

**9. МЕЂУНАРОДНИ СИМПОЗИЈУМ О  
СТОЧАРСТВУ  
САВРЕМЕНИ ТРЕНДОВИ У СТОЧАРСТВУ**

**9th INTERNATIONAL SYMPOSIUM ON ANIMAL  
HUSBANDRY  
MODERN TRENDS IN LIVESTOCK PRODUCTION**

**ПРОГРАМ  
PROGRAMME**

**Хотел Парк, Београд, Србија  
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**7-9. октобар 2009.г.  
7-9 October 2009**



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## COMPARATIVE ANALYSIS OF OAT QUALITY GROWN IN ORGANIC AND CONVENTIONAL CONDITIONS

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Original scientific paper

**Abstract:** Cereals are used in the both animal and human nutrition (*Menkovska, 2003*). The objective of this paper was to make a comparative analysis on the oat quality which was grown in organically and conventional conditions, as well as to investigate the influence of the cultivar, growing and climate conditions, and the production conditions on the oat quality. Three oat cultivars and five oat populations were grown on the experimental field of the Institute for Southern Crops in Strumica, R. of Macedonia, during a three-year period (2005-2007). In this paper the physical properties of the oat kernel were analyzed: test weight and the absolute weight. Standard method for analysis of the physical properties of cereals were applied. Comparing the both production systems in regard to the oat kernel physical quality properties, it was concluded that the absolute weight is a cultivar property. Greater variability in the test weight values has been shown among the cultivars and production years than between the farming methods. In the condition of the same applied farming measures, and the use of the same genotypes, great influence on the appearing difference in the average oat test weight during the whole production period had the climate conditions.

**Key words:** oat, cultivar, population, kernel quality properties, farming methods

### Introduction

The oat (*Avena sativa L.*) is a culture which is mainly grown for the kernel and straw. In Europe it was introduced more than 3500 years ago, because of what it is considered to be an "European cereal". Oat has more suitable nutritional composition (81,8g digestible proteins, as well as 1,02g nutritional components per kg) comparing with the corn (*Jevtić, 1992*).

The oat fields today in the world frame are constantly decreasing, as well as the oat production potential, comparing with those of wheat and barley. The

reasons could be found in the growing of low productive cultivars as well as the inappropriate farming methods.

Two types of oat production are defined today: conventional and organic, which have different approach toward the applying of the farming methods .

Taking into account the high biological value of the oat kernel and the increasing use of oat in the animal and human nutrition (*Menkovska, 2002*), the objective of this paper was through comparative investigations of the both types of production, selection of the most suitable oat cultivars for stable and high quality production in the region of Republic of Macedonia to be performed, so that they should be attractive and desirable on the market.

## **Materials and Methods**

Two types of field experiments, in conventional and organic conditions were organized on the experimental field of the Institute for the southern cultures in Strumica during the period of 2005-2007. The laboratory investigations (kernel physical quality, test weight and 1 000 kernel weight) were performed by standard method for analysis of the physical properties of cereals in the laboratory of the Institute for the southern cultures in Strumica and of the Institute of animal science in Skopje.

Five oat populations were used as investigation material among which four were from domestic origin (Krivogastani, Trebenishta, Radolista, and Kucheviste), one was Bulgarian introduction, and three introductions were from Serbia and Monte Negro (Rajac, Lovcen and Slavuj).

The obtained results were statistically analyzed by the method of analysis of variance, and the differences were tested according to the LSD test.

## **Results and Discussion**

### **Oat absolute weight obtained by organic production**

The results of our investigations have pointed out that the value of the absolute weight of oat which was organically grown depends on the cultivar and ranged from 20,1 g to 34,2 g. Its average value was 27,0 g independently on the year and genotypes (Table 1). The variety Lovcen has shown the highest value of the absolute weight among the investigated oats (29,0 g), and the lowest value of this kernel quality property has shown the population Krivogastani, (20,7 g), what absolutely is for 8,3 g or relatively for 28,7% more.

It can be said that the differences occurring among the cultivars and populations at the same growing conditions are result of the cultivar specificity, i.e. of the genotype specificity of the cultivars and populations.

According to the literature data (*Bogdanović and Pržulj, 2000; Živanović et al., 2000; Vasilevski, 2004*), on the variation of the absolute weight influence have various cultivars and growing locations. So, the oat kernels which originated from Kragujevac location had shown to have higher value of absolute weight (32,0 g) than those from Ljubljana location (22,6 g) (*Nikolić et al., 1989*). Other researchers had pointed out that foreign introduction lines had the highest value of the absolute weight which ranged from 33,8 g to 35,6 g, while the value of domestic lines ranged from 24,0 g to 32,3 g (*Mlinar et al., 1990; Mlinar and Matijašević, 1990*). Beside this, it was shown without some statistical significance that the oat kernels containing nitrogen combination from N<sub>0</sub> to N<sub>12</sub> had increased the absolute weight, while those containing the maximal combination (N<sub>18</sub>), had decreased the absolute weight (*Georgieva, 1995*).

### **Oat absolute weight obtained by conventional production**

From the Table 2 can be seen that independently on the production year, the population Kuceviste has shown the highest value of absolute weight among the investigated oats (27,8 g), while the lowest value has shown the population Krivogastai (19,8 g), what absolutely is for 8,0 g or relatively for 28,8% more.

The results of our investigations have pointed out that the average absolute weight was higher of the organically grown oat (27,0 g), than that obtained by the conventional growing method. (25,2 g). During the production year 2005 the higher value of the absolute weight for the both production methods was obtained (29,6 g and 27,8 g, respectively).

The cultivar Lovcen has shown the highest value of absolute weight among the investigated oats for the both production methods (29,0 g and 27,0 g respectively). The lowest value of this kernel property has shown the population Krivogastani, also for the both production methods (20,7 g and 19,8 g, respectively).

### **Oat test weight obtained by organic production**

As can be seen from the Table 3 the cultivar Rajac, independently on of the year had the highest test weight value obtained by organic production of oat (37,88 kg/hl), while the lowest has shown the population Krivogastani (33,61 kg/hl), what absolutely is for 4,27 g or relatively for 11,3% more.

**Table 1. Oat absolute weight (kg/ha) obtained by organic production**

Cultivar/ Population	2005	2006	2007	Average 05/07 Cultivar/ population
Krivogashtani	22,0	19,9	20,1	20,7
Trebenishta	31.6**	25.6**	28.6**	28.6
Radolishta	27.2*	20.1	22.9	23.4
Bugaria	34.2**	25.5**	25.8*	28.5
Kucevishte	30.0**	26.3**	30.2**	28.8
Rajac	31.4**	25.2*	29.7**	28.8
Slavuj	29.6**	25.8**	29.3**	28.2
Lovcen	31.2**	25.9**	29.9**	29.0
Average/year	29.6	24.3	27.1	27.0
LSD 0,05/0,01	2.21/6.25	2.50/5.65	3.55/6.72	

**Table 2. Oat absolute weight (kg/ha) obtained by conventional production**

Cultivar/ Population	2005	2006	2007	Average 05/07 cultivar/ population
Krivogashtani	21.4	17.5	20.6	19.8
Trebenishta	31.1**	25.1*	25.9*	27.4
Radolishta	24.2	19.4	19.9	21.1
Bugaria	29.2**	23.9*	24.7	25.9
Kucevishte	29.3**	26.2**	27.9*	27.8
Rajac	30.4**	23.1*	26.8*	26.8
Slavuj	28.7**	24.0*	25.6*	26.1
Lovcen	28.7**	24.3*	28.1*	27.0
Average/year	27.8	22.9	24.9	25.2
LSD 0,05/0,01	3.5/6.25	4.99/8.50	4.21/7.72	

**Table 3. Oat test weight (kg/ha) obtained by organic production**

Cultivar/ population	2005	2006	2007	Average 05/07 cultivar/ Population
Krivogashtani	34.53	32.20	34.10	33.61
Trebenishta	35.78	32.30	38.46	35.51
Radolishta	35.65	35.90	38.40	36.65
Bugaria	34.90	30.00	37.86	34.25
Kucevishte	36.00	30.50	39.20	35.23
Rajac	38.90	36.90	37.86	37.88
Slavuj	37.20	35.80	38.00	37.00
Lovcen	37.20	36.80	38.40	37.46
Average/year	36.27	33.80	37.78	35.95
LSD 0,05/0,01	H.C/H.C	H.C/H.C	H.C/H.C	



**Table 4. Oat test weight (kg/hl) obtained by conventional production**

Cultivar/ population	2005	2006	2007	Average 05/07 cultivar/ Population
Krivogashtani	33.50	32.20	34.86	33.52
Trebenishta	34.80	30.00	38.00	34.26
Radolishta	35.60	35.10**	36.53	35.74
Bugaria	34.50	30.00	36.66	33.72
Kuchevishte	35.70	29.30	35.46	33.48
Rajac	37.80	35.80**	36.73	36.77
Slavuj	36.10	34.80	36.53	35.81
Lovcen	35.50	35.20**	38.13	36.27
Average/year	35.43	32.80	36.61	<b>34.94</b>
LSD 0,05/0,01	H.C/H.C	1.25/2.75	H.C/H.C	

### Oat test weight obtained by conventional production

The cultivar Rajac has also shown the highest test weight value for the conventional production of oat (36,77 kg/hl), while the lowest value has shown the population Krivogastani (33,52 kg/hl), what absolutely is for 3,25 kg/hl or relatively for 8,8% % more (Tab. 4).

The higher values of the test weight for the both production methods have been obtained during the production year 2007. The production methods have shown an insignificant increase in the test weight value, and it absolutely was for 1,0 kg/hl, and relatively for 2,9% higher for the organic production comparing to the conventional production. The variety Rajac had the highest test weight value for the organic and conventional productions (37,88 kg/hl and 36,77 kg/hl, respectively), while the lowest value has shown the population Krivogastani (33,61 kg/hl and 33,52 kg/hl, respectively).

### Conclusion

On the basis of the three-year (2005-2007) investigations on the cultivar specificity of oat in the conditions of organic and conventional production, it can be drawn the following conclusions:

✓ The absolute weight, comparing the common average values obtained by the two farming methods has higher value for the organic production (27,0 g) absolutely for 1,8 g, or relatively for 6,7%, comparing with the conventional production (25,2 g).

The variety Lovcen has shown the highest value of the absolute weight among the investigated oats for the both production methods (29,0 g and 27,0 g respectively). The lowest value of this kernel property has shown the population

Krivogastani, also for the both production methods (20,7 g and 19,8 g, respectively). This has shown that the absolute weight is cultivar property.

✓ Greater variability in the test weight values has been shown among the cultivars and production years than between the production methods. The production type of oat has shown an insignificant increase of the test weight: the test weight value obtained by organic production was higher absolutely for 1,0 kg/hl or relatively for 2,9% than the value which was obtained by the conventional production.

By applying the both production methods, the cultivar Rajac had the highest test weight value (37,88 kg/hl and 36,77 kg/hl, respectively), while the lowest value has shown the population Krivogastani (33,61 kg/hl and 33,52 kg/hl, respectively).

## **Komparativna analiza kvaliteta ovsu gajenog u organskim i konvencionalnim uslovima**

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### **Rezime**

U ovom radu se izveštava o rezultatima dobijenim u dva ogleda u proizvodnji ovsu, u konvencionalnim u organskim uslovima. Tri sorte i pet populacija ovsu su gajene na oglednom polju Instituta za jare useve u Strumici, Republika Makedonija, tokom perioda od tri godine (2005-2007). U ovom radu su analizirane fizičke osobine zrna ovsu: težina i relativna težina. Primenjene su standardne metode za analizu fizičkih osobina žita.

Rezultati naših istraživanja ukazuju da su prosečne apsolutne težine veće kod organski proizvedenog ovsu (27,0 g), u poređenju sa ovsom dobijenim na konvencionalan način (25,2 g). Tokom proizvodne 2005. godine, utvrđena je veća vrednost apsolutne težine ovsu za oba proizvodna metoda (29,6 g i 27,8 g, respektivno). Sorta Lovcen je imala najveće vrednosti apsolutnih težina ispitivanog ovsu za oba proizvodna načina (29,0 g i 27,0 g respektivno). Najniža vrednost ove osobine zrna je utvrđena za populaciju Krivogastani, takođe u oba proizvodna metoda (20,7 g i 19,8 g, respektivno).

Više vrednosti testirane težine za oba proizvodna metoda su dobijene u proizvodnoj 2007. godini. Proizvodni metodi su pokazali nesigifikantno povećanje vrednosti test težine i to 2,9% viša vrednost u organskoj proizvodnji u poređenju sa konvencionalnom proizvodnjom. Sorta Rajac je imala najveću vrednost test težine u organskoj i konvencionalnoj proizvodnji (37,88 kg/hl i 36,77

kg/hl, respektivno), dok je najniža vrednost utvrđena za populaciju Krivogastani (33,61 kg/hl i 33,52 kg/hl respektivno).

U poređenju oba proizvodna metoda u vezi sa fizičkim osobinama kvaliteta zrna ovsa, zaključeno je da je apsolutna težina osobina sorte. Veća varijabilnost vrednosti test težine je dobijena među sortama i proizvodnim godinama nego metodom proizvodnje.

U uslovima iste proizvodnje, i korišćenjem istih genotipova, veliki uticaj na razlike u prosečnim težinama ovsa tokom celog perioda proizvodnje su imali klimatski uslovi.

## References

- BOGDANOVIĆ M., PRŽULJ N. (2000): Rezultati ispitivanja jare zobi u brdskom-planinskom području Republike Srpske, Agrozanjanje, Poljoprivredni naučno stručni i informativni časopis, godina I, 3, 84-90, Banja Luka.
- GEORGIEVA T. (1995): Проучване основните звена от технологията на отглеждане на зимуващ овес. Автореферат на дисертация за получаване на научната степен "Кандидат на селскостопанските науки", Висш селскостопански Институт-Пловдив, катедра Растениевъдство.
- JEVTIĆ S. (1992): Posebno ratarstvo. Beograd.
- MENKOVSKA M. (2002): Nutritional survey of cereals grown in Republic of Macedonia. Proceedings, Section of oral presentation, II Congress of physicians of preventive medicine with international participation, October, 2-5, 2002, Ohrid, R.Macedonia. (in Macedonian language)
- MENKOVSKA M. (2003): The technological quality of Macedonian wheat-biochemical approach, recent instrumental techniques and methods, international standards. Institute of Animal Science, University "Ss. Cyril and Methodius", Skopje, 216.
- MLINAR R. (1990): Proizvodne osobine i agrotehnika zobi. Bilten poljodobra, 7-8, 105-107, Zagreb.
- MLINAR R., MATIJAŠEVIĆ M. (1990): Biološke i gospodarske vrijednosti nekih domaćih i stranih selekcija proljetne zobi. Poljoprivredne aktualnosti, 3-4, 37, 483-491.
- NIKOLIĆ J.A., HRISTIĆ V., KRSMANOVIĆ J. (1989): Neke specifičnosti zrna ovsa i mogućnosti šire upotrebe u ishrani ljudi i domaćih životinja. Unapredjenje proizvodnje pšenice i drugih strnih žita, Institut za strnih žita, Kragujevac.
- ŽIVANOVIĆ S., JELIĆ M., STOJANOVIĆ J. (2000): Uticaj meliorativne primene đubriva na prinos i kvalitet zrna jarih strnih žita na kiselom zemljištu. Selekcija i semenarstvo, 7, 3-4, 123-127.

VASILEVSKI G. (2004): Зрнести и клубенести култури (Универзитетски учебник). Универзитет "Св. Кирил и Методиј"-Скопје, Факултет за земјоделски науки и храна-Скопје.

Received 31 May 2009; accepted for publication 15 August 2009