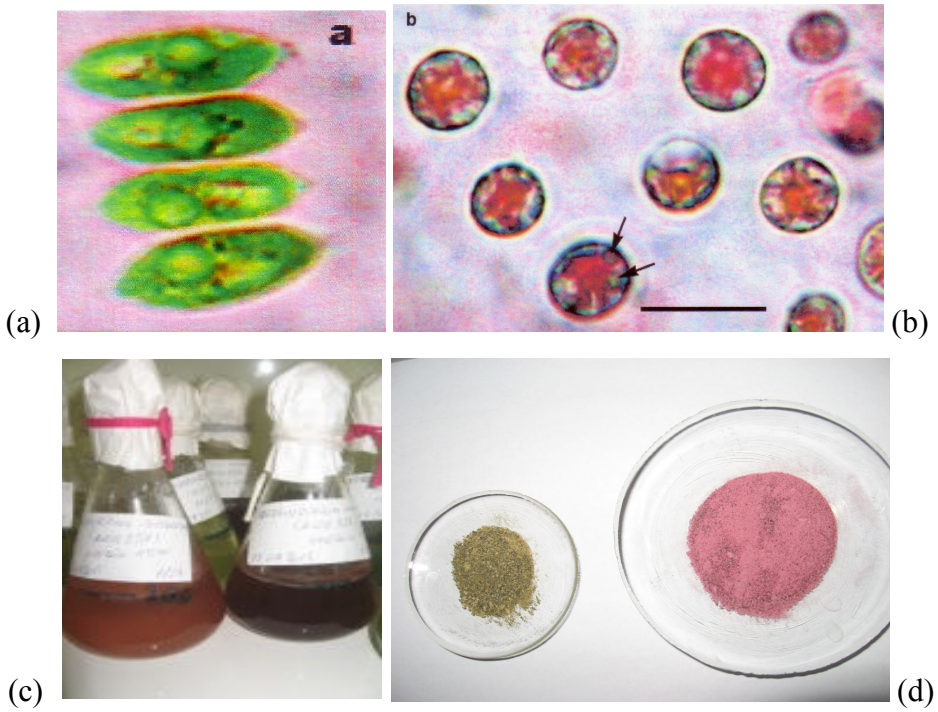

Figure no.1. Cells of green *S. opoliensis* (a) and red *P. purpureum* (b), microalgae inoculums in culture medium (c) and depleted biomass (d)

Depleted biomass after oil extraction from microalgae species selected and grown in laboratory standard conditions were used as raw materials for biodegradable shell of slow-release granulated soil fertilizers to play a nutritional role for crops after their decomposition and graduate release fertilizers from cores.

2. Experimental model for obtaining the biodegradable shell

Raw materials: Depleted microalgae biomass, crude glycerol or waste glycerol waters, corn starch, polyvinyl alcohol, chopped stems and *brassica* grits.

Experimental variant I. An aqueous solution of 5% PVA and a 5-10% starch hydrogel are mixed in a 1-1.5 liter glass flask equipped with stirring. Glycerol water and depleted biomass of microalgae were added sequentially under stirring or, in an optimized experimental variant, biomass was suspended in a small amount of water glycerol waste, finally homogenized with the remaining components to give a stable composition with characteristic creamy appearance and green brown or reddish brown color depending on the microalgae strain used. The nutritional properties as a soil supplement of depleted microalgae

biodegradable shell was assessed by analytical means such as volumetric analysis, gravimetric and ICP-OES, respectively.

Experimental variant II. In a screw conveyor loading a laboratory mill with a capacity of 400-450 g/h, equipped with a sieve having a mesh diameter of 6.8 mm, 240-250 g stems and 200 g meals were added in 10 -12 g portions of each type of plant material. The vegetable mixture was ground in the mill, passed in the paddle stirrer and wetted with 20-50 liters of natural glycerol solution. The mixture was stirred slowly 2.5-3 hours for aging to maximum retention of the microalgae suspension in glycerol and complete soak of vegetable fibers (Oancea F., Velea S., Popescu M., Lupu C. 2011).

Results and discussions

Depleted microalgae biomass was analyzed for attesting the conformity and quality requested for nutritional soil supplements (Table no.1).

Table no. 1. The chemical composition of depleted microalgae biomass

No. crt.	Analyte	Unit	Value	
			Scenedesmus opoliensis	***Porphyridium purpureum***
1	Organic maters	%	86.79	83.59
2	Ash	%	13.31	16.71
3	Total organic nitrogen	%	6.63 (41.44% proteins)	3.54 (22.12% proteins)
4	Al		0.22%	1095 mg/Kg
5	Ca	%	0.86	4.65
6	Ba	mg/Kg	31	186
7	Ni	%	1.24	-
8	Si	mg/Kg	164	267
9	Mn	mg/Kg	324	74.9
10	Fe	%	0.18	0.1
11	Mg	%	0.50	0.4
12	Na	%	5.77	4.97
13	Zn	mg/Kg	383	284
14	Cu	%	0.1%	-
15	P		751 mg/Kg	1.68%
16	K	%	1.03	2.95
17	Cr	mg/Kg	-	20.3

Nutrient intake of crude glycerol from biodiesel synthesis as conditioning ingredient of biodegradable shell depends on the nature of catalysts and additives involved in the technological process (Table no. 2).

Table no. 2. The composition of residual glycerol from biodiesel synthesis

No. crt.	Assesed Properties	Unit	Value
1	Glycerol content	% (masic)	77 – 90
2	Ash content	% (masic)	3.5 – 7
3	Water	% (masic)	0.1 – 13.5
4	minimum energy value	MJ/kg	14.9 – 17.5
5	kinematic viscosity	mm^2/s	120
6	3-monopropilendiol	ppm	200 – 13,500
7	methanol	% (masic)	0.01 – 3.0
8	Non-glycerol organic mater	% (masic)	1.6 – 7.5
9	pH	% (masic)	4.5 – 7.4
10	sulfate	% (masic)	0.01 – 1.04
11	phosphate	% (masic)	0.02 – 1.45
12	acetate	% (masic)	0.01 – 6.0
13	Na	g/kg	0.4 – 20
14	K	g/kg	0.03 – 40
15	Ca	mg/kg	0.1 – 65
16	Mg	mg/kg	0.02 – 55
17	Fe	mg/kg	0.1 – 30
18	Mn	mg/kg	<0.5

In order to increase the NPK nutritional content of the biodegradable shell, crude glycerol should be purified by neutralization with sulfuric acid or phosphoric acid in place of hydrochloric acid aqueous solution (conventional technology), where the alkali metals such as Na, K, Ca and Mg present in vegetable oils are converted into dipotassium salts (sulphates and phosphates), which are known to have complex fertilizer properties.

When rapeseeds were cold pressed for biodiesel manufacture, about 1 kg of oil was obtained from 3 kg of seeds, and 2 kg of protein-rich cake pressed with high biological value remains as technological wastes. Composition and nutritional values of rapeseed pressed cake are: 87% dry matter, 33% crude protein, 15% crude fat, 10% crude fiber,

13.5 MJ / kg energy value and among the predominant mineral elements about 6.3 g/kg Ca, 10.8 g/kg P and 0.1 g/kg Na.

For comparison, an average of 2 tons of Camelina seeds harvested from one hectare of crop area should produce about 650-680 kg biokerosene. Cold pressing process provided 30% crude oil, the waste cake retaining about 10-12% which should be removed by solvent extraction but the technology is difficult and unfeasible. Camelina crude meal contained up to 45-47% proteins, 10-11% of lignocelluloses and useful microelements (Table no. 3).

Table no. 3. Analysis of Camelina meal obtained by cold pressing

No. crt.	Analyte	Unit	Value	Analytical method used for assesment
1	Organic maters	% (w/w)	94.42	Ignition method (1000°C)
2	Ash	% (w/w)	5.57	Ignition method (1000°C)
3	Total organic nitrogen	% (w/w)	5.93 (37.06 proteins)	Volumetric method: Regulation 2003/2003-method 2.3.3. SR EN 15478:2009
4	Total phosphorous	ppm	6142.30	Gravimetric method: Regulation 2003/2003-method 3.2. SR ISO 6598: 1996
5	Potassium	ppm	12418.96	Gravimetric method: Regulation 2003/2003-method 4.1. SR EN 15477: 2009
6	Calcium	ppm	5026.50	SR EN 13475: 2002 Determination of calcium content: oxalate method
7	Carbon (TOC)	% (w/w)	45.50	According to the procedure PO-A-53
8	Ratio (C/N)	-	7,67	Value resulting from the calculation
9	Al	%	0,5	Optical emission spectroscopy in inductively coupled plasma (ICP-OES)
10	Ca	%	3.77	ICP-OES
11	Ba	mg/kg	120	ICP-OES
12	Co	mg/kg	498	ICP-OES
13	Si	%	0.10	ICP-OES
14	Mn	mg/kg	221	ICP-OES
15	Fe	%	0.81	ICP-OES
16	Mg	%	2.15	ICP-OES
17	Na	%	0.23	ICP-OES
18	Zn	mg/kg	94.60	ICP-OES
19	P	%	2.40	ICP-OES

20	Cu	mg/kg	61.80	ICP-OES
21	K	%	3.75	ICP-OES

Biodegradable shell for granulated slow-release soil fertilizers could be obtained from such biomaterials described above, in various original recipes, by applying the compositions and drying them on the core surface. In one of the first experimental versions, microalgae film-forming composition was formulated as a concentrated suspension with gel appearance containing 9770 ppm total nitrogen, 907.7 ppm total phosphorus (P_2O_5) and 1097 ppm potassium according to volumetric analysis, gravimetric method and ICP-OES, respectively.

Figure no. 2. Wet grinding in a lab mill with porcelain balls and filtering the final product

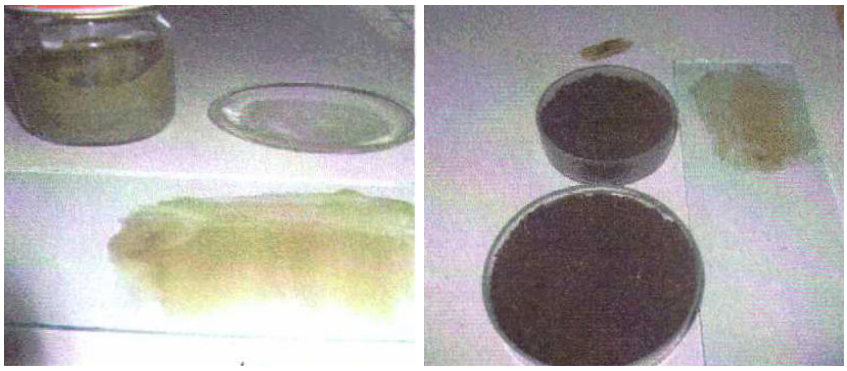

Figure no. 3. Film-forming properties tested on glass, paper and soil supports

As seen in the figures no. 2 and 3, the homogenous paste resulted after fine grinding in a laboratory mill equipped with porcelain balls demonstrated excelent film-forming properties when tested on glass, paper and soil supports that mimmics semiporous to megaporous surfaces of fertilizer granules.

Conclusions

➢ It has been shown the opportunity of turning depleted biomass of microalgae species producing lipids for biodiesel manufacture into eco-friendly natural film-forming composition

formulated as paste, gel or concentrated suspension with potential utility as biodegradable shell for granulated slow-release soil fertilizers.

- Experimental models should be optimized in order to obtain more complex formulas of biodegradable shell by (bio)conversion of appropriate industrial natural wastes or by-products: cold pressed cake or stems of industrial crops, crude glycerol from biodiesel manufacture or wastewaters from chemical processing of fats containing traces of NPK nutrients from catalysts or reagents.

Aknowledgements

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INFLUENCE OF AGRICULTURE ON WATER QUALITY OF LOWER DANUBE RIVER

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Abstract
Nutrients are essential for plant and animal life, but when in excess can cause serious problems by stimulating the rapid growth of algae and nuisance plants in rivers, lakes and estuaries.
The phenomenon known as eutrophication, also occurs in large river, being one of the major issues in water quality facing the authorities in the European countries.
In the Danube basin region, agriculture is a major land user, contributing importantly to eutrophication of the area, including the Black Sea region. As a consequence, agriculture has an important role for maintaining or improving the quality and quantity of water resources.
The aim of this study was to investigate the water quality of Lower Danube River, for 2 years using multivariate statistical methods.
In order to achieve this goal, water samples were collected from different locations and the following indicators have been investigated: water flow rate, pH, water temperature, oxygen saturation, dissolved oxygen, 5-days biochemical oxygen demand, chemical oxygen demand, ammonium-nitrogen, nitrite-nitrogen, nitrate-nitrogen, total nitrogen, orthophosphates, total phosphorus, phenol, methylene blue active substances and Chlorophyll "a".
The obtained results for the water analyses show that the variation of indicators is due to the actual ecological status of the Danube River as results of environmental conditions in the monitored period (2011-2013). In terms of nutrient content, the environmental quality of water falls in the category good to moderate, appreciation which is in good agreement with historical data.

Keywords: water quality, Danube River, statistical analysis

Introduction

Eutrophication of large river systems, as a result of the increasing content of nutrients, is one of the major issues in water quality facing the authorities in the European countries.

The European Union decided that the protection of waters becomes a major priority of water management policies, as a result of increasing destructive impacts of human activities on water resources in Europe [1, 2].

Evaluation of the quality water ecosystems could be a complex process which involves many parameters that contribute different pressures on water quality [3]. Accurate evaluation of water quality based on a large number of samples is difficult, the distinction from independent variations of normal anthropogenic variations influenced the quality parameters [4].

The aim of this study was to investigate the water quality of Lower Danube River, for 24 months during the years 2011-2013, using multivariate statistical methods: principal component analysis (PCA) and cluster analysis (CA).

Experimental

One of the most important waterways inside Europe, the Danube River is the second largest river in Europe [5]. The Danube River is one of the most important pollution sources into the Black Sea, the major pollutants loads, both upstream and from the Romanian sector [6].

The water samples were collected from 10 monitoring locations (center, left bank and right bank of Lower Danube) (Table 1). Have been investigated the following indicators: 5-days biochemical oxygen demand (BOD), chemical oxygen demand (COD), dissolved oxygen (DO), oxygen saturation (OS), ammonium-nitrogen (NH_4-N), nitrite-nitrogen (NO_2-N), nitrate-nitrogen (NO_3-N), total nitrogen (TN), orthophosphates (PO_4-P), total phosphorus (TP), Chlorophyll "a" (Chl. "a"), methylene blue active substances (MBAS) phenol, water temperature (T), pH, water flow (Q).

Table 1. The sampling site locations and their characteristics

Watercourse	Sampling location	Length (km)	Average flow rate (m^3/s)
Bala Area	L1	347	4654
	L2	345	3087
	L3	344	1580
	L4	343	3514
Epurasu Island	L5	340	1361
	L6	341	219
	L7	334	1576
Lupu Island	L8	197	2713
	L9	196	1645

	L10	195	4367

The water samples were collected in decontaminated polyethylene containers and kept at 4 °C during transportation to the laboratory for analysis. The reagents (Merck) used throughout the analyses were of analytical purity, the solutions were prepared with double-distilled and deionized water, and the determinations were carried out according to current standards (Standard Operating Procedure).

Results and discussion

The statistical software package JMP 10 for windows was used for the multivariate statistical calculations. Multivariate analysis of the surface water quality data set was performed through Principal component analysis and Cluster analysis statistical methods.

Principal component analysis (PCA)

Principal components analysis (PCA) provides information on the most significant parameters which describe the entire dataset, which reduce the dimensionality of data with a minimum loss of initial information [7, 8].

The interdependence of parameters was carried out using the Pearson linear correlation coefficients (Table 2). A very strong linear dependence is by the correlation coefficient absolute value is > 0.9, 0.7 - 0.9 for a significant linear dependences, moderate linear dependence is 0.4 - 0.7, 0.2 - 0.4 for low linear dependence, and < 0.2 for no linear dependence [9].

From the data in Table 2 it can be observed that the correlation Phenol vs. NH_4-N may indicate a possible common anthropogenic source or resulting from the same processes of organic matter decomposition. The correlation TN vs. NO_3-N is explained by the fact that NO_3-N is the predominant form of nitrogen in TN. Phenol vs. COD correlation is expected since Phenols are organic compounds which are responsible for part of COD. The COD vs. BOD correlation is expected since there are both measures of organic matter content. DO vs. T inverse correlation is also expected since the gases solubility in water is invers proportional with water temperature.

Table 2. Correlation matrix for water quality parameters

	Q	pH	T	OS	DO	BOD	COD	NH_4-N	NO_2-N	NO_3-N	TN	PO_4-P	TP	MBAS	Phenol	Chl. "a"
Q	1,0000															
pH	-0,0413	1,0000														
T	-0,0320	0,0136	1,0000													
OS	-0,2449	0,0305	0,5540	1,0000												
DO	-0,1572	-0,0161	-0,4135	0,2051	1,0000											
BOD	0,0621	-0,1495	-0,2680	0,0337	0,0276	1,0000										
COD	0,0390	-0,0879	-0,5392	-0,0415	0,3695	0,8052	1,0000									
NH_4-N	0,1301	-0,0009	-0,5983	-0,3268	0,3724	0,1764	0,5718	1,0000								
NO_2-N	0,0155	0,0022	-0,3867	0,0568	0,2775	0,2603	0,4426	0,3704	1,0000							
NO_3-N	0,3598	-0,1012	-0,2648	-0,7704	-0,3375	-0,0801	-0,1275	0,1639	-0,2025	1,0000						
TN	0,3160	-0,0936	-0,2211	-0,6941	-0,1867	-0,0699	-0,0164	0,3590	-0,1212	0,8607	1,0000					
PO_4-P	0,1970	-0,1973	-0,0760	-0,1677	0,0335	0,0644	0,2256	0,3074	0,0027	0,2267	0,3266	1,0000				
TP	0,0282	-0,0617	0,1840	0,0399	-0,3276	0,0117	-0,1706	-0,2270	-0,1863	0,0332	0,0312	0,0945	1,0000			
MBAS	-0,1777	-0,2353	0,0574	0,0937	0,0461	-0,0587	-0,1102	-0,0770	-0,1526	-0,0861	-0,0821	-0,1156	0,2396	1,0000		
Phenol	0,0381	-0,0110	-0,6193	-0,0765	0,5673	0,3100	0,7543	0,7202	0,4783	-0,1651	-0,0235	0,2928	-0,2052	-0,0618	1,0000	
Chl. "a"	0,0967	0,0234	0,2894	-0,1535	-0,4869	-0,1825	-0,4682	-0,4093	-0,3449	0,2845	0,1958	-0,2368	0,1310	0,0337	-0,6029	1,0000

From correlation of PO_4-P with TN and NO_3-N probably due to soil phenomena of nutrients from adjacent land or through tributaries (PO_4-P and NO_3-N are major constituents of fertilizers). Annual evolution of Chl. "a" concentration is highly influenced by seasonal changes and local hydrological conditions, while the nutrient levels dependent on the most part of precipitation, discharge rate vs anthropogenic river flow (e.g. municipal wastewater treatment plants) and various chemical equilibria among abiotic and biotic forms.

Cluster analysis

Another type of multivariate analysis is cluster analysis, who providing details of similarities between groups of parameters [7, 8]. A pivoted data set was used for the generation of the dendrogram presented in Figure 1 [10].

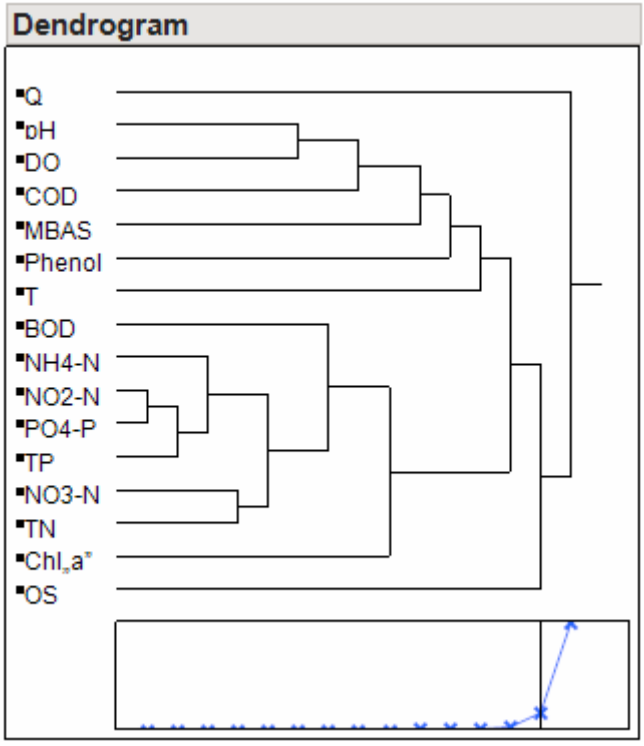

Figure 1. Dendrogram of the 16 quality parameters

We can observe, generally, an association of nutrients both in reduced and higher oxidation forms, behavior also observed for the parameters describing the organic matter content. The final group shows the overall association of the monitored indicators and the oxygen saturation with the flow rate.

Conclusions

Statistical data presented in this paper indicates a strong relationship between the monitored physical and chemical indicators for water quality of Lower Danube River, for 24 months during the years 2011-2013.

The results of water analyses show that the variation of indicators is due to the actual ecological status of the Danube River as results of environmental conditions in the period

2011-2013. In terms of nutrient content, the environmental quality of water falls in the category good to moderate, appreciation which is in good agreement with historical data.

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REGENERATION OF SUGAR BEET PLANTS FROM CALLUS

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Abstract
The possibility to obtain plants from sugar beet leaf originating callus has been examined. The tissue callus originates form leaf fragments obtained from young and healthy sugar beet plants. The results of the experiment show that callus tissue was induced for up to 63.8 % of the inoculated explants on a modified culture MS62 medium. For organogenesis or plantlets regeneration there were used two classical culture media, i.e.: Murashige-Skoog and De Greef and Jacobs, with certain additives. The best organogenesis was obtained on Murashige-Skoog (79.8 %). Thus it was possible to regenerate a total of 137 plantlets (74 on Murashige-Skoog and 63 on De Greef and Jacobs medium) with any modification in plants.

Keywords: sugar beet, in vitro, callus, plantlets regeneration

Introduction

Regeneration of plants from callus can be used for multiplication of sugar beet, which is an essential plant genetic resource for food security, as stated by the Annex I of the Plant Treaty, where the species is listed. Romania paid a lot of attention to this crop, mainly due to the climatic conditions favoring its cultivation (Sand, 1995). Still, besides classical growing, a major importance is given today to modern technologies which are using in vitro culture techniques (Sand and Cachita, 1994). In Europe, sugar beet is the major crop for extracting sugar and other uses (Cachita and Sand, 2000).

The success of plant regeneration from callus culture depends on the activity of stimulation of organogenesis in meristem cells that play a crucial role in shaping the morphology and physiology of adventitious shoots or roots (Dudits and Heszky 1990; Gurel and Wren, 1995). Composition of media and hormonal balance in those environments are crucial to the success experiences.

The scope of this study is to assess the regeneration potential of plantlets starting from tissue culture originating from sugar beet leaves. In this regard there were used at least two types of leaf fragments: basal with a small part of petiole, and median with a small fragment of the median nervure, considering that in these parts of the leaf there are meristem cells for

the young developing leafs. Different culture media formula have been tested and the results are expected to be used in the broader technology for sugar beet growing.

Material and Method

Plant material Sugar beet healthy plants (*Beta vulgaris* L.) grown in pots in contained greenhouse conditions, aged three months, have been used as donor plants for in vitro experiments.

Sterilization was induced from sugar beet young and healthy leaf explants sterilized with a solution of 10% calcium hypochlorite for 5 minutes, after which they were washed several times with sterile distilled water.

Inoculum preparation Small fragments of about 1 cm^2 originating from the basal part and median part of the leaf have been cut under sterile conditions and immediately inoculated on the culture medium of Murashige-Skoog (MS) (1962) with the addition of 2,4-D 10 mg / L + 1 mg / L NAA, variant I, and 2,4 - D 5 mg / L + 2 mg / L NAA, version II. The basal fragment also included the petiole fragment and the median leaf also included the main nervure of the leaf.

Plantlets regeneration from callus culture The experiments regeneration of plantlets from callus was initiated on the two culture media, namely: Murashige-Skoog and De Greef and Jacobs. These culture media and growth regulators contained in three variants namely: V1 - 1 mg / L NAA + 1 mg / L BAP; V2 - 1 mg / L IBA + 1 mg / L K and V3 - 0.5 mg / L GA3 + 0.5 mg / L BAP.

On these culture media were inoculated fragments of callus obtained from leaf fragments.

Acclimation was carried out for 10 days at a temperature of 18 - 20° C, with air humidity of 85-90%.

Results and discussions

A regenerative callus tissue was easily induced using as starters plant materials from young healthy leaf fragments of sugar beet. The process starts first at the injury place and continues covering all used leaf fragment. It seems that the callus is fast producing at the petiole and nervure levels. It can be considered that the leaf explant is a tissue that produces relatively easy callus tissues for many purposes used in vitro culture techniques.

The two types of explants were inoculated on MS medium Murashige - Skoog (MS62) with addition of 2,4 - D 10 mg / L + 1 mg / L NAA, variant I, and 2,4 - D 5 mg / L + 2 mg / L NAA, variant II, respectively.

The experimental collected data were interpreted using the Duncan Test, which allows to analyze and to compare the variations.

The best results were obtained by the explant fragments taken from the leaf center, with a portion of the main nervure, i.e. 66.4 % (Table 1). The fragments that were collected from the basal part of the leaf and including a small portion of petiole gave good results i.e. 57.8 %.

Regarding the impact of the regulators in the culture medium, there were insignificant differences between the two formulas which offer a choice of economical variant.

The callus tissue obtained from all the two types of explants was a regenerative light green callus, with friable, coarse appearance. The callus was easily separated and it can be used for multiplication in small fragments, thus providing the possibility of having a callus amount that could be used for many purposes (Cachiţă-Cosma 1987; Sand, 1994; Sand and Cachita, 1995; Cachiţă-Cosma and Sand 2000).

Table 1 Results of callus regeneration from leaf fragments of sugar beet

Explant type	Culture medium Murashige-Skoog (MS)(1962)			
	variant I 2,4 –D 10 mg/l + 1 mg/l ANA		variant II 2,4 – D 5 mg/l + 2 mg/l ANA	
	% callus	Significance	% callus	Significance
Leaf fragment in the basal part, with petiole	57.8 %	B	48.6 %	B
Leaf fragment in the middle part, with nervure	66.4 %	A	62.3 %	A

The resulting callus tissue was used in this experiment after cultivation for 6 weeks on Petri dishes. The callus was fragmented and inoculated on two different types of culture media to induce plantlets regeneration (Tables 2 and 3).

Each of the two culture media have been supplemented with three kinds of growth regulators, i.e. V1: 1 mg / L NAA + 1 mg / L BAP; V2: 1 mg / L IBA + 1 mg / L K and V3: 0.5 mg / L GA3 + 0.5 mg / L BAP.

The differences are not significant, which means that the culture media and growth regulators are not the only factors influencing the results of experience, especially when sugar beet genotype is involved. This statement is based on previous experiments, each time using a different source of germplasm. The results did not differ much, but the conclusion was that

the origin of the biological material has a great importance in using explants cultivated in vitro (Dudits and Heszky 1990; Gurel and Wren, 1995; Hagege et al., 1990; Margara, 1995).

Table 2 Results of plantlets regeneration using as starting material callus originating from leaf explants of sugar beet, on Murashige-Skoog culture medium

Callus origin	Growth regulators					
	1mg/l ANA+1 mg/l BAP		1 mg/l AIB +1 mg/l K		0.5mg/lGA_3+0.5mg/l BAP	
	obtained plants (%)	Significance	obtained plants (%)	Significance	obtained plants (%)	Significance
Leaf fragment in the basal part, with petiole	80.7	A	67.1	A	64.3	A
Leaf fragment in the middle part, with nervure	63.6	B	60.4	AB	60.6	B

From the data presented in the table no 2 it can be concluded that the explants consisting of fragments that were collected from the basal part of the leaf and that included a small portion of petiole provide the highest plantlets regeneration rate, on Murashige - Skoog medium (MS62), although callus regeneration rate is smaller.

The variant with the best results for all types of calluses, proved to be that with 1 mg / L NAA + 1 mg / L BAP , but the other two variants yielded also good percentage of plants.

In Table 3 are presented data obtained from the culture De Greef and Jacobs, with the same amounts of growth regulators.

On the De Greef and Jacobs medium, the best results were obtained with callus pieces collected from the basal leaf part with small portion of nervure, especially on the medium containing 0.5 mg / L GA3 + 0.5 mg / L BAP. Percentages obtained from middle leaf parts were between 44.5 and 52.6% which suggests that other types of explants and hormones can be used successfully in inducing plant.

Table 3 Results of plantlets regeneration using as starting material callus originating from leaf explants of sugar beet, on De Greef and Jacobs culture medium

Callus origin	Growth regulators					
	1 mg/l ANA + 1 mg/l BAP		1 mg/l AIB +1 mg/l K		0.5mg/l GA_3+0.5mg/lBAP	
	obtained plants (%)	Significance	obtained plants (%)	Significance	obtained plants (%)	Significance
Leaf fragment in the basal part with petiole	64.8	A	61.6	A	68.3	A
Leaf fragment in the middle part with nervure	44.5	C	52.6	BC	47.8	C

Conclusion

The explants, consisting of fragments taken from the center of the leaf and which contains a portion of the main stem have given the best results. If it is analyzed the effectiveness of used culture media it can be concluded that both culture media can be used with good results. It seems that the media composition has not a significant influence. The best culture media formula for plantlets regeneration proved to be that containing 1 mg / L NAA + 1 mg / L BAP for basal leaves on MS62 medium, and that contains 0.5 mg / L GA3 + 0.5 mg / L BAP on De Greef and Jacobs medium.

Acknowledgement

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RESEARCHES CONCERNING THE CONTROL OF DROUGHT AT MAIZE USING BIOPRODUCTS

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Abstract
Climatic changes of the next centuries will have major implications on agricultural production, affecting food, feed and biomass yields. Rainfalls already have uneven distributions during a year, long dry periods alternating with excessive rainfalls. There are many ways to control or alleviate the negative effect of drought on agricultural crops, such as irrigation, developing new cultivars, tolerant to water deficit, or utilization of various (bio-)chemical products, which retain the moisture in the soil, reducing the water losses through evapotranspiration.
In our experiment we tested a bioproduct developed by TimacAgro, France. Two maize hybrids were tested in containers in order to assess the role of WR30 bioproduct on retaining the water in the soil. Drought was induced two times: at vegetative and flowering phenophases. Catalase activity, chlorophyll content and water content of soil were measured in vegetative and flowering stages, before and after drought stress. WR30 was also tested to assess the influence on germination rate of maize.
Results indicate that WR30 had a positive effect on maintaining water in soil during drought and also determined a better germination of maize kernels.

Keywords: drought, maize, germination, chlorophyll, catalase

Introduction

All plants are subject to the life cycle of many factors of stress. Depending on the species and source of stress, each plant will respond differently. Drought has major implications for global food supply because of the expected effects of gradual climate change over the next century, and the variation in climatic extremes in the short term that it is expected to bring. Although increased temperature is a more predictable outcome than changes in rainfall patterns accompanying climate change, it is generally considered that major maize producing areas will become warmer, drier and subject to an evolving array of maize diseases and pests that are new to those areas. According to Mars Bulletins (2012) the

EU-27 countries produce around 12% of global maize, and their yields in 2012 have also been reduced by an average of 12.5% by heat and drought.

FAO defines drought as "an extended period - a season, a year, or several years - of deficient precipitation compared to the statistical multi-year average for a region that results in water shortage for some activity, group, or environmental sector".

In Romania in the last years unusual meteorological phenomena occurred more frequently: hail storms, frosts, droughts and floods, with the most severe impacts felt by rural populations, who depend on agriculture for their livelihoods. During a severe drought in 2012, FAO and the Ministry of Agriculture and Food Industry evaluated the impact of natural hazards on standing crops, losses to main summer standing crops (maize and sunflower), and natural resources for livestock production, such as pastures and meadows. The resulting Program of Disaster Risk Reduction identified five technical aspects as critical bottlenecks that worsened the impact of the 2012 drought on small-scale farmers: lack of fodder conservation, inappropriate seed varieties, absence of climate smart agronomic techniques, poor pasture management, weak irrigation infrastructure for small farmers (FAO, 2013).

In fields with varying topography, texture and thickness of topsoil, yields may vary ten-fold. The normal practice of sowing a single variety or hybrid in such a field implies the need for a good level of drought tolerance to reduce this level of within-field yield variation. The prospects of adding additional irrigated land on which maize will be grown are relatively slight, given that irrigated land area is projected to increase at a rate roughly equal to or less than the population growth rate.

Climate changes and reduction of soil quality make drought tolerance an important issue in plant cultivation. But drought tolerance is also strongly linked to heat tolerance, as Lobell et al. (2011) recently demonstrated: maize yields are affected only by an increment of 1°C of the mean temperatures, even if field are well-watered. This 1°C rise of average temperature also affects the water cycle, increasing its intensity by 8% due to increased evaporation rates (Knight et al. 2012).

A serious issue arises when high temperature spikes coincide with the susceptible growth stages in maize of flowering and early grain fill, and farmers can do little to alleviate this stress. Adaptation to heat stress is defined as tolerance to "temperatures above a threshold level that results in irreversible damage to crop growth and development." This threshold is lower for reproductive organs than for vegetative structures.

Edreira et al. (2011) reported increased pollination failure and a large increase in kernel abortion when ears were heated and held at 33-40°C. High temperatures also reduce leaf area and accelerate leaf senescence but there are clear and heritable differences among inbred lines in tolerance to temperatures exceeding 40°C in the field. Root elongation in maize seedlings is also reduced by high temperatures, though differences in the temperature response of the rate of elongation of roots and leaves are much greater among species than within. There is increasing evidence that tolerances to drought and heat are under independent genetic control, and can be treated as two distinct traits. Drought tolerance from a breeding viewpoint is a complex trait that shows a high level of genotype x environment (G x E) interaction (Cooper at el. 2006) – though from the physiological viewpoint it can be simplified into several clear processes (Blum, 2011). Heat tolerance appears to be less complex, but there is little published evidence to date confirming this assertion.

Genetic improvement in drought tolerance would increase yield with 20-25% and another 20-25% by application of water-conserving agronomic practices. Though irrigation has the most important role in protection against drought stress (50-60%) (Edmeades et al. 2006). Genetic and management strategies that target improved grain yields in a water-limited environment target three variables: amount of water captured by the plant (W) (Chimenti et al. 2006, Edmeades et al. 2006), the efficiency with which that water is converted to biomass (water use efficiency, WUE) (Passioura and Angus 2010, Chapman and Edmeades 1999), and the harvest index (HI) or the proportion of biomass forming grain. Each of these variables can be altered (Duvick et al. 2004; Tollenaar and Lee, 2011).

Drought affect plants in various ways: change the color of from green to green-gray, lower then upper leaves are rolling of, stomata are closing, photosynthesis is being sharply reduced and growth is slowing, leaf senescence, anthesis is affected, sometimes with compete abortion of ears if drought is very severe during flowering, ears have fewer kernels that will be poorly filled if drought extends throughout grain filling (Edmeades et al. 2000).

If some of the aspects are difficult to improve due to financial aspects, the utilization of smart agronomic techniques can be available for farmers of all scales. Usage of bioproducts in controlling drought is a useful way to protect the crop from the negative effects of climatic stress.

There are two types of water retainer products on market: natural and synthetic products. Natural water retainers are obtained by grinding mineral rocks, meanwhile synthetic water retainers are polymers. These amendments usually expand in the presence of water and

increase the water holding capacity of soils and potting mixes. Some water retainers are important for soil pH correction and contain nutrients available for the plants.

The aim of the experiment was to assess the role of a synthetic polymeric water retainer - WR30 (Timac Agro International) - in controlling drought at two maize hybrids.

Material and methods

Experimental design

A pot experiment was established using containers in randomized blocks. 140 L containers with a surface of 0.16 m^2 were filled with chernozem. To half of the containers a synthetic polymeric water retainer product - WR30 - was added to soil before sawing (50 kg/ha). Basic fertilization was realized with 133 kg/ha Hyper N 23-0-5 and TSP 45 Timac mixture (in 3:2.5 ratio). Two maize hybrids were used: DKC4490 and DKC4626 (Monsanto). DKC4490 is a drought and heat tolerant maize hybrid. For all variants three replicates were used. Sawing took place on July 05, 2013 and plantlets started to emerge after 3 days. 5 plants were cultivated in each container. The experimental variants were split in two: half of the containers were watered normally and to half of them drought was induced two times: in vegetative (3 weeks after emergence) and in flowering stages (2 months after emergence).

The drought was induced by reducing, and when it was necessary, completely stopping the watering of plants, until moisture content of soil sufficiently dropped and water deficit symptoms developed.

In order to assess the effect of WR30 on drought alleviation, chlorophyll content (using a portable chlorophyll meter, Konica Minolta) and soil humidity (using a moisture analyzer, Kern Analytics) were measured after both drought period. To determine the effect of WR30 on the metabolic processes involved in drought tolerance, the activity of catalase enzyme was assessed. To assess catalase activity of DKC4626 hybrid, which is more sensitive hybrid to drought, we established a pot experiment with peat moss as substrate, with two variants: V0: control – without WR30 and V1: with WR30 (50 kg/ha). Plants were watered properly until developed 6 leaves, then drought was induced to all plants, in order to assess the effect of WR30 on drought tolerance of plants. After 3 weeks of drought (due to relatively low temperatures in September, dehydration of peat was low), when specific symptoms of water deficit were visible, leaves were collected and frozen until enzyme extraction. Catalase was extracted from leaves using the method of Tayefi-Nasrabadi et al. (2011). All determinations were repeated three times and results were reported to mean of data.

Evaluation of the effects of WR30 on germination rate and early growing of maize plantlets. Surface sterilized seeds were places on sterile Petri dishes with deionized water jellified with different concentrations of WR30: 0% (control), 0.05%, 0.5%, 2% and 5% of WR30 (w/v). Germination rate was daily observed and plantlets' roots and coleoptiles were measured.

Statistical analysis of data was conducted by one-way and two-way analysis respectively using ANOVA and F-test.

Results and discussions

Chlorophyll content of leaves

Chlorophyll content of leaves at vegetative stage, after drought stress.

The tendency for higher values of chlorophyll content in leaves of DKC 4626 hybrid was maintained also after drought stress, both at watered and drought variants. But there was a general tendency at both hybrids to respond positively to drought when WR30 was applied. However, the WR30 could not retain enough water in soil to assure the necessary moisture content as in control variant, the chlorophyll content in drought conditions was higher when WR30 was applied even with 2 SPAD units. Nevertheless these differences were not statistically significant and the chlorophyll content was significantly lower in drought conditions than in normally watered plants even if WR30 was used.

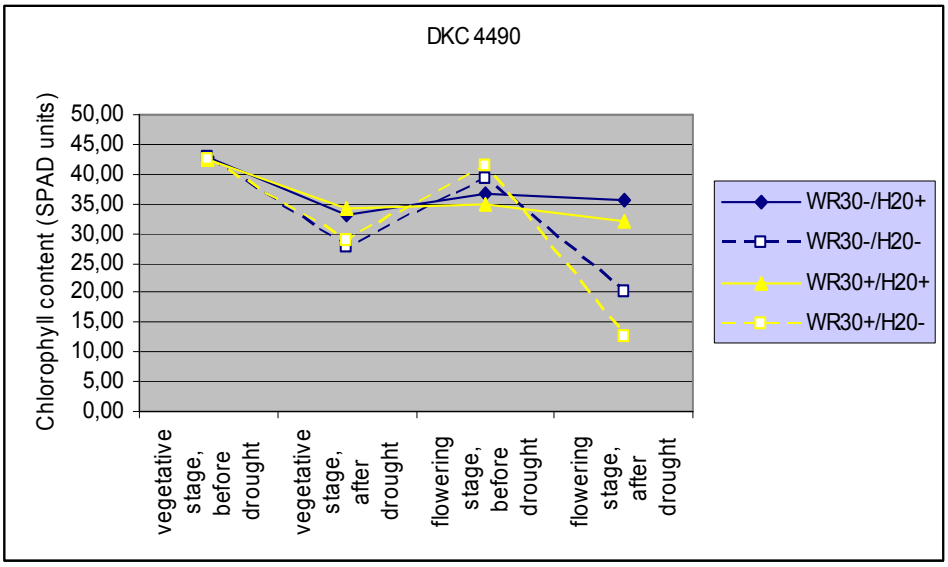

Figure 1. Dynamics of chlorophyll content in leaves of DKC 4490.

It is also very important to mention that during drought stress, plant tissues lose water and dehydrate, conducting to a concentration of cell content. In contrast, turgescent cells present a dilution of all cell biocomponents in cytoplasm and vacuoles. As a result, the SPAD readings are higher for dehydrated plants and could lead to a conclusion that leaves have higher chlorophyll content, but in reality drought stress do not determine a more intense biosynthesis of chlorophyll, only SPAD chlorophyll-meter assesses the concentration of chlorophyll per leaf area.

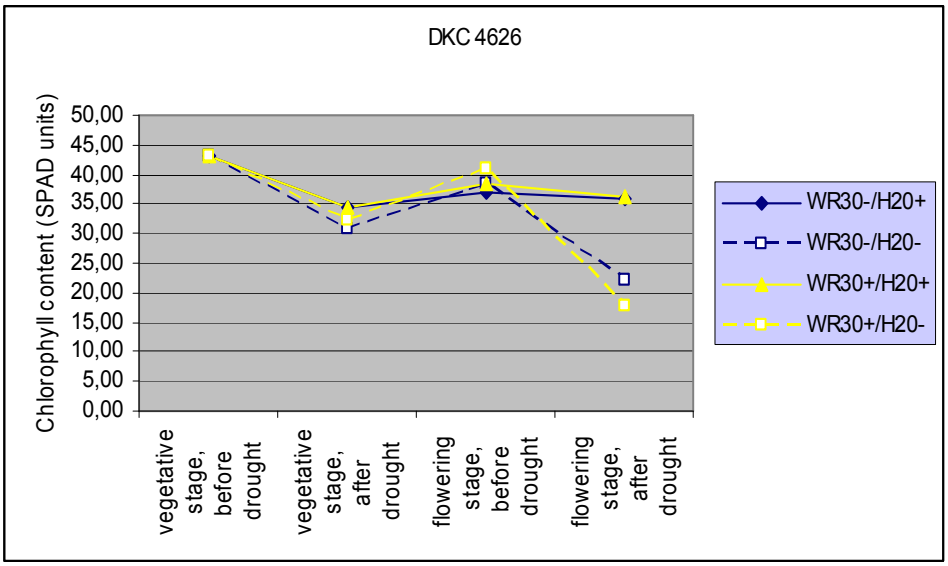

Figure 2. Dynamics of chlorophyll content in leaves of DKC 4626.

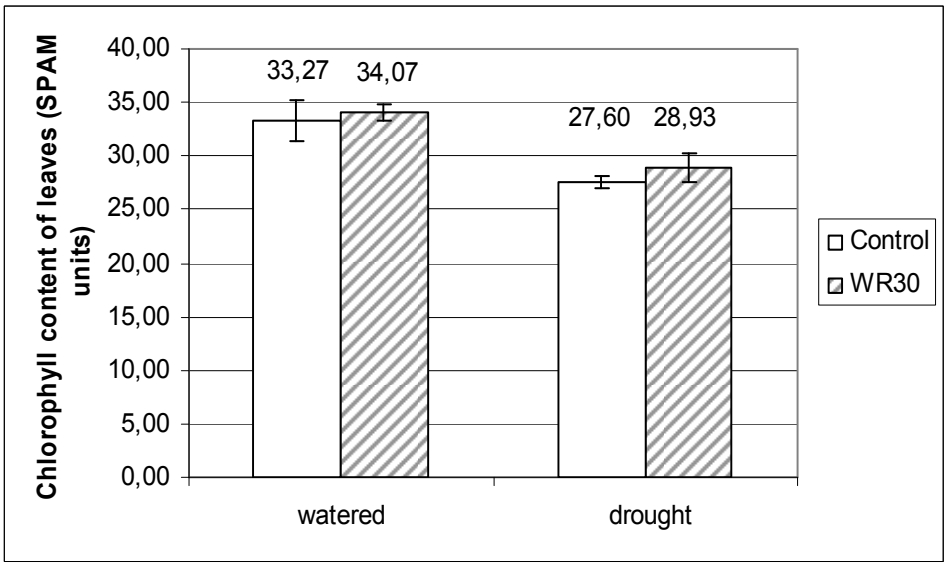

Figure 3. Statistical analysis of chlorophyll content for the DKC4490 hybrid (significant differences were between drought and watered variants at P<0.001%).

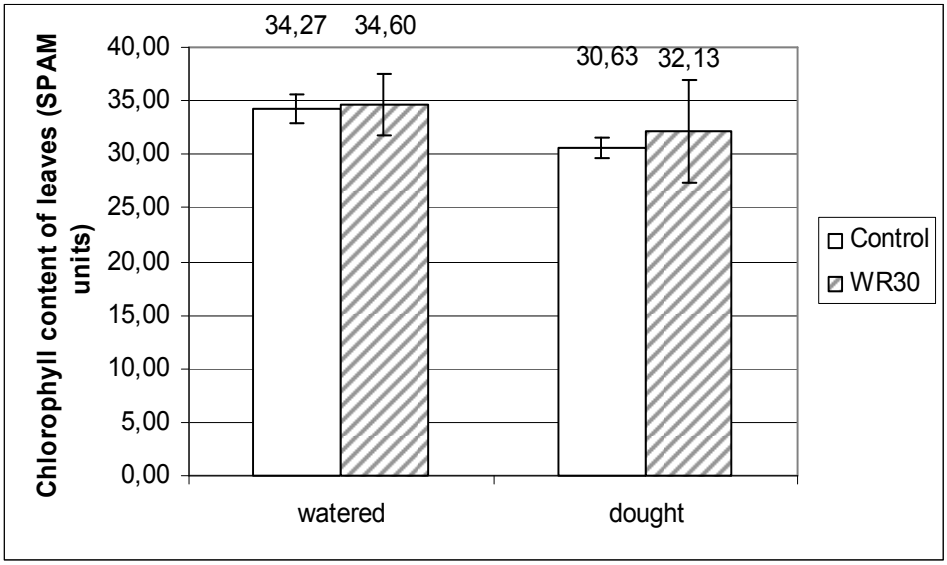

Figure 4. Statistical analysis of chlorophyll content for the DKC4626 hybrid (no significant differences at P<0.05).

Chlorophyll content of leaves at flowering stage, after drought stress.

The results obtained after drought stress at flowering stage is quite controversial: the values of chlorophyll content dropped very heavily at "drought" variant treated with WR30, compared to the "drought" variant without WR30. The explanation could be:

- the plants from WR30 variant were developing faster and the chlorophyll content lowered due to the maturation due to the effect of WR30,
- WR30 had a negative effect on plant metabolism stopping the biosynthesis of chlorophyll,
- chlorophyll content was higher in plant suffering from heavy drought stress due to dehydration of tissues and concentration of biocomponents in cytoplasm.

Considering the results obtained by in vitro assessment of the effect of WR30 on germination and early growing of plantlets, we can conclude that the second statement is false. In vitro tests demonstrated that the higher the concentration of WR30, the better germination and growing of plantlets. The 3rd possibility cannot be considered true in our case, because this occurs when plants are in early developmental stages.

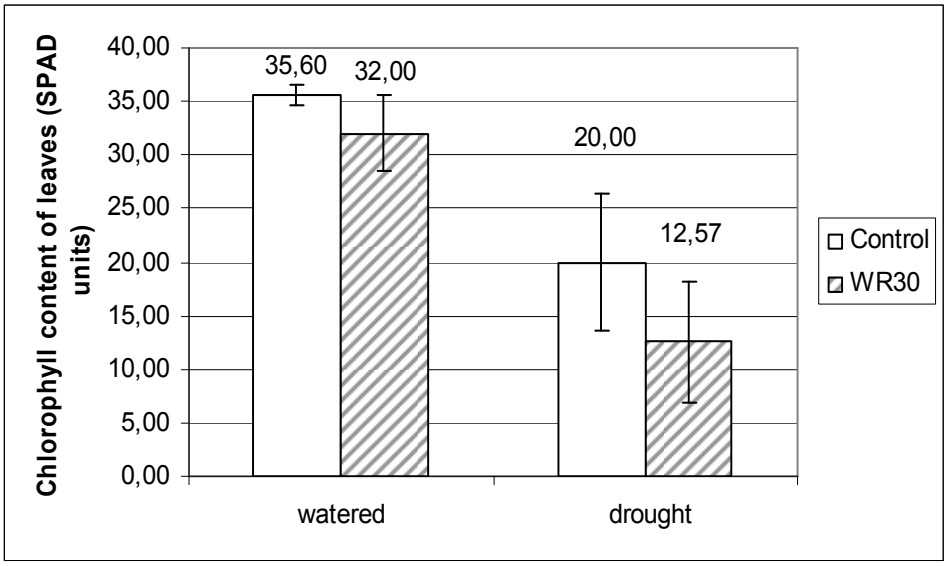

Figure 5. Statistical analysis of chlorophyll content for the DKC4490 hybrid (significant differences were between drought and watered variants at P<0.001%).

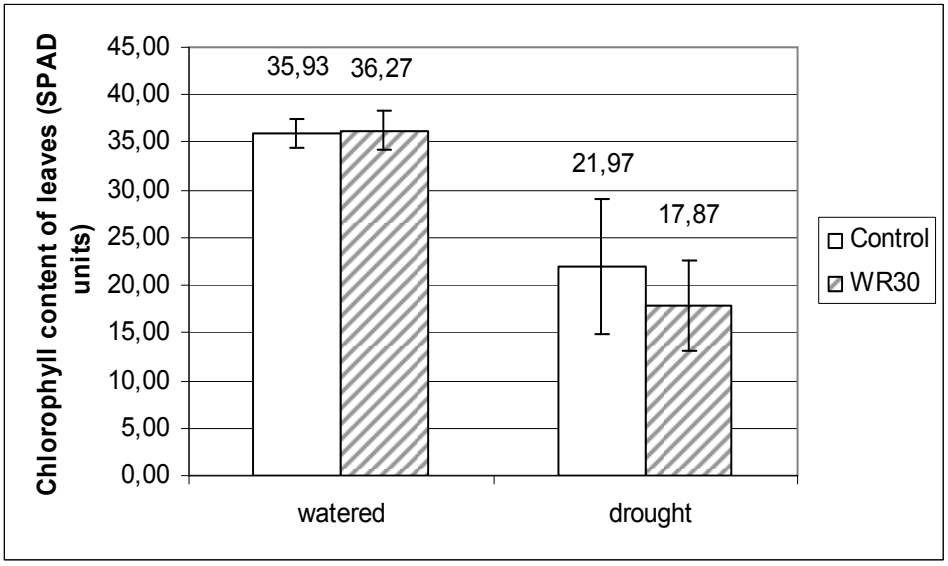

Figure 6. Statistical analysis of chlorophyll content for the DKC4490 hybrid (significant differences were between drought and watered variants at P<0.001%).

Catalase activity of plants

Results show that specific activity of catalase in plants treated with WR30 was lower than in control variants. Considering that catalase is an enzyme which is produced in drought conditions as a tolerance reaction of plants to stress, results can suggest that WR30, due to retention of water in substrate, could prevent the negative effects of drought.

Table 1. Catalase activity and protein content of plants after drought stress

Variants	Replicants	Protein content	Catalase activity	Relative catalase activity	Specific activity	Specific activity
		mg/ml	U/ml	%	U/mg proteina	Relative value %
Control	C2	3,69	0,367		0,1	
	C3	3,45	0,566		0,164	
	C4	3,95	0,321		0,081	
	C5	3,32	0,275		0,083	
			0,382	100	0,107	100
WR30	S2	3,87	0,291		0,075	
	S3	3,83	0,321		0,084	
	S4	3,57	0,367		0,103	
	S5	3,25	0,275		0,085	
			0,314	82,07	0,087	81,08

Water content of soil

Water content was constantly reduced during drought stress, from 16-18% to 10-12%. After 2 weeks of drought there were already differences in water content of soils treated with WR30 compared to those without this product, which conducted to the conclusion that WR30 has an active role in maintaining the moisture in the soil.

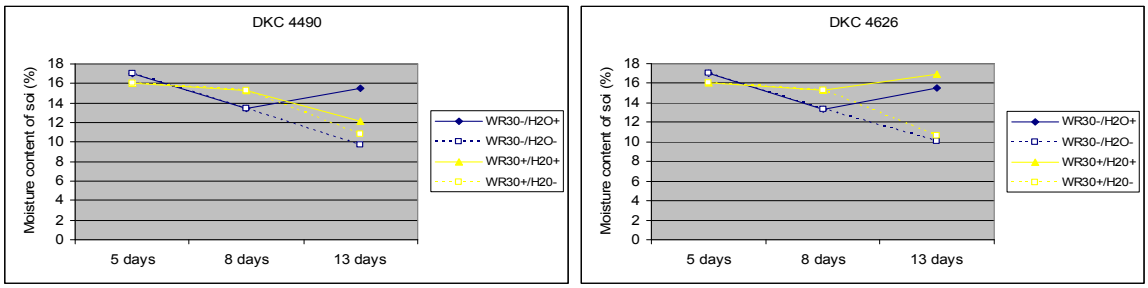

Figure 7. Short term variation of soil water content during drought stress in vegetative stage.

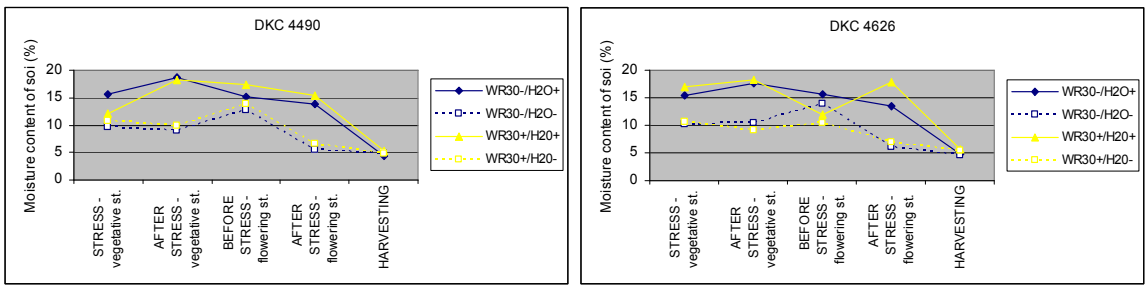

Figure 8. Long term variation of soil water content during the entire growing period.

Germination rate and early development of plantlets

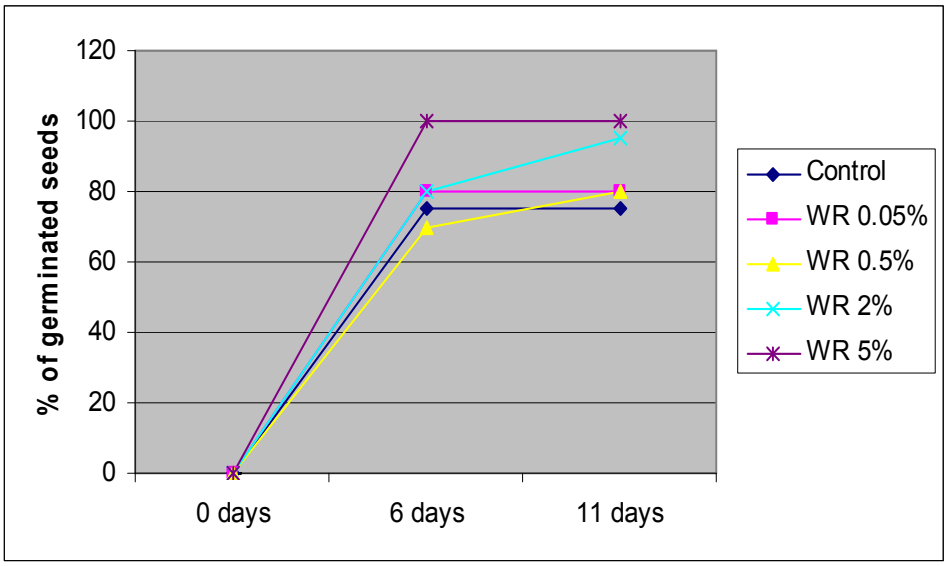

Figure 9. Dynamics of germination rate of maize kernels.

Germination rate of maize kernels was influenced by the different concentrations of WR30. The best percentage of germinated seed was observed on the highest concentrations of WR30: 5%, followed by 2%.

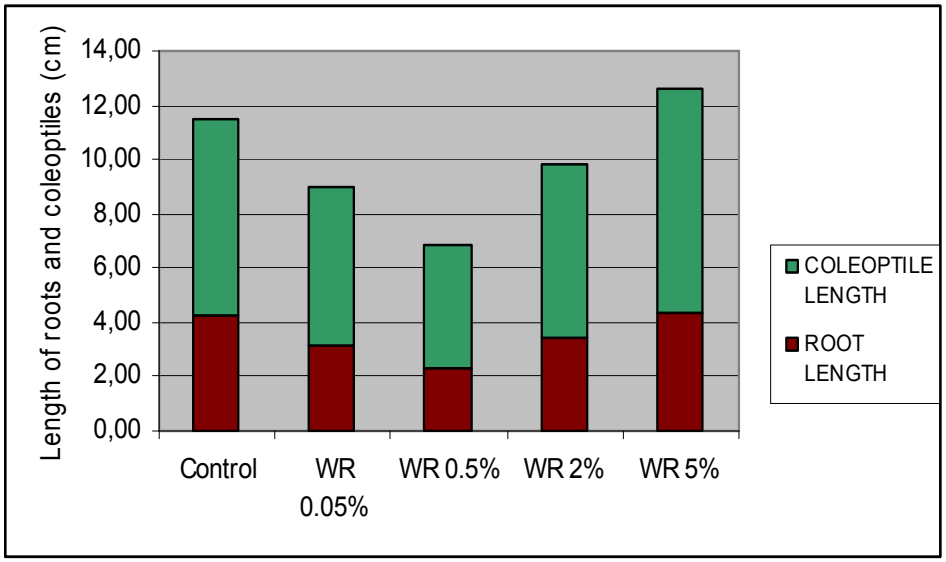

Figure 10. Root and coleoptile length of plantlets.

After germination of kernels, roots and coleoptiles of plantlets were measured. Results presented in the figure above, show that the best concentration for early growing of plantlets

was WR 5%. There was also a tendency of better growing and development at lower and higher concentrations, values decreasing while concentration of WR30 is approaching 0.5%.

Conclusions

WR30 gave a protection against drought stress of maize but the effects are limited to the period of vegetative development stages. The positive effects are not considerable at further developmental stages, such as flowering, ripening and plant senescence.

The results (improvements of chlorophyll content and better germination of seeds under WR30) are very promising and worth a thorough analysis, considering a field trial for large-scale evaluation.

It is also necessary to consider if the differences between the maize hybrids were determined by some genetic properties of cultivars, such as precocity, or a different reaction to the application of WR30.

Catalase activity of plants from WR30 variant was lower, which proved a lowest intensity of drought stress due to accumulation of water in soil by WR30. This was also confirmed by the analysis of water content of soil, which proved that WR30 has an active role in maintaining moisture in soil.

Germination and plantlet development were improved by higher concentrations (2-5%) of WR30, which could help plantlet emergence after germination in soil too.

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GLOBAL FINANCING OF UNIVERSITIES

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Abstract:
Funding methodology is performed by MECTS using mainly methodological proposals developed by CNFIS based on statistical studies and simulations made by the FIS Service of UEFISCDI.
The assignation of budgetary allocations to universities is done by MECTS, on the basis of contracts sealed with institutions of higher education. Consolidation and validation of support information, development and use of electronic applications for proper calculation, as well as filing the documentation related to the proposals on annual and monthly allocation of budget funds to higher education institutions are made by FIS Service of UEFISCDI, under the guidance of CNFIS.

Keywords: funding, universities, budget, equivalent student

In the overall funding process of universities we distinguish the following steps:

• Introduction of the global financing system for universities at the 1st of January 1999. During this stage, differentiation with regards to institutions of core funding starts from knowing the number equivalent students and the indexes of net unit costs.

• Starting with the 1st of January 2002, a system for qualitative indexes was introduced for the distribution on institution level of the allocations for basic funding. In this stage qualitative indexes were introduced with direct implications on cost level: percentage of occupied positions, percentage of professor and associate professor positions in the total number of teaching positions, percentage of teachers under 35 years, percentage of teachers with the scientific title of doctor in the overall teaching staff.

• Completing the system of quality indicators for core funding since 2003.

The fundamental principles in formulating proposals on financing are:

- strategic development priorities of higher education;
- the fundamental principle according to which: "resources should follow students";
- funding similar activities at similar levels.

Starting with these principles, based on documents, CNFIS proposes unitary allowances for equivalent students and the necessary budget coming from state for the development of higher education on profiles.

Budgetary Proposals for funding higher education institutions for the next financial year are brought in each year until April 30 and transmitted to the Minister of Education and Research, the main credit officer, responsible for developing and executing the budget for public higher education.

Amounts set for financing are stated separately in the institutional contract of higher education institutions. The agreement specifies: the number of students (unitary equivalents) financed from the state budget, the courses of study and the number of PhD grants funded.
National Education Law provides for education funding a min. percentage of 6% from GDP:
After adoption by the Parliament and the promulgation of the State Budget Law, CNFIS proposes allocation by institutions of the budget funds on higher education.

Public funding of public higher education institutions has three main directions:

- core funding covers the major expenses related to teaching and it is allocated through multi-annual research grants, following the priority study fields that provide sustainable and competitive development of the society;
- complementary funding covers several aspects related to teaching: accommodation and food subsidies, funds for endowments, investments and capital repairs and funds for scientific research;
- additional funding is granted in order to stimulate institutions and study programs excellence, both within state and private universities.

Core funding at university level is determined by a formula, the essential indicator is the net unit cost per equivalent student.

The procedure translates a principle accepted worldwide, namely "resources should follow students". Differentiation with regards to institutions of core funding starts by knowing: the number of equivalent students, the cost indexes determined through education areas and the qualitative aggregated indicators.

The notion of equivalent student was introduced in order to express in mathematical terms the following aspect: the costs involved for a student's academic training differ depending on the type of education followed. These differences are expressed by shares associated with each form of education. As a reference (with share 1) we consider a university student who

attends day courses. Postgraduate education forms have shares above par, while part-time or evening classes have shares below par.

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HUMAN RESOURCES AND THEIR FINANCIAL COMPONENT

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Abstract:
Higher education institutions have tended to multiply horizontally and vertically. After 1989 the number of state institutions (public sector) has increased and private higher education institutions emerged.
However, vertically the postgraduate education has developed in very fast pace with advanced studies (master) and doctoral studies or postgraduate academic courses. Higher education institutions have university autonomy and legally guaranteed academic freedom, which means that they came to exercise their autonomy also in the financial field or in forms fully compatible with public and academic responsibilities devolved upon them.
Universities are required to satisfy an ever increasing diversity of needs: municipal, county and national, respectively teaching, learning and research. They must clarify mission and objectives in a system in which hierarchical pressures crystallize not only by subjective criteria (prestige, differential valuing etc.), but also in financial terms or access to resources.

Keywords: human resources, budget, funding, teaching staff

The human resources component in the university is founded on the teaching staff.

University staff is dominated by seniors. Referring to academic degrees professors (20.2%) predominate, associate professors (14.5%) and lecturers (31.8%). Salaries offered in an austerity budget are deeply uncompetitive, state matched only by the option of academic staff for increasing the teaching standards and the number of paid jobs.

Such an action led to the marginalization of research in individual work programs and a decrease in institutional ones.

Academic career is becoming less attractive to talented young people who prefer foreign or national migration in sectors such as finance-banking etc.

Recruiting, forms and routes of academic careers, wages, working and living conditions of the teaching staff in higher education institutions should be reviewed fully and deeply.

Financing higher education should promote high quality teaching and research activity, cost-efficiency, within a financially healthy system of higher education and taking into account national needs.

The quality of human resources, in terms of teaching staff quality can be achieved from global financing components through three branches: core funding, complementary funding and additional funding.

The size of budget allocations for personnel costs (the wage) has two components:

A - payroll (core funding from the budget);

B - salary fund (funding based on performance criteria from the budget).

This salary fund is reflected in the number of jobs financed from the budget (teaching, research and administrative). Within we find the number of study groups, the number of teaching and research procedures, as well as the number of administrative and service staff.

In fund A the salary figure is being reflected, with the average expenditure per student and in fund B the complementary funding related to institutional programs is being reflected, performance and national competition indexes.

Financial autonomy allows total fund allocation of salaries for the teaching staff, total salaries for teaching and non-teaching staff appropriate in order to improve the quality of human resources.

Specific human resource management strategies in order to ensure institution's objectives relate to: recruiting, selection, promotion, motivation, performance evaluation, use of associate teachers, improving services and teaching staff for research and administration.

Strategic management is related to financial management having as basic sources either allowance (finance) budget (A + B) or own revenues from other activities.

Research centers developed near institutions of higher education, especially those of excellence, are sources of extra income for teaching and research staff employed extra (TESA), specially trained for research.

The essential role of the National Council for Scientific University Research should be noted which has a strict record of research plans (contracts, grants), diversified by domestic and foreign sources (World Bank program type Tempus - finished, Socrates, Leonardo, Erasmus), etc. Let's not forget the diversity of journals and research bulletins, patents and inventions of teaching and support staff employed in higher education, as well as the direct collaboration in research programs between European universities. These are extra-budgetary funding sources that lead to the improvement of the human resources quality.

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PROMOTING THE ECO-CULTURAL TOURISM IN THE PROTECTED AREAS

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Abstract
The local sustainable development asks for activities and actions with interdisciplinary and multidisciplinary involvements. Sustainable development is grasped in the concrete reality by finding means of using all economic, cultural, social, political, moral, ecological dimensions. The essence of the sustainable development is given by preserving the patrimony for the welfare of present and future generations, this meaning not only the values produced by humans and scientific and technological knowledge, but also the natural capital. Sustainable touristic products represent the best alternative among economy, culture and environment protection and are meant to be adequate financial economic instruments for a permanent promotion of touristic actions, for the valorisation of the cultural patrimony in the ecotouristic areas.

Keywords: ecotourism, culture, socio-economic and ecological impact, sustainable development

Introduction

Romanian tourism is being confronted with problems of infrastructure and image, and this is a reason we consider that the chance of sustainable development of this area is being represented by promoting niche tourism, namely cultural ecotourism. In an age of globalization, the authentic cultural patrimony is making the difference and represents an opportunity for sustainable development of local communities. The essence of sustainable development is represented by the harmonious integration of economic development, by responsible governing, by ensuring the social cohesion and community man - nature.

Diversity and quality are the main factors of competitiveness and, as logical consequence, they also represent the fundamental problems facing the tourism industry in general and reception of international tourism (reception) in particular.

At this time, current tourism consumer demands grow continuously, particularly concerning quality, but also such characteristics as technical, psycho-sensory economic issues related to the availability of products on inter - relations, sanogenous characteristics and the relationship with environment.

1. Ecotourism in the protected area

Cultural tourism is present in literature mostly in the last decade as a sign for preoccupations of the specialists in the field and as consequence of the interest manifested by voyage consumers for this type of tourism. We mention in this respect works such as those of Ivanovici Milena, (*Cultural Tourism, Iuta Cape Town South Africa Publ. House, 2008*), Smith Melanie, Robinson M, (C*ultural Tourism in a Changing World, British Library, Canada,2006*), Girard L.F (*Cultural Tourism and Sustainable Local Development , Italy 2009*), Kockel Ullrich (*Culture, Tourism and Development - The Case of Ireland*, Liverpool University Press, 1994), Berriane M., (*Tourism, Culture and Development in the Arab Region. Supporting culture to develop tourism, developing tourism to support culture*, UNESCO, 1999) or reviews such as those published by Daralli Fiorella (Almatourism - *Journal of Tourism, Culture and Territorial Development,* Rimini, Italia) and Endresen K., (*Sustainable Tourism and Cultural Heritage - A Review of Development Assistance and Its Potential to Promote Sustainability,* NWHO, 1999).

Ecotourism represents an updated theme that raises the interest of specialists in the field, reflected in scientific papers, books, treaties that appeared after 2000. With managerial strategies (Butnaru Gina Ionela, *Strategii manageriale pentru asigurarea calităţii produselor şi serviciilor turistice*, Editura Tehnopress, Iaşi, 2009), to agrotouristic marketing (Alecu, I. N., Constantin, M., *Agroturism şi marketing agroturistic*, Ceres Publishing House, Bucureşti, 2006) and ecotourism (Glăvan V., *Turism rural. Agroturism. Turism durabil. Ecoturism*. Ed. Economică, Bucureşti, 2003; Nistoreanu P., Ţigu Gabriela, Popescu Delia, *Ecoturism şi turism rural,* A.S.E. Publishing House, Bucureşti, 2003), to national strategies and standards of ecotouristic certifying (Ministry of Regional Development for Tourism – *Strategia de dezvoltare a ecoturismului,* faza I şi faza a II - a, 2010, OMT - *Technical assistance for the elaboration of the ecotourism strategy of Romania* (Final report), 2005, Standardul European de Certificare in Ecoturism (The European Ecotourism Labelling Standard – EETLS, 2009), there have been tackled different themes but the cultural side was not mentioned or it was registered very briefly. We consider necessary the outlining of such an important aspect because the nature and culture individualizes places and leave the mark, have an impact on local communities. It is through the Guide published in 2012 by the members of the coordinating team for the project that we highlighted the importance of gastronomic culture, the wealthy tradition and popular habits in Sibiu surroundings which distinguishes through an

ecotouristic potential as well as the habits, traditions, popular costumes, trades, side by side with multicultural gastronomy (Romanian, German, Hungarian).

The Frumoasa's protected area status prompted a reorganization of tourism that takes place in this region, in the context of a required sustainable exploitation of natural resources and in particular landscape resources, so as to have a minimal impact on the integrity of natural ecosystems.

The diversity of these resources makes it possible to practice tourism, in its various forms:

- Travel for leisure and recreation, tourism practiced by companies through hotels, through reservation;
- Knowledge tours (itinerant), practiced either individually or through organized tours, suitable for smaller groups of visitors who have the opportunity to explore the variety of wild landscapes;.
- Specialized tourism (Scientific) for ornithologists, specialists, researchers, students;
- Special programs for youth, for knowledge, understanding and appreciation of nature;
- Ecotourism, with a role in promoting sustainable use of biodiversity, by generating income, jobs and business opportunities, along with an equitable distribution of the benefits to the population and the local community;
- Rural tourism (in which guests are hosted and guided by locals) and which has tradition in the Mărginimea Sibiului, home to many local families and visitors coming to the this area. This type of tourism has an important potential to improve incomes of local people;
- Travel for photography.

Ecotourism provides sustainable contributions to local communities by: using the services of local guides for presenting tourist attractions of the area; using other local people's services (kitchen staff, transport, rent bicycles, carriages, etc.); sale of local products; sale of souvenirs; financial contribution to the creation of infrastructure or local events; implementation of a counselling and training programme in tourism services of local people; access of local people to free training to improve their level of professional training, such as courses offered by CCIA Sibiu for tourism pension administrators in Mărginimea Sibiului area; projects involving training courses with tourism pension administrators; enabling practice for students/young people living in the area to achieve a working experience in the field of ecotourism, etc.).

Ecotourism should also highlight the cultural component of the visited area and contribute to the conservation of this component (presentation of traditions of the area to

tourists; encouraging participation in traditional festivals such as: "Mountain Peony Festival" at Gura Râului, "Up the mountains of Jina" festival, "Watering Johns" etc.; purchasing some local products (souvenirs, food, drinks) etc.; creating centres for recovery of traditional customs: folk dance ensembles, choir, popular music orchestra, groups of singers; exploiting traditional crafts - processing wool, wood, stone, leather, painted eggs, ceramics; supporting the establishment of facilities for recovery of handicrafts and other specific products made in the local community: herbal teas, syrups, sugar, tinctures, honey and other derivatives, etc.). A special role is played by the local people' opinion regarding the development of tourist areas and their participation in the economic development programmes, issues that we pursued in our research.

Sustainable tourism can make a substantial contribution to the development of Mărginimea Sibiului area, but in order to be capitalized on, tourism potential must:

- take advantage of the unique mountain resources, which is the main attraction for tourism development, maintaining essential ecological processes and helping to conserve the natural heritage and biodiversity of Frumoasa Site of Community Importance;
- respect the socio-cultural authenticity of local community, preserve cultural heritage and traditional values of the area and contribute to inter-cultural knowledge;
- facilitate long-term viable economic activities that would bring equal socio-economic benefits to all stakeholders, including stable employment and opportunities to obtain financial income and social services for local communities, thus contributing to the prosperity of the area.

Ecotourism activity, in addition to anchoring in the durability, keeps step with economic integration and it generates development structures necessary to support development of the area. Modernization of infrastructure, sustainable urban-rural development, the use of unconventional forms of energy and clean technologies are found in ecotourism.

2. Cultural ecotourism – a future touristic product

The attested value of cultural ecotourism can become a touristic product, an original and brand like one that can extend at a regional and national level. Local development contributes to the improvement of the community level of living. The ecological imbalances explained in their complex causality that depends directly or indirectly of man's activity is a stronger motivation for concrete activities of protecting the environment, including the promotion of ecotourism.

The cultural side of Romanian ecotourism can determine on a local plan a good turning into account of the natural and cultural potential, in this way having a contribution to increasing the places for work both in the touristic area and auxiliary sectors of services and managing local resources; it diversifies the local economy mostly of rural adjacent areas mostly where agriculture has few possibilities to develop; it stimulates the rural economy through an additional demand of agricultural products and more financial capital; it contributes to the improvement of local infrastructure; it favours the intercultural understanding and free communication among inhabitants and tourists; the touristic activities diversified, can entail the increase of the interest for environment protection, by convincing the tourism consumers and responsibility factors on the importance of natural protected areas. Ways of promoting cultural ecotourism for local communities outlines scientific solutions that back the social development and contribute to the improvement of its human condition. The tourists' guidance towards cultural circuits is more and more evident (according to studies made by Euromonitor.

As a result for this phenomenon in order to attract visitors it is at a world level that the promotion of cultural and natural trumps is made. With an original offer, a unique one Sibiu county can be successful in tourism and mostly in cultural ecotourism. By using the experience gained in the project "Sibiu Cultural European Capital" we consider that cultural ecotourism is an opportunity for Sibiu to become an ecotouristic and cultural destination on the European touristic map, not only for foreign visitors but for Romanians too, with benefits on local communities within the rural environment.

We believe that the touristic products will contribute to the increase of rendering visible Sibiu County that can become landmarks in intercultural and multicultural tourism. Backing culture can be done by developing ecotourism and mutually too, the ecotouristic potential can be turned into account through culture.

At the same time, the Centre for information and advice on which we will be developed will be able to demonstrate better the profitability of ecoturistic cultural potential among local communities.

3. The benefits of the cultural ecotourism

The cultural ecotourism offers a frame for action allowing connection among the natural potential, infrastructure, nonmaterial culture such as habits and traditions but material culture too such as traditional gastronomic products or craftsmanship objects. The touristic products have an important educational side as far as they promote the knowledge of the

ecotouristic potential for Sibiu area side by side with education through culture. Education serves society by offering a critical reflection of the contemporary world. It is the means to disseminate knowledge and to develop competences, to make behaviour, public understanding, values and way of life for local communities evolve in the way we wish. It is obvious that education does not solve the contemporary problems for good. But this must take part of the effort to create new links among the members of society and to generate a high respect for the needs of environment protection, for preserving and promoting traditional culture.

The diversification of non-agricultural economic activities within rural areas and the encouraging of the entrepreneurs will determine the creation, the improvement and diversification of facilities and touristic attractions. Rural tourism and ecotourism represent an alternative for employment for labour force in the countryside, a way to diversify rural economy and bring income source for the inhabitants within the rural area. An important component of rural tourism is agritourism, but by promoting the ecotourism and handicraft and recreation activities on creates opportunities for women integration on the labour market. The way of life for rural population is connected with a rich material and immaterial patrimony that confers specific identity for the village. These elements of originality must be preserved and turned into account in a superior manner.

The update of the research theme is being outlined for the interest of a great number of tourists regarding ecotourist packets. In this respect, The Association of Ecotourism in Romania appreciates that the number of tourists attracted by the 19 tour-operators agencies and the 13 pensions members AER raise to over 7 000 and the number of tourist days overpasses 20 000 every year.

Table 1

Arrivals in the agro-touristic boarding houses in 2013, in Romania and Sibiu County

	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Total country	29293	25780	26996	31796	41203	45847	62343	78673	42943	35442	30803	37450
Total Sibiu County	1650	1538	1878	2382	2221	2449	1695	2418	1759	1824	1786	2326

In Sibiu County, an important part of the tourists choose agro-touristic boarding houses. In 2013, arrivals in such establishment is presented in Table 1 and Fig. no.1

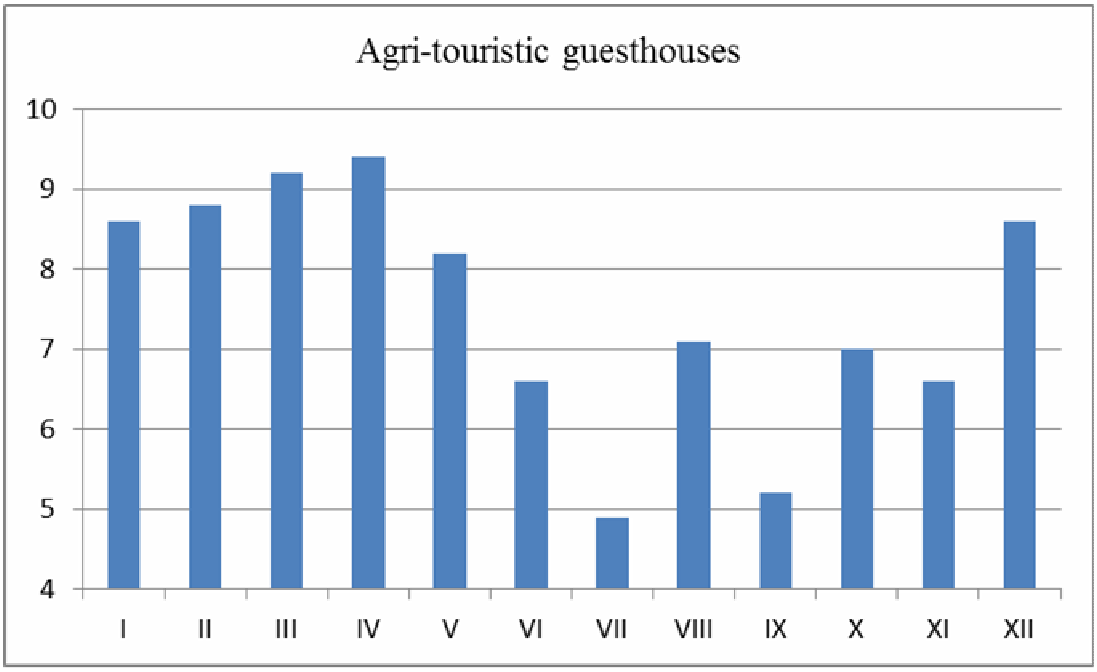

Fig. 1 Arrivals in the agro-touristic boarding houses in 2013, in Sibiu County (%)

In Sibiu County, tourism creates opportunities for regional and local economic growth and contributes to creating new jobs through specific cultural and natural heritage. An important part of the new jobs created is also a regional opportunity for female employment. Hence the need to implement such a project, which brings to the fore the stabilization of the active population in rural areas, capitalization of natural and anthropic tourism potential in eco-economy and rising living standards in the area.

Conclusions

Compared to existing offers, we believe that this research brings a new concept of integrated and systematic approach to the role of tourism activity. Sustainability of this research is outlined by market demand of specialized staff knowing the best local traditions and keen to promote in a professional way the originality of tourism products existing in the area. The concept of globalization is thus understood as an opportunity to make widely known the types of tourism in the area, while maintaining the personal touch of Sibiu area.

Tourism development takes into account the principles of sustainable development, to preserve and protect natural and cultural heritage, but also reduce anthropic pressure on the environment, inherent in the practice of large-scale tourism. On this line, approaches like ecotourism, traditional culinary products exploitation, promoting ideas of transition from

agritourist pensions to eco-pensions are considered appropriate. The experience gained in Sibiu especially after 2007 and the post-European Cultural Capital situation allows shaping the image of tourism development in the area. Increased number of tourists expected in terms of tourism development, overworked the environment, disrupting the ecosystem balance. Environmental pressure must be kept under control in areas with special natural assets such as the "Natura 2000" site in order to allow its capitalization in a sustainable manner and a uniform spatial distribution of tourism activities.

The emergence of a new tourism product will have a measurable impact on the number of travel agencies who access online the new tourism product in order to direct a segment of the tourism market towards sustainability and eco-classification by promoting and marketing the new tourism product.

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Special Role of Agriculture in Roural Tourism Development

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Abstract
More and more farmers are developing their business to include tourism and culinary experiences because of the need for diversification, with financial benefits that follows. By integrating the best of science, sustainable agriculture and traditional knowledge, many farmers are directly and indirectly contributing to local cuisine as a unique tourism attribute, strengthening the relationship between farm-to-fork along the entire value chain. This paper examines some of the benefits to both food tourist and food producers. The increasing appeal of gastronomy and locally sourced cuisine in tourism are beneficial for individuals and society.

Key words: tourism, agritourism, agriculture, development, local food, cuisine

Introduction

With an abundance of printed and online articles, aided by television infotainment and more trip experience, travelers today increasingly demand more authentic happenings. The preparation and types of food provide a powerful, multi-sensorial means of expressing one's local culture and heritage. In this respect, a distinctive local cuisine provides an unparalleled marketing opportunity for any destination. Local foods, supported by local agriculture, therefore, can be the key for tourism development. As Boyne, Williams and Hall (2001) wrote, "...where destination areas' [high quality] food and beverage [and other] production are [used] to strengthen the tourism product, and tourists are encouraged to purchase and consume locally produced agricultural products, thereby stimulating local primary production sectors, we see a bi-directional development process - food production for tourism and tourism for food production."

Agriculture is a prerequisite for food tourism as the roots of cuisine are in agriculture. It is agriculture that produces most of the raw materials that tourists eat. Many farmers process themselves raw materials into finished products. Direct sales from and visits to producers create new experiences for tourists, and sales and customer contact for the farmers. Such tourism contributes to the economic and social development in the rural sector. As a

result of these connections, the benefits of linking tourism and agriculture go beyond the actual product "on the plate." Some of the direct and indirect benefits of linking agriculture and tourism are:

- Increased economic development
- Local pride, generating attractive, vital and viable rural areas
- A vibrant and locally distinctive tourism product.

The Special Role of Agriculture

Agriculture provides a basis for which a visitor may be introduced to a new culture.

When looking at agriculture, the experience for the visitor has a certain integration into the ways culinary cultures are presented. Understanding the systems within which agricultural practices are included into the shaping of a local culture and how both culture and environment interact within a certain social and geographical space, introduces to the tourist a fuller picture of the culture at hand.

In other words it is the way culture is communicated through food as a total process that includes production (agritourism, farm visits, visits to vegetable gardens etc.), processing (cooking pans, fermentation processes), and consumption (end products, wine tasting, fine dining) that make sense as a culinary journey.

Agritourism is defined as "a business conducted by a producer for the enjoyment and education of the public, to promote the products and thereby generate additional income" (Sustainable Agriculture, 1998). It is essentially the economic activity that occurs when people link travel with products, services, and experiences of agriculture. Certain types of agritourism enterprise and activity are:

- Nursery trails and tours;
- Picnics;
- Camping grounds;
- Farmers markets;
- Farm stays/bed and breakfasts;
- Animal "petting" areas;
- Planting demonstrations;
- Equipment and garden displays;
- Greenhouse museums;

- Spice tours;
- Wine estate tours;
- Catering classes;
- Tea and coffee estate tours;
- Tasting (wine, fruit);
- Catering (using farm produce);
- Direct sales (wine, fruit, plants);
- Flower fairs, shows and festivals;
- Weddings and events;
- "Pick-your-own" flowers or fruit.

Some of these can be undertaken by the poor farmers, for instance spice tours, catering and cooking classes, farm stays and camping.

Rural tourism is not just a farm-based tourism. It includes farm-based holidays but also comprises special interest nature holidays and ecotourism, walking, climbing and riding holidays, adventure, sport and health tourism, hunting and angling, educational travel, arts and heritage tourism, and, in some areas, ethnic tourism. [Humaiirra IIrrshad, 2010]

According to Donatella Privitera (2012) rural tourism should: be located in rural areas, (...) functionally rural, (...) rural in scale i.e. usually small-scale; be (...) traditional in character; grow slowly and organically; be connected with local families; and (...) represent the complex pattern of rural environment, economy, history and location. However the concept of rural tourism is slightly different from the definition used by *Donatella* (2012) who includes farm-based tourism within rural tourism.

Setting agriculture as the starting point of any culinary trip is the perfect introduction to an authentic and original lifestyle the visitor is about to experience. Agricultural practices become the start of a unique and memorable experience that will introduce the visitor to a brand new world full of flavors and aromas. It combines the ingenuity of the human mind together with what the environment has to offer, as well as, the cultural, social, and economic interconnections that come with it.

According to many authors [Berno Tracy, Urban Laurin, Giorgos Maltezakis, 2014], tourists that engage in these types of activities are looking for elements that create a much simpler way of life than the ones they follow back home in both psychological and physical terms, which in turn is reflected in their culture through hospitality.

The authentic experience for the tourist is also within the romantic, often exotic, character of an agricultural area. The originality of practices used for the production of the essential materials and produce incorporated in a cuisine creates a feeling which is often outside the everyday visitor experience. Distinct from the urban spaces most of us are used to, we often lose touch with the love and attention to detail shown by farmers and people of rural areas when it comes to the actual production of food.

Agriculture and Food: Fast to Slow Food Movement

This movement towards "authentic" regional or local cuisine is not exclusive to the domain of tourism. In response to the growth of "fast food", the concept of "slow food" or sustainable cuisine has emerged. Believing that in the name of productivity, contemporary society ("Fast Life") has changed humans' ways of being, threatening the environment and landscapes, the sustainable cuisine movement considers that the defense against these unsustainable practices should begin with the rediscovery of regional foods and cooking. The movement has progressed from a sole focus on pure gastronomy towards ecology and a dedication to sustaining the land and farmers who produce artisan foods. The "eco" [organic] part of [this] eco-gastronomic movement necessitate[s] a new focus on education of the entire food continuum, from soil to table." [Martins Patrick, 2001] Thus the "slow food" movement makes the critical linkage between agriculture and cuisine.

People's interests in food quality, ecological concerns about the needs for increased sustainable agricultural practices, health and nutrition concerns, a more sophisticated knowledge of food and beverages and acquired information about different cuisines are impacting upon tourists' expectations and behaviors. [Haukeland J. V. and Steen Jacobsen Jens Kr., 2001]

Slow Food promotes the idea of co-producer, that goes beyond the role of passive consumer and are interested in those who produce food. The interest goes to the way we produce food and to the problems faced by farmers. Slow Food actively supports food producers and becomes part of the production process. [http://slowfoodturda.ro/site]

Agriculture and the Tourist Experience

Food tourism is a beneficial activity for travelers that choose it consciously as part of their "tourist experience" or unconsciously in a search to satisfy their hunger. The benefits of such choice differ in nature and purpose due to the multifaceted character of food tourism

itself. Taking as a starting point its undoubtedly entertaining nature, food tourism becomes a playful and tasty medium for a culture to be introduced to the visitor through the authentic and original personality of a cuisine and its products, as well as, an interactive learning experience for all kinds of visitors whether they are interested in history, culture, cooking techniques and practices or even sheer interest for the flavors of the place of interest.

All tourists must eat, and tourists experience a place through a meal. But tourists also "consume" the area's landscape, by either eating out or eating to enrich the earth, providing a negative or positive contribution to sustainability. With mainly cows, but also other ruminants, grazing the local landscape supports not only meat and dairy products, but the grazing animals also contribute to increased protective layers of humus. More mull gives higher carbon sinks which reduces the threat of climate change. Sustainable meals are thus an essential part of a sustainable location.

Many farmers take the ethos of sustainability even further with the stance that soil is one of the most complex and important ecosystems in the world and that soil biodiversity and health are the key to human health and well-being.

Drawing on the best of traditional agricultural practices, they aim to improve the quality of the soils to improve the vitamin and mineral content of food they produce, believing that the first fundamental of biological farming is to consider people, namely their health and well-being as a function of the food and environment as it is produced on the farm. The second fundamental is valuing and understanding the soil and its biology as the basis for all fertility — the ultimate in farm-to-fork health and nutrition. [Oliver Robert, Berno Tracy, 2010]

Extending this notion of a systems approach to agriculture, one can view the cow as a common denominator for sustainable development in practice. Increasingly acclaimed Allan Savory clarifies how cows and other grazing animals are the only ones that can help humanity to face the challenges of global supply of food and water, while quickly reducing the amount of carbon dioxide in the atmosphere to prehistoric levels. Savory's model is called "Holistic Management." [www.savoryinstitute.com]

Allan Savory with the Savory Institute conveys knowledge on how we can plan grazing in such a way that the fertility of the soil constantly increases. Grazing animals eat or trample down vegetation that is rich in carbon. In their stomachs, microorganisms break down cellulose and lignin. This nutritious mixture becomes feces returned to the soil and recharges the humus supply. A significant positive effect is that the carbon sink created by

the grass roots also means that the soil has a greater capacity to retain water, so that there is still water in the soil during dry periods. Pastures can bind four times more carbon than rainforests.

The tourism industry can take advantage of the growing interest in sustainable food systems, sustainable cuisine and food tourism by promoting and using more local products throughout the industry, while at the same time, meeting travelers' needs for an authentic, quality experience. By forging stronger linkages between agriculture and tourism through the development and promotion of sustainable cuisine, a symbiotic relationship between these sectors can be established.

Conclusions

Rural tourism, while still only a minority tourism market, is making a valuable contribution to rural economies. Its contribution can be expressed not only in financial terms, but also in terms of jobs, contributions towards funding conservation, encouragement to the adoption of new working practices, and the injection of a new vitality into sometimes weakened economies.

In a country that has forgotten its traditions, or in a country where brand new products evolve and traditions change, it is obviously important to have an open dialogue about how to combine innovative ideas, with the preservation of the old traditions.

The dialogue is also relevant for the classic culinary countries. There is a risk that old traditions, and established regulations can be an obstacle to exciting agriculture experiences that modern food tourists seek. Specific lessons learned include:

- Agriculture is at the heart of food tourism - agriculture provides the product; culture provides the authenticity; and tourism provides the infrastructure and services
- Agriculture/tourism linkages can create unique and authentic opportunities for both producers and food tourists
- Agriculture/food tourism linkages can be a powerful tool for economic development and sustainable rural livelihoods
- Food tourism can be used as a means to rejuvenate tradiţional agricultural and artisan practices, or as a vehicle to create new ones
- Every destination is slightly different, so agriculture and food tourism must be considered in context.

Agriculture is an essential component of sustainable food tourism and there are numerous benefits to a broad range of stakeholders that can be derived from enhancing and sustaining agriculture-tourism linkages in this context. The potential to contribute to rural development and sustainable livelihoods, support for the agricultural and artisan food sectors and reduced economic leakage in the tourism sector are just a few of the potential positive outcomes. Tourists also benefit through the opportunity to experience authentic local culture and heritage, and engage in a meaningful way with local producers and suppliers. However, the way forward for agriculture and food tourism linkages requires careful consideration. There are lessons to be learned from successful linkages already achieved that can serve as examples as to how these linkages can be implemented and sustained.

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STUDIES REGARDING FERTILIZATION INFLUENCE UPON CERTAIN QUALITY AND YIELD PARAMETERS IN WHEAT

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Abstract:
In this study we have determined the influence of different fertilization levels upon the quality and production in wheat varieties cultivated in the western side of Romania. The experiment was conducted in compliance with the conditions of farms (near Gataia, Timis County) and all the technological links have been observed. Fertilizers were applied differently in both the fall and spring exits, by complex form of fertilizers (8-25-0, 20-20-0) and supplementary different doses of nitrogen, in form of NH_4NO_3 ***have been added. The main studied parameters were the "Zeleny" sedimentation index, gluten content in grain, and protein content in grain. During this experiment we have identified some correlations between quality parameters of wheat production.***

Keywords: wheat, fertilization, quality, crop production

Introduction

No food does meet human requirements both economically and in active nutrients like wheat bread. Wheat contains almost the full range of essential amino acids and its high content of carbohydrates gives a high energy value.

Wheat is the most important cultivated plant having the largest share food. Large areas that is sown, and enjoyed the attention are due to: the high content of carbohydrates and grains also protein ratio of these substances requested by human body; long grain and preservation challenge that can be transported without difficulty; the plant has high ecological plasticity, being cultivated in areas with very different climates and soils; opportunities for full mechanization of culture (Bâlteanu, 1991, Bizík J et all, 1998).

Wheat is grown in more than 100 countries and is an important source of trade. Wheat grains are used mainly for the production of flour, for the manufacture of bread - food for a large number of people (according to some statistics, 35-40 % of the world population) and provides about 20 % of total calories consumed by humans. Also, the wheat kernels are used in the manufacture of pasta products as well as industrial raw material for other quite different: starch, gluten, ethanol, bioethanol used as fuel. (Christian D., 1991, Elen O., 2002). Wheat flour is used in bakery, but also serves to manufacture alcohol.

Materials and methods

The biological material was represented by Sobel wheat variety. Method of Latin rectangle experiment (12,8 mp plot) was performed using in the following variants of fertilization (N-P-K): **V1** 8-25-0 (280 g / plot) autumn + 240 g NH_4NO_3 (AN) at the exit of winter + 210 g NH_4NO_3 (AN) spring; $\mathbf{V_2}$: 8-25-0 (280 g / plot) autumn 160 g NH_4NO_3 (AN) at the exit of winter + 160 g NH_4NO_3 (AN) spring ; $\mathbf{V_3}$: 20-20-0 (350 g/plot) autumn 160 g NH_4NO_3 (AN) at the exit of winter + 160 g NH_4NO_3 (AN) spring; $\mathbf{V_4}$: 20-20-0 (350 g/plot) autumn + 315 g NH_4NO_3 (AN) in spring; $\mathbf{V_5}$: 20-20-0 (270 g/plot) autumn 240 g Timac Printemps NP (NP TA) at the exit of winter + 240 g NH_4NO_3 (AN) spring; $\mathbf{V_6}$: 20-20-0 (330 g/plot) autumn 160 g NH_4NO_3 (AN) at the exit of winter + 240 g NH_4NO_3 (AN) spring; $\mathbf{V_7}$: 20-20-0 (330 g / plot) autumn + 400 g NH_4NO_3 (AN) spring; **V8**: 8-25-0 (190 g/plot) autumn 345 g Timac Printemps NP (NP TA) at the exit of winter + 270 g NH_4NO_3 (AN) spring; $\mathbf{V_9}$: 8-25-0 (280 g / plot) 270 g Sulfammo in autumn (SA) at the exit of winter + 240 g NH_4NO_3 (AN) spring. In terms of product quality we have determined the percentage of gluten and protein from the grainss and Zeleny index. Zeleny rate (W) was determined by the sedimentation of the particles of flour and lactic acid in the presence of bromophenol blue followed by the reading the volume of the residue. The percentage of protein and gluten were determined by Agri device Bruins Instruments Check.

Results and discussion

Regarding the application of differentiated level of fertilization can be seen, from the application of "F" test (tab. 1), that there aren't significant differences between the experimental variants studied.

Tab. 1 F test performed for the character "crop yields"

Variation sources	SP	GL	s2 (SP/GL)	F calculate	F
Total	12904485	35			
repetition	458128.4	3			
variants	3730158	8	466269.7		
erorrs	8716198	24	363174.9	1.28	-

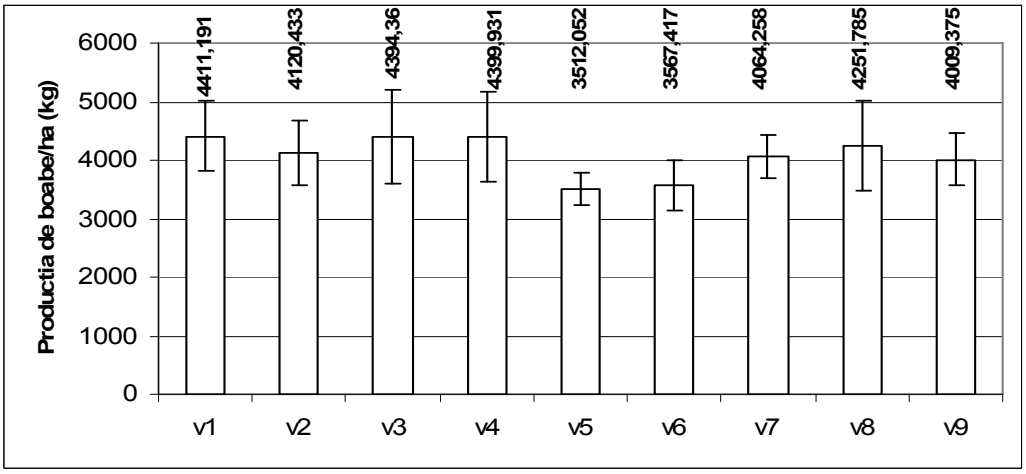

Fig. 1 Mean values and standard deviations for the character "crop yields"

The values obtained in terms of wheat production ranged between 3512.05 kg / ha and 4411.91 kg/ ha with an amplitude of variation of 890 kg / ha. The best results in terms of productivity were obtained from V_1 (8-25-0) autumn + 240 g NH_4NO_3 (AN) at the exit of winter + 210 g NH_4NO_3 (AN) in spring (fig. 1). It is known that autumn wheat is a culture that better exploit the high levels of fertilization, in this case V_1 involved the application of high nitrogen fertilizer doses.

Regarding the sedimentation index (Zeleny) we found that there was no statistically difference between variants of fertilization (tab. 2).

Tab.2 F test performed for the character "Zeleny index"

Variation sources	SP	GL	s2 (SP/GL)	F calculate	F
Total	388.75	35			
repetition	15.19	3			
variants	125.5	8	15.69		
erorrs	248.06	24	10.34	1,52	-

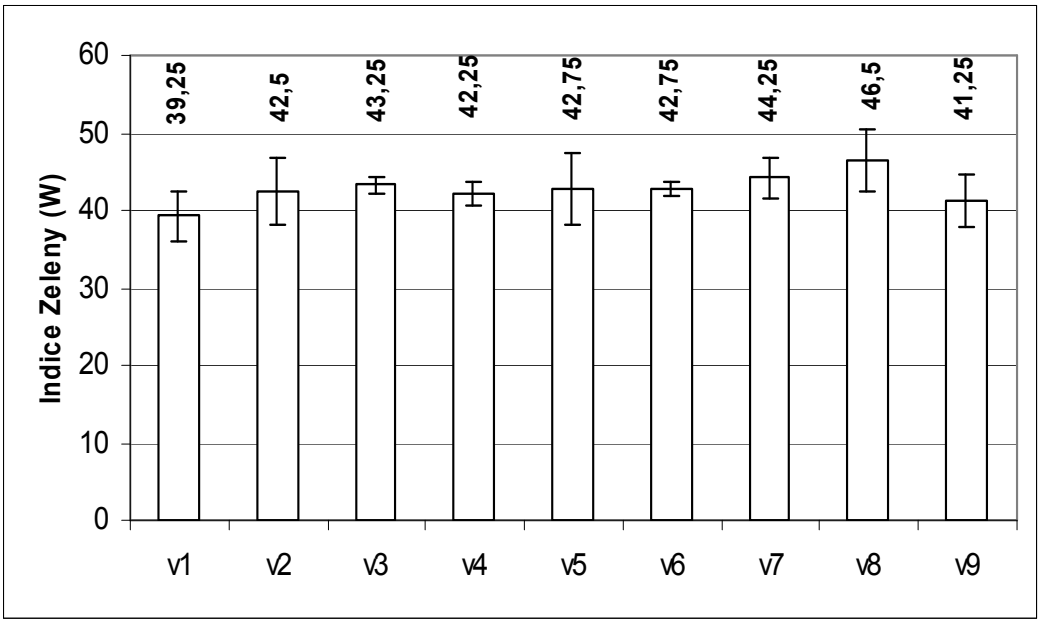

Fig. 2 Mean values and standard deviations for the character "Zeleny index"

Regarding the 9 variants studied, based on different fertilization applications, the Zeleny index values were between 39.25 and 46.5 and the amplitude recorded a variation of 7.25. (fig. 2) Significantly close values obtained for the sedimentation rate can be explained because in terms of their qualitative characters the determinism is more complex and is strongly influenced by factors also internal and external (ecological, biological, technological).

The number of analysis methods for the technological characteristics of wheat flours increases, due to the need to anticipate, as early as possible, their technological behavior. A number of studies explored how the flour quality parameters depend on each other and how some values might be anticipated, with an acceptable error of course, on account of other's value. The protein content was correlated with wet gluten content, to a comparable level of that recorded for the Romanian flours (Popa, 2007) and the hydration capacity of flours increased similarly with increasing of protein content and wet gluten.

Tab. 3 F test performed for the character "gluten content in grains"

Variation sources	SP	GL	s2 (SP/GL)	F	Test F
Total	56.22	35			
repetition	11.33	3			
variants	14.22	8	1.78		
erorrs	30.67	24	1.28	1.39	-

Applying the F test, for quality parameter "gluten content in grains" we have not obtain statistically significant dereferences (tab. 3). However, we can see a direct correlation between gluten content and Zeleny index.

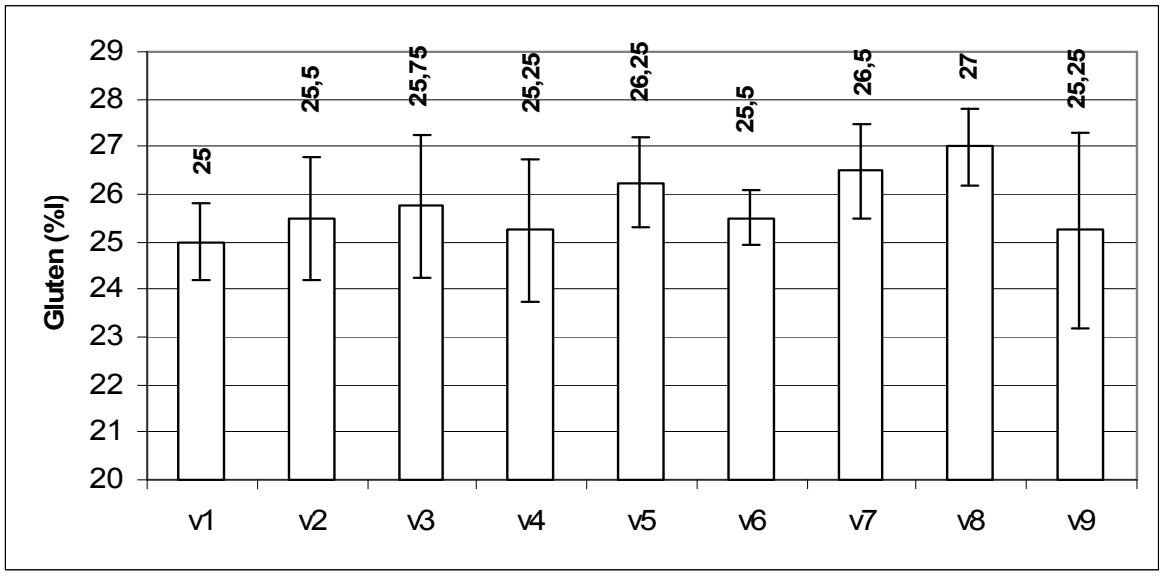

Fig. 3 Mean values and standard deviations for the character "gluten content in grains"

Analyzing the values obtained, we can observe a variation between 25% and 27% with 2% variation amplitude (fig. 3). Based on these values studied, the experimental variants can be classified as superior flour as stated in the Ministry Order no. 250/531/83 of 14 June 2002. Another quality parameter was grain protein content. We have seen a positive correlation in combination with wet gluten content. By applying the F test, on grain protein percent, it has been observed significant differences (tab. 4) between the new fertilization variants investigated.

Tab. 4 F-test conducted for the character "grain protein content"

Variation sources	SP	GL	s2 (SP/GL)	F calculated	Test F
Total	3.19	35			
repetition	0.77	3			
variants	1.16	8	0.145		
erorrs	1.26	24	0.05	2.76	*

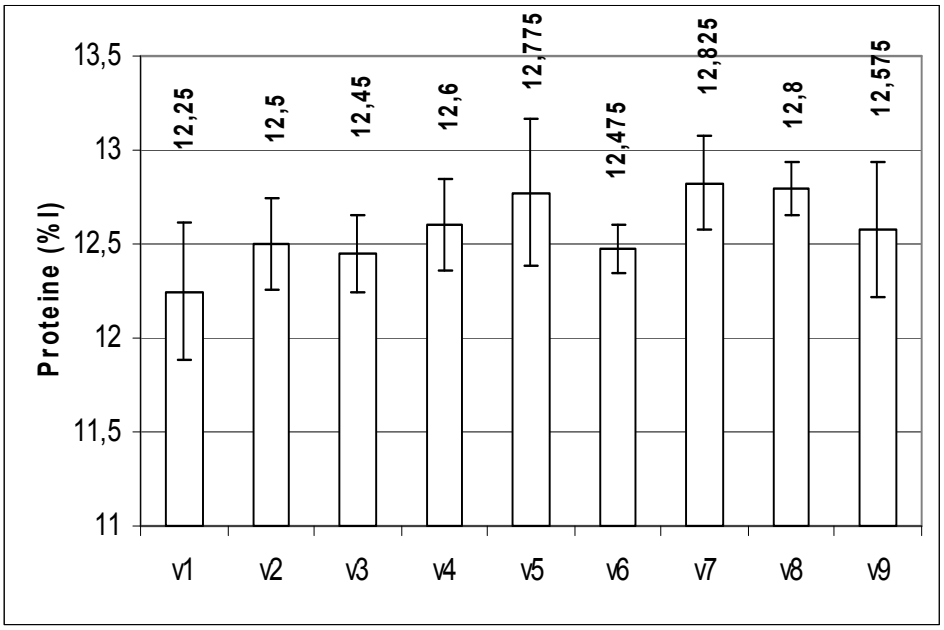

Fig. 4 Mean values and standard deviations for the character "grain protein content"

Percentage values obtained ranged between 12.47% and 12.82%, registering a amplitude variation of 0.35%. According to these values all the variants were classified in the superior flour category (fig.4). The highest values for protein content were recorded in V_5 and V_7 variants, while lower values were obtained in V_1 variant. A lower protein content can be correlated with a higher percentage of starch in the grain, which is also one of the main quality parameters of wheat flour.

Conclusions

Differential application of fertilizers produced differences between studied variants, but they were statistically provided only regarding the protein content of grains. Regarding the productivity, the best results were obtained in V_5 version, also the same variant registered a negative correlation with quality indices (gluten and grain protein content); for these indices the best results were obtained in V_7 version.

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THE INFLUENCE OF SOIL SALINITY ON PHOTOSYNTHETIC PARAMETERS OF *SOLANUM LYCOPERSICUM* L. PLANTS

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Abstract
Around 6-7 % of total land area and 20% of the irrigated land is affected by salinity, which means more than 800 millions hectares of land are affected by salinity worldwide. Salinity affects around 1 million hectares in European Union which has been the main reason of desertification.
It has been shown that, the osmotic stress causes decreasing in almost all growth parameters and caused alterations in vegetative growth and fruits qualities of tomato plants. A yield loss of 50 % at salt salinity of 5 dS m^{-1} includes tomato as sensitive to moderately tolerant plants to salt stress.
The salinity decreases all photosynthetic parameters but stomatal conductance is more influenced. The light curves have been influences by the salinity including the maximum changing to lower values. The carbon dioxide dependence curves have been influence only for stomatal conductance.

Keywords: stress salinity, *Solanum lycopersicum* L., photosynthetic parameters

Introduction

More than 800 millions of hectares are affected by salinity while only in European Union soil salinity affects around 1 million hectares which has been the main reason of desertification. Salinity is one of the most severe abiotic stresses which influence the water viability and nutrients (Yan et al., 2013). Salinity in soil has been identifying as one of the most widespread soil degradation processes on the Earth. Due to increasing of those surfaces, there is a high pressure to use them for crop production.

Tomato is an important horticultural crop worldwide, being the second crop grown after potatoes. Tomato plants could be a good candidate for this proposes. The total consumption of tomato world wide has been around 100 million tones produced on 3.7 million hectares per year, the second most important vegetable crop next to potato. Anyway, due to a huge numbers of hectares affected by salinity there is a possibility to grow resistant tomato on them (see http://salinityforum2014.ucr.edu/).

The salinity determines decreasing of economic yield due to the impact at different levels starting with seeds germination and finishing with reproduction and secondary metabolites (Plaut et al., 2013). The tomato photosynthetic process have been shown to be negatively affected by salinity in many papers (Romero-Aranda et al., 2001; Schwarz et al., 2002). Even more it have been demonstrated that tomato plants assimilation rates decrease drastically in case of treatment with 8.4–14.3 dSm^{-1} for some cultivars or with 4.8–8.4 dSm^{-1} in more resistant ones (Wu and Kubota, 2008).

Materials and methods

Tomato (*Solanum lycopersicum* L.) seeds were sown in 0.5 L pots filled with a 1:1 mixture of quartz sand and commercial potting soil. The plants were grown in the greenhouse for a 12 hr light period and day/night temperatures of 25/15 ºC. The stress plants were watered daily to soil field capacity with a saline solution of 100 mmol/L and 130 mmol/L NaCl. Control plants have been watered in the same way with distilled water. In all experiments, we used similar-sized 3 weeks old plants having on average five fully developed leaves. For measuring the photosynthetic parameters, leaves have been clipped the cuvette of the commercial gas-exchange system (GFS-3000, Heinz Walz GmbH, Effeltrich, Germany). The measurements of the light response curve were carried out in the following sequence (light intensities in μmol m^{-2} s^{-1}):

$$1000\rightarrow1200\rightarrow1500\rightarrow1000\rightarrow800\rightarrow600\rightarrow500\rightarrow400\rightarrow200\rightarrow100\rightarrow50\rightarrow0.$$

The CO2 response curves have been done between 0 and 1000 μmol mol^{-1}.

The rates of net assimilation (A), transpiration (E), and stomatal conductance to water vapour (g_s) were calculated per unit enclosed plant leaf area according to von Caemmerer and Farquhar (1981).

Results and discussions

The photosynthesis parameters of plants that are subjected to environmental stress often are disturbed due to the oxidative damages (see for examples (Scandalios, 1993; Miura and Tada, 2014). In *Solanum lycopersicum* L. plants a treatment with 150 g/L NaCl determine a decrease in chlorophyll fluorescence at half of control plants values (Giannakoula and Ilias, 2013).

It is well known that assimilation rates and stomatal conductance to water vapor are both light dependence. The dependence is following a curve with maximum (Poorter et al.,

2013). After 600 μmol m-^{2} s^{-1} light both parameters are decreased due to photoinhibition and photosynthetic apparatus damage (Figure 1). High light together with osmotic stress, breaks the balance between light absorption and CO_2 fixation in chloroplasts which determine photoinhibition (Lang et al., 2013)

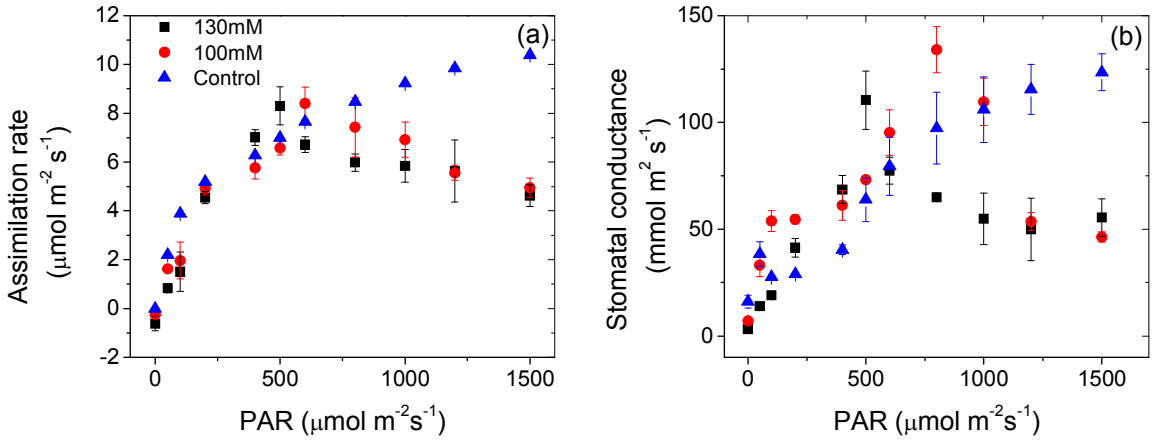

Fig. 1 The dependence of assimilation rate (a) and stomatal conductance (b) to PAR

The assimilation rate curves function to CO_2 concentration has been not influences by osmotic stress (Figure 2a). In contrast stomatal conductance to water vapour curves are influence drastically by different osmotic stress (Figure 2b. This can be explained by the limitation of stomatal opening in case of osmotic stress which protect the photosynthetic apparatus to damage.

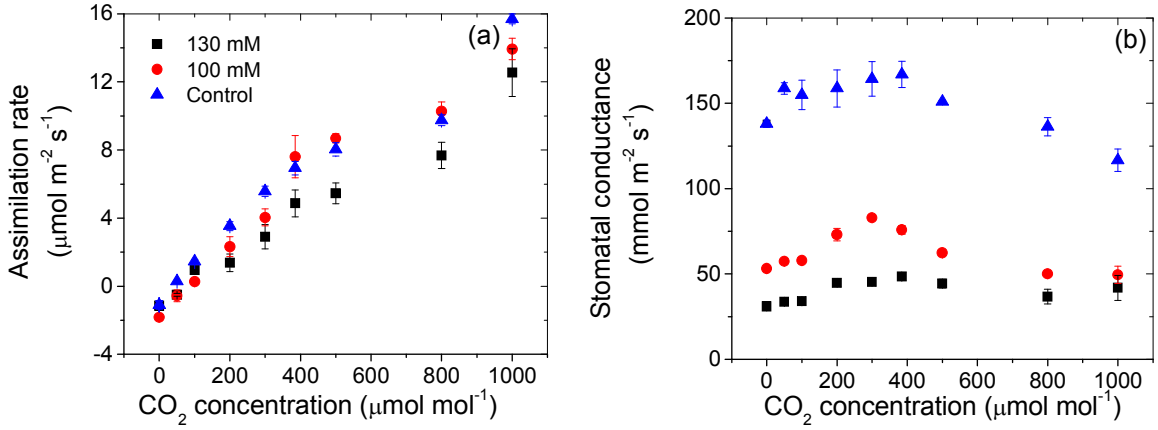

Fig. 2 The dependence of assimilation rate (a) and stomatal conductance (b) to CO_2 concentration

Conclusion

Under the osmotic stress, light intensity and the CO_2 concentration emerged as the key factors affecting the CO_2 assimilation and stomata closure of tomato.

Acknowledgments

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RENEWABLE ENERGY PRODUCTION BY CASCADE PROCESSING OF BIOMASS

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Abstract

Vegetal biomass is the most important source for biofuels production. Different processing technologies (bioethanol, biodiesel, biogas etc) lead to different energy yields. Reasoning of our study is the principe that byproducts resulted from some technologies (bioethanol, biodiesel) can be used as feedstock in the other technologies (biogas). The purpose of this work is to compare the energy yield of the biogas technology applied to process agricultural waste biomass (eg. corn stalks) with the energy yield obtained from the same biomass processed by applying two technologies in cascade: lignocellulosic ethanol technology followed by anaerobic digestion of the resulted bagasse. Biomass was pretreated and hydrolyzed using cellulolytic enzymes, followed by fermentation of resulted sugars with Saccharomyces cerevisiae. The laboratory scale experiment was carried out in batch system. Volume and composition of the produced ethanol and biogas was measured using gas counters and NIR sensors. In the case of cascade processing, the yields of ethanol reported to dried biomass are between 0.206 g g^{-1} of mechanical pretreated corn stalks and 0.186 g g^{-1} for physicochemical pretreated corn stalks. In the phase of anaerobic digestion, the methane concentration in biogas reached 66.29% and the gas yield is improved with 32.2 ml / 100 ml fermentation medium by addition of 8% dried corn stalks (grinded to 10 mm particles), and with 158.7 ml / 100 ml fermentation medium by addition of 8% dried corn stalks bagasse (mechanically pretreated), compared with control (cattle manure and inoculum). By cascade processing of residual agricultural biomass in order to obtain ethanol and biogas from lignocellulose, the highest energy yield is obtained.

Keywords: renewable resources, energy, lignocellulosic ethanol, biogas