PRODUCTIVITY OF OLD TYPE OF GRAINS AND GENETIC RESOURCES PRESERVATION[1]

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Abstract

This paper presents the status of wheat genetic resources at the global level and in the Republic of Serbia. According to the report of the Food and Agriculture Organization of the United Nations dated 2010 the collection of wheat consists by 45 % of the total number of samples stored in gene banks around the world. In Serbia, a collection "of wheat and corn", is also better represented comparing to other collections, with approximately 32 % of the total number of samples stored and maintained in breeding farms. In addition, the paper points out on some of the most ancient wheat species gaining more value through the use of organic farming. A review of domestic and foreign relevant literature provides an overview of the research that examines old kind of wheat productivity in different production conditions during last years. The general conclusion appoints that these types can achieve very good results in terms of production with low investment, but further work on their breeding is necessary.

Key words: *grain, genetic resources, organic farming*

Introduction

In the past, agriculture has played an important role in maintaining genetic diversity. However, due to the resulting economic and environmental change in replacement of a large number of species with a

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small number of uniform and high yielding varieties and hybrids, caused a significant loss of agro-diversity. Many species and varieties that have played an important role in human nutrition practically disappeared over the past century. Rahmann (2011) states that, during the twentieth century, approximately 75 % of plant genetic diversity is lost, mainly by farmers replacing numerous local varieties with few genetically uniform hybrids.

The loss of species diversity in the centers is causing genetic erosion and loss of genetic resources, which have a negative impact on agriculture. Yet, in 1929. the N.I. Vavilov recognized the importance of collecting genetic material in the centers of origin of certain plant species in order of its preservation for future generations. Soon, the centers and institutions were established worldwide with a mission to preserve and multiply the collected genetic material, and to create new and expand existing collections. So many species and old varieties saved from extinction enabling their subsequent direct use in the production and use of genetic material in breeding new varieties.

Organic agriculture is an ecological form of production that promotes natural processes and biodiversity. The adoption of organic farming in recent decades has been established indirectly saving species and varieties which is due to under-utilization of threatened extinction. On the other hand, the use of old varieties and landraces in organic agriculture is not only increasing the genetic divergence of cultivated plants, but it is easily establishing the stability of production and yields, which highlights the dependence of organic farming on conservation of biodiversity. Using the old species and populations is not only a goal but a necessity in the organic farming system since they are characterized by a high degree of adaptability to local agro-ecological conditions, resistance to diseases and pests, tolerance to infestation and lack of nutrients. Greater attention to these ancient species has resumed growing demand for traditional products, for which astute consumers are willing to pay a higher price, especially if labeled as organic products. Higher product prices offset yield losses that occur in organic growing conditions, and thus ensure sustainable production.

In recent years, organic production of particularly interesting species of wheat without chaff as *Triticum monococcum*, *Triticum dicoccum* and *Triticum spelta* is presented. Tests show that compared to common wheat, these types exhibit greater resistance to powdery mildew and leaf rust, and protect the grain from the chaff attack diseases such as *Fusarium graminearum* (Konvalina et al., 2010a).

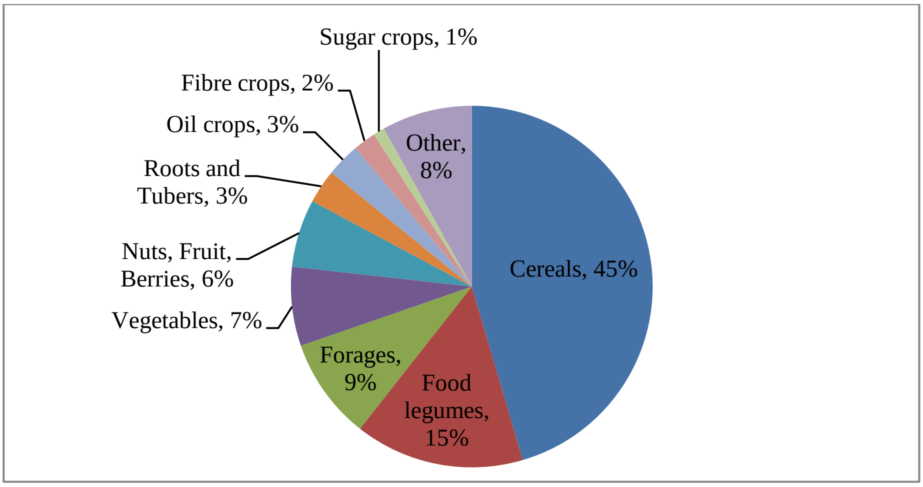
Genetic resources of grain in the World and the Republic of Serbia

Genetic resources for food and agriculture (agro-biodiversity) are a very important components of biodiversity and the overall diversity of the plants, animals and micro-organisms genetic material, which are necessary to maintain the basic functions of agro-ecosystems (*Prodanovic, 2006*). Agro-biodiversity is an important part of global biodiversity, but the human diet is based on a very small number of species. Agricultural areas in the world were planted with 12 species of wheat, 23 species of field and vegetable crops, and about 35 kinds of fruit, which means that approximately 1440 million hectares is planted with no more than 70 species (*Altieri, 1999*). No more than 30 species of plants produces 95 % of the calories of plant origin at the global level, with only three species (rice, wheat and maize) constitute 50 % of the total (Rahmann, 2011).

Genetic diversity is a necessary basis for human life and for economic development, and therefore for policies aiming to preserve genetic resources essential component of the global economy (*Roljević et al., 2011*). To preserve the diversity of species that currently have great significance for nutrition and are supposed to have an economic impact in the future, a number of GenBank, in which the genetic material of different species are preserved and multiplied, were founded around the world. The aim is to preserve genetic resources for future breeding work and made them available to future generations. GenBank and *ex situ* conservation, are the most appropriate way to preserve germplasm of domesticated plants and their wild relatives, and *in situ* conservation in their natural habitat on farms for their safekeeping and use significantly easier. According to the purpose of the collection, they are classified into several groups (core collection, the active collection, core collection, gene collection).

According to the 2010 FAO report, there are 1,750 GenBank that preserve the genetic material of plants important for food and agriculture, globally. It is estimated that global *ex situ* maintains 7.4 million plant genotypes and patterns. According to the character of the material to be stored, the most common local population (44%) inbred lines (22%), modern cultivars (17%) and wild or weed species (17%). Analysis of genetic material suggests that about 30% of plant genotypes differ (or 1,9-2,2 million samples), while the rest is doubled.

Figure 1. Percentage of different plant groups in the total number of samples at the global level



The gene banks have, as the most common, collections of cereals and legumes (Table 1). Collections of wheat covers 45 % of the samples, with the largest number of genotypes of wheat (856 168), rice (773 948), barley (466 531) and maize (327 932). Oats genotypes (130 653), genus Aegilops (40.926) and Triticosecale (37,440) are less represented in the collections of grain (FAO, 2010).

Institution, dealing with the preservation of plant genetic resources at the national level, pays more attention to collection and preservation of neglected and under-cultivated crops. Neglected crops in the past were much more cultured and had a great importance in human nutrition. However, replacement of major agricultural crops or the disappearance of the environment in which they are grown, brought faster vanishing of these species. There is a great concern for the survival of wild relatives of cultivated plants as their natural habitats are disappearing due to changes caused by man and climate. Great value of genetic resources of wild relatives is reflected in the possession of resistance or tolerance to biotic and abiotic stress and these properties are important for the adaptation of major crops to a changing environment.

However, cultivation of field crops in farms, centers of origin, plays a key role in preserving genetic diversity. Thus, the expression of genetic variation population to adapt to changing conditions of the environment and the sustainability of agricultural production is allowed.

In Serbia, the largest number of samples to be preserved *in situ* and *ex situ* collections are the "wheat and corn," a total of 8,646. *In situ* or on-farm breeding, held about 32 % of genotypes, while the remaining 68 % held in academic institutions and Genbanks. In this collection, most of the samples are those of corn (74%), followed by wheat (17.5%), barley (5.2%), oats (3%) and rye (0.5%).

Table 1. *Number of genotypes of cereals stored and grown in situ in the Republic of Serbia*

	Type of collection	**Wheat**	**Barley**	**Oats**	**Rye**
Instituts	**Cultivars**	200	70	10	1
	Breeds	500	100	20	5
Other	**Landraces**	50	10	5	5
	Relativs	50	20	10	2
Total	1.058	800	200	45	13

Source: *The Second Report on the State of the World's Plant Genetic Resources for Food and Agriculture was launched at FAO (SoWPGR-2), Country report on the state of plant genetic resources for food and agriculture country report, Republic of Serbia, Headquarters, Rome on 26 October, 2010*

According to the National Report of the Republic of Serbia (2010) *in situ* are preserved and cultivated 1,058 samples of cereals, with most samples of wheat, then barley, oats and rye. The largest numbers of genotypes grown in situ are domestic varieties, while the local population and relatives of the main types of cereals can be found only on farms in marginal agricultural areas. Among the neglected cereals species in our country are *Triticum durum* and *Triticum spelta*.

The *ex situ* collections, is represented with most of the samples of old varieties and landraces, while the old cultivars are under-represented. Collected genetic material is kept in the Institute "Zemun Polje" Plant Gene Bank and the Ministry of Agriculture, Forestry and Water Management. According to estimates of the ex situ conservation, the collection, "wheat and corn" includes 5,888 samples.

Table 2. *Ex situ conservation of samples of grain crops in the Republic of Serbia*

	Type of collection	Wheat	Barley	Oats	Rye
Instituts	**Lanraces and traditional cultivars**	70	30	15	10
	Relatives	200	100	20	5
Genbanank		439	117	180	18
Total	1.204	709	247	215	33

Source: *The Second Report on the State of the World's Plant Genetic Resources for Food and Agriculture was launched at FAO (SoWPGR-2), Country report on the state of plant genetic resources for food and agriculture country report, Republic of Serbia, Headquarters, Rome on 26 October, 2010*

In the total number of samples to be stored 80 % are genotypes , while 20 % are small grains genotypes. In the collection there are 325 samples of relatives of small grains, which are an important source of genetic material for future breeding work.

Given the great importance of wheat and other grains in the population nutrition, the priority of institutions involved in preservation of genetic resources in the Republic of Serbia will be collecting new samples, and their evaluation in existing collections. Regarding the current state of preservation of plant genetic resources for food and agriculture in the Republic of Serbia, Roljević et al. (2011) point out that it should work to achieve the following objectives:

- All domestic collections should use the same descriptors approved by international organizations such as the ECP/GR or IPGRI,
- Collections should have the databases available on the Internet,
- Organize the collection of new samples in the field,
- All databases should be linked with line ministries,
- Using new methods of biotechnology, particularly molecular markers, it should be given more attention in the evaluation of samples,
- Cooperation with other institutions involved in collection, and wheat germplasm, exchange of samples collection and dissemination as well as participation in all working groups ECP/GR.

Documentation system plays an important role in the management of genetic resources. Unfortunately, due to the poor economic situation in the country and research institutions engaged in germplasm collection, and crop databases are maintained at a low level.

The role of organic agriculture in conservation of genetic diversity

According to the FAO/WHO organic agriculture is a holistic system of agricultural management that promotes health ecosystems, including biological cycles and soil biological activity. Organic agriculture is based on the creation and maintenance of conditions that positively affect the health of ecosystems and encouraging natural processes instead of entering artificial inputs. Very important is the role of organic agriculture in the preservation of biodiversity and genetic resources, by promoting diversity on farms and "on farm" conservation. Since this type of production is suitable to the number of species in nature and does not reduce the production, it is also known as sustainable. By integrating the advantages of biodiversity in agricultural practices to the genetic diversity of species and varieties adapted to local ecosystems it limits the influence of biotic and abiotic stress factors on the yield and quality of crops. Therefore, breeding locally adapted varieties is not only measure of sustainability and conservation of agro-diversity, but it has to be followed by need for their use in organic farming because of the agronomic characteristics they possess.

Most of the genetic diversity of domesticated species are the traditional varieties or landraces (*Camacho Villa, 2005*). Traditional varieties are genetically diverse, locally adapted and relevant to agricultural production, especially in marginal conditions, where, because of the adaptation to unfavorable environmental conditions and tolerance to weed and nutrient deficiencies, are still a very important role in human nutrition. The diversity of the local population allows manufacturers to obtain safe and stable crop yields even in the situation when stress or disease attack, which in this case was in the peripheral parts of the crop because, thanks to the genetic heterogeneity of some genotypes to be affected by stress but not all of them. In this way, the level of infection plant diseases might be successfully controlled, and thus enable the production of healthy food without the use of synthetic pesticides. Thus the effect of compensation reached with the local population might apply lower rates of seed and be grown in a small density compared to conventional uniform sorts.

Today, there are a few different varieties of crops selected especially for organic growing technology, while, according to estimates, more than 95 % of this production is based on varieties that have created the conditions for conventional production (*Lammerts, 2011*). However, these varieties have characteristics that are very important for the conditions of low input production, such as organic. Although the properties are to be achieved by breeding for organic production, as well as a satisfactory yield, resistance to biotic and abiotic stress, quality of cooking and good organoleptic properties, does not differ from the preferences of conventional production, it is very important expression of these traits in low input systems, which is not guaranteed if the selection is done for conventional production (*Lammerts*, *2011*). In addition, some features that are highly desirable in conventional agriculture can have negative consequences in the low input system. For example, the focus of most commercial wheat breeding program is to improve the yield by increasing the harvest index.

This involves the introduction of dwarf genes that affect the shortening of the tree. Lammerts (2011) points out the key problems that are caused by the introduction of dwarf wheat: reducing the size and depth of the root system, relying on the introduction of high levels of inorganic nitrogen for the synthesis of the corresponding protein content, reduced competitiveness against weeds and reduced resistance to the operation of protection against weeds (a thus the greater the need for herbicides), greater susceptibility to diseases such as powdery mildew, Septoria, Fusarium, reduced protein content and greater resistance to lodging.

According to Oljača et al. (2002), almost all the methods that are used to increase agro-biodiversity (intensification of crop rotation , crop - pair polyculture, cover crops, establishing integrated ecological farm) are used in organic farming systems. The main objective of well-planned crop rotation is to increase biodiversity in order to fill empty niches occupied by harmful organisms and establishing community -like nature and the interactions that exist in these communities. The effect of crop rotation as a complex measure is beneficial in Multi-link: the structure of soil, water, air and thermal regime, soil biological activity, balance, organic matter content and availability of minerals, creating and maintaining a favorable structure and protecting the soil from erosion, all of which contribute to a favorable microclimate for the development of crops and increase the competitive ability of crops. Crop rotation is implemented by including additional crops products, cover crops, mixed crops and roofing.

The introduction of cover crops crop rotation is achieved by training and rational use of land resources. Growing crops in double cropping with Rides causes stress (irrigation) in the warmest part of the year, after harvest of small grains can greatly influence the overall productivity of arable land with far less investment. The stubble cropping system can complete omission of farming which decreases work and energy consumption. Besides the importance of agro-technical characteristics (increased organic matter and soil fertility) cover crops help to combat corvettes, diseases and pests.

In order to restore the ecological balance in the communities of crops it is necessary to increase their biodiversity. In natural communities, it is this feature of the stability factor, and the polyculture basis for organic agriculture that contribute to increased biodiversity. Pairing the crop represents growing two or more crops simultaneously in the same place . Increased diversity in cultivated plant communities contribute to a better redistribution and use of natural resources, increasing biomass production and yield, reduces damage from attacks of weeds, pests and diseases and provides socio-economic benefits (greater system stability, secure income, better and more varied diet). Numerous obstacles for wider use of this system of cultivation of large areas might be found in the fact that high-tech resources (agro-chemicals, varieties, mechanization) are created for growing a single plant species system.

Cover crops are a typical example of useful relationships introduction in agro/ecosystems. These are the types of crops that are grown in pure culture or as a mixture of several kinds to cover and protect the land for part of the year when the main crops are not grown, and its rapid and strong growth make constant pressure on weed populations. Cover crops can be boomed and incorporated into the soil, which is called green fertilization, or to mow and leave the surface of the soil as a living mulch. Cover crops can be grown after harvest of the main crop to the land covered by the next growing season (subsequent crop), can be seeded as the main crop during the growing season (sub crop) or sown simultaneously with the main crops (intercropping).

Productivity of old type of grain in different conditions production

In addition to biotechnical and technological advances that modern agriculture has, a need for identification of appropriate genetic resources among older varieties and local populations, both to their direct use and potential parental lines in breeding programs for better adaptation of modern varieties is important. Exploitation of gene banks can be useful because the characteristics of crops needed for low input and organic production, such as tolerance to reduced availability of nutrients or disease resistance disappeared in the implementation to obtain high yielding varieties.

From social, cultural or economic reasons, just some species of the genus Triticum such as *Triticum spelta* L., *Triticum durum* L., *Triticum monococcum* L., *Triticum dicoccum* and many others are becoming more and more interesting. In the past, these species were very numerous, but demands for high productivity and the creation of modern varieties of crops pushed them into oblivion. However, now they are coming back into use and gives an image of exclusive food that are astute consumers are willing to pay a higher price than other products of modern wheat varieties. Because not of everyday use, but also because it can serve as an alternative source of dietary fiber and protein, these crops are also called alternative or underutilized species. Greater attention to these ancient species has resumed growing demand for traditional products. The old types have shown better performance in non-competitive pedo - climatic conditions, compared to modern varieties, but the key problem of lodging during their breeding (*Konvalina, 2012; Lammerts, 2011*). Besides of this type use value, it have been of invaluable importance in the preservation of plant genetic resources, and are considered as a valuable source of genetic material for further breeding of modern cultivars for its resistance to stress and disease (*Codianni, 1996; Kountroubas et al., 2012*). Most commonly it is associated with alternative systems of agriculture such as organic agricultural production.

In our climatic and soil conditions, these crops can be managed well. According to past experience of Kovacevic et al. (2007, 2009) who has examined alternative types of grains and have showed that they give lower yields of bread comparing to commercial Triticum aestivum ssp. vulgare (cultivar NS 40S), but the good yields are achieved with alternative species and varieties have other advantages when it comes to the purpose and quality.

Spelt (*Triticum aestivum subsp. Spelta*) is one of the earliest domestic types of wheat. It is suitable for cultivation in low input systems, without the use of pesticides in severe environmental conditions in marginal areas (*Bonafaccia et al., 2000*). Spelt appear in a winter and spring types, with the winter sowing something deeper than the regular wheat, which enables a good root system development and prevents freezing. Now days it is grown primarily for the organic food market, mostly in the German-speaking world. Spelt has a significant genetic pool for breeding modern cultivars of wheat. Useful features include resistance to disease due to morphological grain characteristics, better use of nutrients in low input systems compared to modern wheat varieties and high overwintering (*Kountroubas et al., 2012*). The tree is spelled in the middle of an empty and has thin walls, therefore, especially in older varieties (which can be up to 1.5 m high) has increased the possibility of lodging which is considered the major drawbacks of this kind.

Spelt has a variety of potential applications, depending on the genotype of the variety and processing conditions. Hulled grain spelled mostly small, with soft endosperm and high gluten content that gives it an advantage in the application of specific products (cakes and pastries). Bread made from spelled flour has a distinctive strong smell, taste great and stays fresh longer than conventional bread. It is believed, without scientific evidence that spelt has some medicinal properties and can be used in the treatment of inflammatory bowel disease system, neurodermatitis, but also in the treatment of high cholesterol in the blood.

Examining the differences in the qualitative and quantitative components of yield between spelled and common wheat at different levels of nitrogen application rates and different planting Ruegger and Winzeler (1993) concluded that the moderate nitrogen requirements spelled gives higher average yields in low input systems of cultivation. During the three-year trials Berner et al. (2008) discovered that spelled and wheat yields were 14 % and 18% lower in terms of reduced tillage. This and other similar tests have confirmed the benefit of growing spelled in low input systems. The lower yields in low input growing conditions compared to the conventional system can be explained by a lower availability of nitrogen in the spring and early summer, because the higher humidity and lower temperatures in the conditions of reduced tillage microbiological processes are taking place more slowly. In studies of Kovacevic et al. (2007, 2009) growing under conditions of organic agriculture *Triticum spelta* (4.78 t/ha) had the highest yield of the alternative types of wheat. Grown in mountainous conditions, the principles of organic farming and the use of soil enhancers and microbiological fertilizer spelled gave very satisfactory yields (Oljača et al., 2011). Kountroubas et al. (2012) conclude that the yield of spelt in low input conditions are satisfactory and that can be grown as an alternative crop, but also suggest that it is necessary breeding of this species against flattening which would contribute to the sustainability of its production in the future.

After conventional (*Triticum aestivum* L.), durum wheat (*Triticum turgidum ssp. Durum*) is the most common cultivated species of wheat. Its hard, translucent light colored seeds are mainly used to brew semolina and pasta, as well as special types of bread. The protein content and gluten quality are the key factors affecting the quality of pasta, and depend on the genotype, agro - ecological conditions and technological process (*Fagnanao et al., 2012*). Fagnano et al. (2012) reported that the yield of durum wheat in organic farming system is lower by 21 % compared to conventional production (an average of 2.5 t/ha in organic compared to 3.2 t/ha in conventional production). Some varieties had small yield loss in organic cropping system in relation to the average yield of conventional production which highlights the importance of selecting varieties adapted to the conditions of organic farming (Fagnano et al., 2012).

Wozniak and al. (2012) reported that the productivity of durum wheat depends, more significantly, on the agro-ecological conditions, but the processing system. However, it was found that the treatment system which affects the content of crude protein and gluten content in grain, both of which have the optimal parameter values in terms of conventional compared to no tillage cultivation (*Wozniak and al., 2012*) . Improved productivity of durum wheat with conventional tillage (CT) as compared to direct seeding (NT) was determined in tests of Giacomo et al . (2012). These authors suggest that the yield of durum wheat in no till system was 14% lower than the yields achieved in conventional tillage at the same level of nitrogen (Giacomo et al., 2012) . On the other hand, De Vita et al. (2007) indicate a correlation processing method and amount of rainfall on the yield of durum wheat. When rainfall is less than 300 mm productivity and quality of durum wheat is higher in the case of direct treatment, while the rainfall greater than 300 mm IS suitable FOR conventional tillage (*De Vita et al., 2007*). Examining the yield components of three types of chaff wheat (*Triticum monococcum* L., *Triticum dicoccum* Schubler and *Triticum spelta* L.) in comparison with durum wheat (*Triticum durum* Desf. *cv. Trinakria*) Codianni et al. (1996) it might be reported that the durum wheat give 16.1% , 37.6% and 69.5% higher yields compared to dicoccum, spelt and monococcum. Among the types of chaff wheat only *Triticum dicoccum* showed similarity with durum wheat yield in parameters such as thousand seed weight, plant height and number of spikes per m^2 (Codianni et al., 1996).

Triticum monoccoum and *Triticum dicoccum* are the earliest cultivated forms of diploid and tetraploid wheat and their genetic relationships indicate that they originate from the southeastern part of Turkey (region rivers Euphrates and Tigris) (*Stallknecht et al., 1996*). Stallknecht et al. (1996) reported that in marginal conditions *T. monocoum* yields equal to or greater than the yield of barley and common wheat, but in terms of conventional agriculture achieves lower yields compared to modern varieties of wheat. The same authors suggest that grain *T. monocoum* contains more protein than red wheat grain (*Stallknecht et al., 1996*). Application of agronomic methods of production kid T. monocoum is necessary to adapt the later maturing and suitable for growing in areas with low rainfall, as in an area with a larger amount of moisture leads to greater flattening (*Stallknecht et al., 1996*). Susceptibility to the disease is not known, and can be expressed in terms of moisture in the environment (*Stallknecht et al., 1996*). Chaff has a very important role layer that protects the chaff wheat seed types of adverse biotic and abiotic factors.

Triticum dicoccum is suitable for cultivation in organic farming because it contributes to the improvement and expansion of agro range of plant species with higher added value (*Konvalina et al ., 2010a*). Although in the past it played an important role in the diet of people, today are grown only in marginal conditions in the mountainous areas of Pyrenees and the Alps, in Italy, Spain, the Balkan countries, Turkey, the Caucasus, Ethiopia and India, which is well adapted and gives lower but stable yields. There was a better tolerance of this species to drought than the regular soft wheat (*Konvalina et al., 2010b*), higher protein content and improved tolerance to disease and the presence of weeds (*Konvalina et al., 2012*). However, a major drawback stands out less resistance to lodging and lower productivity classes compared to common wheat, and lower swelling power of protein and therefore *T. dicoccum* have no good baking characteristics (*Konvalina et al., 2012*).

Low content of iron and zinc in modern wheat cultivars necessitates the re-use of old varieties of wheat germplasm as monococum *Triticum, Triticum dicoccon* and *Triticum dicoccoides* (wild dicoccum). These old wheat varieties have a higher content of iron and zinc in their grain, and the use of their genetic resources in the process of selection can fix shortcomings of modern varieties (*Gomez- Becera et al., 2010*).

The use of barley, as the covered or naked, is poorly represented in the human diet. The reason for the increased use of bakery products which are more suitable than wheat, barley, inferior appearance and organoleptic properties of the product of barley. On the other hand, in the form of chaff wheat forms required before using the peel grain which loses part of the aleurone layer and thus a significant part of the protein (*Bhatty, 1986*). Bhatty (1986) points out that the content of beta-glucans, non-starch polysaccharides which are partially soluble in water, which increases the viscosity of the feed barley makes it less suitable for the food industry. In the production of bread, wheat flour can be added to 5-10% barley flour, and seriously compromise the volume and appearance of loaves (Bhatty, 1986). Some studies have shown that naked form, on average, provide about 12 % lower yields than conventional forms of barley[3].

In recent years, interest in the use of naked barley as alternative types of wheat in direct consumption and industrial processing has increased. Naked barley has a higher protein content comparing to regular barley (*Bhatty, 1986*) and is a rich source of soluble fiber, which belong to the group of beta-glucan (*Pržulj, 2009*). In the food industry it is suitable for the production of malt, muffins, cookies, tortillas and other (Bhatty, 1986). Because the content of beta-glucan barley-based products can be classified as functional foods, since this polysaccharide helps regulate blood sugar and cholesterol levels, reduces the risk of heart disease, relieves gastrointestinal problems and regulates body weight (Pržulj, 2009). Pržulj (2009) concluded that although Serbia has no tradition in the cultivation of naked barley, there can be identified genotypes satisfactory agronomic traits and yield profitable.

Although the benefits of growing neglected species grains in certified organic production are extremely big, they are still relatively poorly used. Using the old varieties and landraces in organic agriculture influences the increase in genetic divergence of cultivated plants, and facilitate the establishment of stability and production yield (*Prodanovic, 2006*). However, the main obstacles to the expansion of production of “ancient grains” is the lack of information on their agronomic requirements, therefore it is necessary to test their response to different environmental conditions (soil fertility, drought, salinity, etc.) in terms of the degree of fluctuation of yield and grain quality.

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[3] http://pubs.ext.vt.edu/2908/2908-1403/2908-1403_pdf.pdf pp. 10

Conclusion

The old type of grain and their local populations are of great importance for the production of organic arable land. Nutrient use efficiency, higher protein content, disease resistance, and better tolerance to weed compared to modern varieties are just some of the advantages of the old varieties. Greater attention to these ancient species has resumed growing demand for traditional products. However, apart from its value in use, these species have inestimable importance in the preservation of plant genetic resources, which are considered as a valuable source of genetic material for further breeding of modern cultivars because of its resistance to stress and disease. Because of the genetic potential of possessing old varieties and landraces have the largest collection of samples and in gene banks around the world. The introduction of organic farming and creating a market for indigenous products, is represented in a sustainable manner of agricultural biodiversity in situ conservation, especially keeping the genetic heritage of old varieties and species.

The main obstacle for the production expansion of the old type of grain is considered to be a lack of information about their agronomic requirements. Thus, growing in different environmental conditions has to determinate the fluctuation of yield and grain quality, and consequently adapt production technology supporting.

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