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# THE INFLUENCE OF TOP DRESSING ON MORPHOLOGICAL AND PRODUCTIVE PROPERTIES OF SPELT WHEAT ON DEGRADED SOIL

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## Abstract

Spelt wheat is characterized with a lot of good productive traits, primarily well is adapted to the agroecological conditions and soils in hilly and mountainous areas, tolerant to drought, pathogens and insect attacks (*Flaksberger,* 1930). Grains are tightly wrapped glumes and paleas and protected from air pollution, so that can be cultivated in areas that are less suitable for the wheat. The flour, milled grain of provides all the necessary nutrients, ideal for the natural balance (*Bodroza-Solarov et al*., 2009). It is used for making special type of bread that is more digestible than the value of common wheat flour. Nutritional value flour gives the high gluten content, so it can be used for the preparation of pastries and variously pasta without adding eggs. If it used milling of kernels, we obtain the so called integral wheat flour (*Ruegger et al.,* 1990). The spelt can be cultivated without the use of chemicals and he is highly respected in organic agriculture (*Kohajdová and Karovičová,* 2008). Grain, obtained in this way is used for the preparation of healthy food. The large numbers of consumers that feed on and live in harmony use these products.

## Introduction

Spelt wheat is one of oldest species which belongs of the genus *Triticum.* This wheat was well known even before 6,000 years. It was cultivated in ancient Egypt. The spelt grain used in the diet the ancient Romans who spread production throughout the Empire in today's Europe and North Africa. Growing was in mountainous areas of Southeast Europe until the 20th century (*Glamoclija et al*., 2011).

Nowadays spelt becomes interesting for cultivation, especially after studying the relationship of plants to the agroecological and soil conditions, and finding the most appropriate production technology (*Stallknech et al*., 1996). Studying the chemical properties of grain and flour *Zielinski et al.* (2008) point out that this is excellent raw material for making bread because has bigger nutritional value. In countries with a growing population and who eat more organic agricultural products special types of bread are well accepted. The special bread baking it was very well received, especially in countries where an increasing number of residents in the nutrition benefits of organic agriculture products (*Abdel-Aal et al.,* 1995).

Cultivation of wheat is becoming more and more interesting in Serbia. Areas under spelt increase in mountain areas, but also in the lowland areas. Association with organic farming includes this wheat in the crops rotation because it can be grown in conditions of alternative methods of crop protection (*Stallknecht et al.*, 1995).

## Material and methods

During 2011/12 were conducted field micro experiments within thermo-electric power plant Nikola Tesla in village Usce on degraded land that is fallow over 15 years, that has been created to landfill of coal. The subject of research was the first domestic varieties spelt *Nirvana*. It was selected in the Institute of Field and Vegetable Crops, Novi Sad. The variety of winter spelt wheat is very tolerant to frost. Spelt wheat well grows in less fertile soils and drought better tolerated than common wheat. Spike is the average length of 10 cm to 15 cm with 22 flower spikelets. Kernel is chaffy because is strongly hulled with glumes and paleas after threshing. The hectoliter mass hulled grains is 75-78 kg and 1000 grain weight around 41g. The grain contains about 15% of total protein. The grain is rich in vitamin B and minerals. Compared to common wheat spelt has 7-8 times more calcium, magnesium, phosphorus and selenium. Mineral matters in grains are associated with organic carbon, and easy to adopted organism.

Before preparing for sowing of wheat was done cleaning the soil of various waste dumps. In late summer plowing was ploughed. Seedbed preparation was during October

In sowing period were used mineral fertilizers NPK 15:15:15 in the amount of 600 kg $ha^{-1}$. Wheat was sowed in late October. Top dressing was done in early March, with variations mineral fertilizers, as follows: V1 (ammonium nitrate - KAN, 220 kg $ha^{-1}$), V2 (urea - 40%, 150 kg $ha^{-1}$) and V3 (control, no nitrogen). During the growing season are not undertaken other crop tending or protection. Hand harvesting was in July and at the same time samples were taken for determining the following parameters: stem height, spike length, spikelet number, grain number, grain weight and mass of tailings. Data were analyzed using analysis of variance and tested LSD test.

## Results and Discussion

**Stem height.** The average stem height at the time of wheat harvest was 97.7 cm and 89.6 cm control (Table 1). Top dressing of crops with KAN stem height is increased by about 11%. The use of urea for top dressing stem height is an average increase of over 16%. The top dressing of crops significantly increased stem height wheat.

**Spike length**. The average length of the spike at wheat harvest period was 10.23 cm, while the control was 8.9 cm (Table 1). The top dressing of crop spikes were longer by about 12%, but the effective top dressing was not significantly for the length of the spike.

**The number of spikelets**. The average number of spikelets was 18.87 in control 17.5 (Table 1). The top dressing of crops with KAN number of spikelets was increased by about 13%. Using of urea in top dressing of crops spikelets increased by 10%. The nutrition urea was not significantly influenced this morphological feature.

**Number of grains per spike.** The average number of grains per spike of wheat was 24.33 while the control was 20.1 grains per spike (Table 1). The top dressing of crops with KAN number of grains per spike was increased by about 40%. The use of urea in top dressing of crops of number grains per spike increased by 23%. The top dressing of crops KAN significantly increased the number of grains per spike in wheat, while nutrition did not significantly influenced the morphological properties.

**The grain of weight.** The average grain weight in spike at the time of wheat harvest was 1.06 g, while the control was 0.9 g (Table 1). The top dressing with KAN influenced on weight of grains per spike. Increase was by about 33%. Grain weight spike in average increase of 22% using urea for top dressing However, top dressing is not statistically significant on increasing grain weight in spike.

**The mass of grain chaff**. The average weight of chaff (glumes and paleas) after kernel hulling was 0.46 g, while in the control was 0.4 g (Table 1). The top dressing of crops KAN and urea weight of chaff increased by 25%, but these differences were not statistically significant.

Table 1. Indicators of morphological and productive traits

| Morphological and productive characteristics | The average values of treatment | | | | LSD test | |
|---|---|---|---|---|---|---|
| | Control | KAN | Urea | Average | | |
| Stem height, cm | 89.6 | 99.3 | 104.3 | 97.7 | 0,05 | 9.4658 |
| | | | | | 0.01 | 14.3400 |
| Spike length, cm | 8.9 | 10.9 | 10.9 | 10.23 | 0,05 | 2.5272 |
| | | | | | 0.01 | 3.8286 |
| The number of spikelets | 17.5 | 19.8 | 19.3 | 18.87 | 0,05 | 2.9962 |
| | | | | | 0.01 | 4.5390 |
| Number of grains per spike | 20.1 | 28.1 | 24.8 | 24.33 | 0,05 | 7.0220 |
| | | | | | 0.01 | 10.6377 |
| The mass of grain | 0.9 | 1.2 | 1.1 | 1.06 | 0.05 | 0.3648 |
| | | | | | 0.01 | 0.5526 |
| The mass of grain chaff | 0.4 | 0.5 | 0.5 | 0.46 | 0.05 | 0.1998 |
| | | | | | 0.01 | 0.3627 |

## Conclusions

Based on the research of the influence of crops on the morphological characteristics of spelt wheat production on degraded land, the following can be concluded:

- Top dressing significantly influenced the growth of stems. Using KAN they were increased by 11% while using Urea stems were higher about 16%.
- The length of the spike had is significant influenced in crops with top dressing. The both types of nutrients affected increase length of spike equally.
- The number of spikelets per spike, number of grains and 1000 grain weight were higher in variants with top dressing, but these differences were not significantly higher than in control.
- The mass of tailings in the grain chaff was also higher than in control variant, but the variations compared to the control were not significant.
- Top dressing did not significantly influence the morphological characteristics of plants and production, because in pre sowing preparation added 600 kg $ha^{-1}$ NPK 15:15:15 mineral fertilizers. Nitrogen from top dressing significantly influences on wheat tillering in spring. An increased number of plants per area achieved higher grain yield in general.

## References

Abdel-Aal, E.S., P. Hucl and F.W. Sosulski (1995): Compositional and nutritional characteristics of a spring einkorn and spelt wheats. Cereal Chem. 72, pp. 621-624.

Bodroza-Solarov, M., J. Mastilovic, B. Filipcev and O. Simurina (2009): *Triticum aestivum spp. spelta* - the potential for the organic wheat production, Journal on processing and energy in agriculture, Vol. 13 (2), pp. 128-131.

Flaksberger, C. (1930): Ursprungszentrum und geographische verbreitung des spelzes (*Triticum spelta* L.). Angew. Bot. 12, pp. 86-99.

Glamoclija, Dj., M. Staletic, J. Ikanovic, M. Spasic, V. Djekic and M. Davidovic (2011): Possibilities alternative grain production in the highlands area of central Serbia. International Scientific Meeting: Multifunctional Agriculture and Rural Development (V) II Book, pp. 71-77.

Kohajdová, Z. and J. Karovičová (2008): Nutritional value and baking applications of spelt wheat, *Acta Scientiarum Polonorum Technologia Alimentaria 7* (3), pp. 5-14.

Ruegger, A., H. Winzeler and J. Nosberger (1990): Die ertagsbildung von dinkel (*Triticum spelta* L.) und weizen (*Triticum aestivum* L.) unter verschiedenen umweltbedingungen im Freiland. J. Agron. Crop Sci.164, pp. 145-152.

Stallknecht, G., K. Gilbertson and J. Ranney (1996): Alternative wheat cereals as food grains: Einkorn, emmer, spelt, kamut, and triticale. Progress in new crops. ASHS Press, Alexandria, VA. p. 156-170. In: J. Janick (ed.).

Stallknecht, G. and K. Gilbertson (1995): Spelt is alternate cereal food crop. Montana Farmer 83(2), pp. 12-13.

Zielinski, H., A. Ceglinska and A. Michalska (2008): Bioactive compounds in spelt bread. European Food Resources and Technology, No. 226, pp. 537-544.