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THE INFLUENCE OF GROWING SYSTEMS ON UTILITY VALUE OF PISUM SATIVUM L.

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Summary

As far as the utility value of *Pisum sativum L.* is concerned, the evaluated indicators were within the norm STN 46 1300-2: The seeds of food peas and indicators which give a more complex characterisation of seed peas from a technological and nutritive point of view. Pisum sativum – i.e. the cultivar Olivin - was grown by means of an integrated and ecological growing system and with two different ways of soil cultivation (conventional, economical). The results of the four year research period (1994-1997) indicated that the year of growing has the most significant influence on the content of important seed components (proteins, lipids, ash, calcium, potassium, phosphor, starch, saccharides and fibre). From the important indicators for the technological quality of Pisum Sativum, only the granularity and the cooking ability were statistically not significantly influenced by the year of growing. Neither the growing system (integrated, ecological) nor the way of soil cultivation significantly influenced the important indicators for the pea seed quality. Only the contents of the total and non-reduced saccharides were influenced by the system of growing (higher portions were found with the integrated growing systems).

Key words : *Pisum sativum,* quality of pea, integrated, ecological system of growing

Introduction

Legumes are plants with seeds, which are rich in proteins and saccharides. Thanks to that they have a high biological value and they are used in human and animal nutrition. Legumes have a good growing value thanks to their specific ability to improve the soil fertility.
In spite of all these qualities the total harvested area of legumes has continuously been decreasing. The cause for this is probably decreasing legumes prices, smaller yields and increasing production costs. In 1999 the consumption of edible legumes reached 2 kg per inhabitant in Slovakia in comparison with the recommended range of 2,1 – 3,2 kg per inhabitant, so it is on a low level of a recommended dose.
The research task of the departments of the Agronomic Faculty of the University of Agriculture in Nitra was to evaluate the technological and nutritive quality of the pea, which is the most spread legume grown in Slovakia with a relatively simple production technology, low demands on harvest works, with hybrids of a good quality and possibilities of exporting to foreign markets.
We evaluated the quality of peas, which are grown for seeds by means of an integrated as well as an ecological system. These systems belong to productive methods, which increase the production quality and which are compatible with the requirements from the point of view of protection of the environment. (Lacko-Bartosova et al., 1996). Integrated agriculture according to Vereijhen (cit. in Lacko-Bartosova et al., 1996); can be characterized as a system relying mainly on growing and biological inputs and chemicals are integrated supplements of the system. Ecological agriculture means such a way of using the soil, in our case such a plants production, in which the specific sowing methods, green fertilizers, fertilizing by means of organic manure, mechanic and biological methods of plants protection are used. The aim of the production is to produce products of a specific quality with a minimal negative influence of agriculture on the environment (Jilkova, 1994, Potravinový kódex, 1999).

Material and methods

The research task of the departments of the Agronomic Faculty of the Slovak Agricultural University Nitra was to evaluate the technological and nutritive quality of the pea hybrid Olivin. The pea was grown for seeds by means of an integrated system of growing: in the integrated system the nutrition of the crop was provided by industrial fertilizers in accordance with a balanced method. Manure was applied to sugar beat and maize. (clover – maize for grain – maize for silage – summer wheat – sugar beat – spring barley – **pea** – summer wheat).
In the ecological system manure was used as a fertilizer for maize for silage. The necessary amount of nitrogen for the plants was provided by 37,5% of vetch in seeds (chick pea + clover – clover – summer wheat – maize for silage – rape – **pea** – maize for silage – summer wheat).
In both systems one variant without fertilizing and two variants of cultivating soil were used. The conventional way of ploughing 0,24m deep as well as a minimum ploughing depth of 0,12 – 0,15 m were used.
From the point of view of the utility value of the pea, we observed indicators according to the Slovak Technical Norms 461300 – 2 – Seeds of edible pea such as: smell, humidity, adulterants and impurity, cooking ability, the presence of pests. Further features, which characterize peas for seeds in a complex way from a technological and nutritive point of view are: granularity, the content of N – substances, starch, saccharides, oil, fibre and the ash content.

Results and discussion

The results obtained during a four-year-evaluation period (1994 – 1997) were compiled statistically by analysis of dispersion and evaluated. We found out the decisive influence of the year of growing on the content of proteins, oil, ash, calcium, potassium, starch, total, reduced and non reduced saccharides and fibre. We found a decisive influence of the year of growing on the content of phosphorus. From the important indicators of the technological quality of peas, only the granularity and cooking ability were statistically not considerably influenced by the years of growing. The decisiveness of other factors such as the system of growing and cultivating of soil was much less significant. We only found the influence of the system of growing on the content of the total and non-reduced saccharides. The influence of the cultivating of soil on the observed indicators was not decisive.
In table 1 you will find values of the quality traits (the average of a four-year evaluated period 1994 – 1997). There are only insignificant differences between the ways of soil cultivating. The evaluated values were more significantly influenced by the system of growing. There are differences e.g. in the fibre content of 26%. As far as saccharides is concerned, the differences are statistically decisive. In the integrated system of growing the content of proteins, ash, phosphorus, potassium, magnesium, saccharides and fibre was higher than in the ecological system of growing. In the ecological system of growing on the other hand, the granularity, cooking ability, the content of lipids and starch was higher than in the integrated system of growing.
The content of proteins as basic building components of an organism and starch as the main source of energy are very important indicators of the nutritive quality of peas. We found out big differences in these contents according to the year of growing. The content of proteins varied in a scale between 19,14% and 23,9%. The significant influence of the year of growing, the location and the weather conditions on the variable content of proteins in pea seeds has been supported by many authors (Nekljudov et al., 1970, Zlámal, 1976, Slaměna, 1985).

Table 1 Values of quality traits (everage 1994-1997)

Quality traits	System of growing			Cultivating of soil	
	Integrated	Ecological	Control	Minimum	Conventional
Graining	86,23	89,73	88,16	87,87	88,21
Cooking ability	83,07	85,47	84,16	84,7	83,76
Crude protein	21,47	21,19	21,02	21,03	21,32
Oil	1,05	1,14	1,11	1,11	1,09
Ash	4,37	4,09	4,09	4,33	4,04
Ca	0,13	0,13	0,145	0,13	0,139
P	0,673	0,623	0,607	0,617	0,652
K	1,314	1,289	1,264	1,282	1,296
Mg	0,177	0,162	0,161	0,168	0,163
Starch	54,28	55,5	54,67	54,93	54,71
Saccharides total	6,45	6,05	6,12	6,18	6,23
S.reduced	1,39	1,23	1,27	1,32	1,27
S.non-reduced	5,05	4,81	4,85	4,86	4,95
Fibre	5,19	4,12	4,8	4,46	4,95

The content of starch varied from 49,6% up to 60,4%. The reciprocal negative correlation between starch and proteins has been confirmed. In the year with the highest content of proteins the content of starch was the lowest and vice versa. The amount of these two important components (starch plus proteins) was the highest in the ecological system of growing. The pea grown in the ecological system was the most suitable from a nutritive point of view although we could take into account the negative correlation between the content of proteins and their nutritive value (Slaměna et al., 1994). The evaluated hybrid Olivin belongs to the peas with a relatively high nutritive value what has been confirmed by EAII 80 and by experiments with rats (Chrenková et al., 1996).
The cooking ability, which is a very important feature of peas from a gastronomic point of view, should be as high as possible (the Slovak Technical Norm requires a cooking ability of minimum 90%). The cooking ability of different evaluated samples varied from 75% to 93%. None of the systems of cultivating soil or systems of growing increased the cooking ability with more than 90%. There is no decisive correlation between the cooking ability and some of the evaluated indicators (the content of starch, proteins, oil, etc.) So the cooking ability is mainly genetically influenced.
The content of adulterants and impurity varied in different samples from 0,3% to 17,6%. The lowest content of 1,84% from the year 1994 meets the STN for seeds of edible peas for direct consumption and industrial use as well. In the following

years the content of adulterants and impurity did not meet the requirements of STN for seeds of edible peas, so further cleaning would be necessary.

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AN UNCONVENTIONAL CROP – AMARANT (AMARANTHUS)

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Summary

There are about 250 species included in the genus Amaranthus L. Twenty species of this genus are recorded in Slovakia. The most important are: Amaranthus cruentus, Amaranthus hypochondriacus and Amaranthus caudatus. At present for seed production different hybrids are cultivated. They have favourable nutritive value for man with about 15 – 16% content of proteins (but do not content gluten proteins „prolamines“ and „glutelines“). The content of fat reach 7 – 8% and of starch about 62%. They content also mineral substances and vitamins (Holubova, 1992). Genotypes with huge biomass werw obtained by interspecies hybridization. They are used as fodder, energetic raw material and green vegetable.

***Keywords**:* Amaranthus L., Láskavec, vegetable, nutritive value, amarant

Introduction

The human nutrition is mainly provided by only a few sort of crops at present time. A number of common crops such as wheat, maize, rice, potatoes, legumes etc. must be completed with additional, less known crops which are able to improve quality of human nutrition. An amarant (*Amaranthus* L.) surely belongs to this category.

Materials and methods

In order to realize introduced goals we have explored botanical and morphological attributes of some cultivated species. It was obtained from the Department of plant production experimental plots.
For our trials and experimentation we selected as an experimental material followed species of the genus Amaranthus L.: A. caudatus, A. hypochondiacus, A. cruentus, A. hybridus subsp. chlorostachys. Some of them are presented on tables below.

Results and discussion

Amarant is one of the eldest grain crop ever known. The most significant species are: Amaranthus caudatus L., A. cruentus L., A. hybridus L. subsp. chlorostachys (Willd.), A. hypochondriacus L. etc.(Dostál, Červenka, 1991; Žajová, 1998).
Amarant is classified among pseudocereals for its content of saccharides is similar to that of common cereals however, with a higher digestibility. As for content of proteins it actually remains behind legumes but has a higher protein quality than for example, soya and even so a milk. It can be used as vegetable for its high content of important vitamins and minerals. Thus