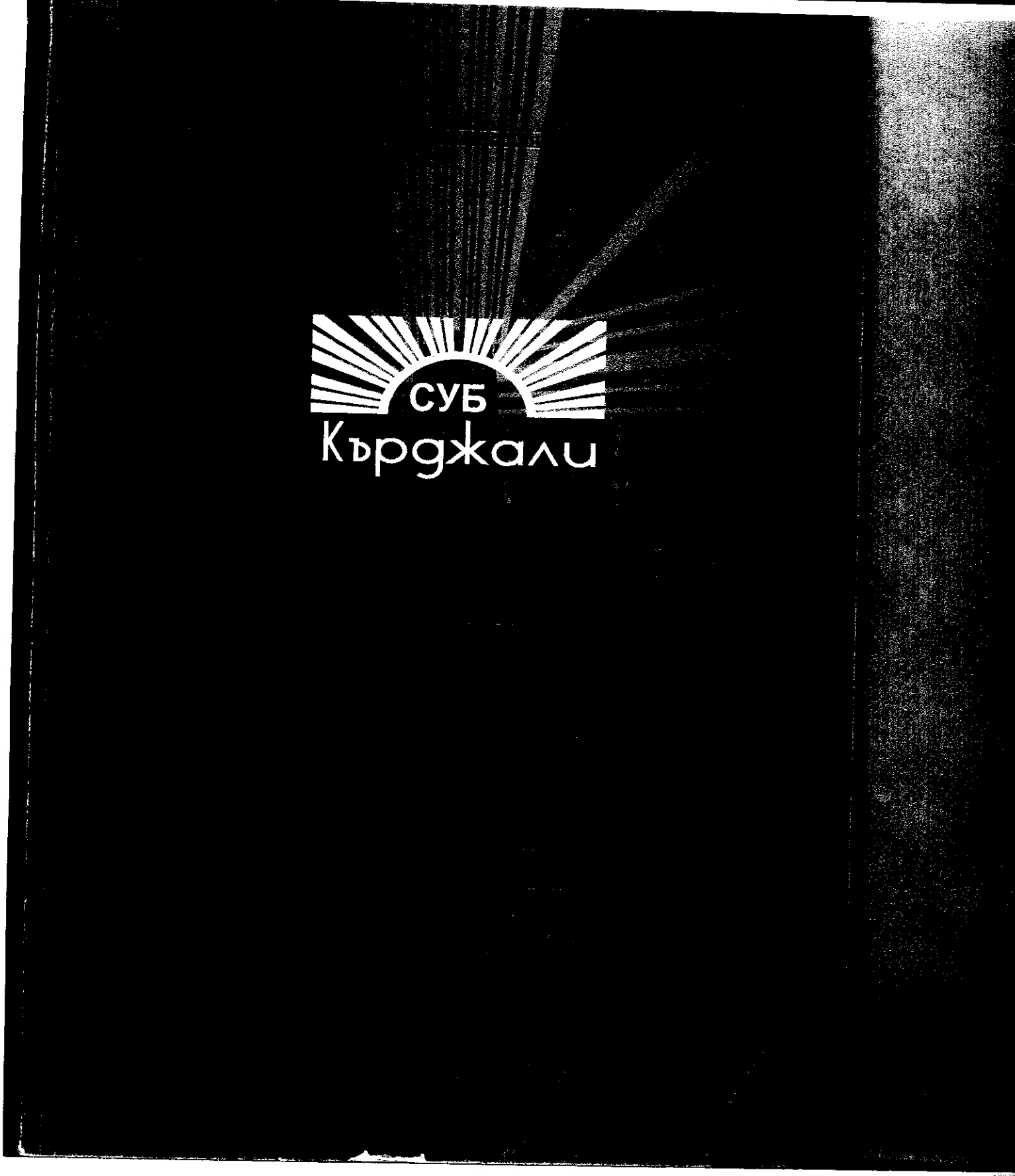
СУБ
Кърджали

КОНФЕРЕНЦИЯТА СЕ ПРОВЕЖДА ПОД ПАТРОНАЖА НА:

Проф. д-р Дамян Дамянов, дмн – *Председател на СУБ*
Инж. Ангел Коджаманов – *Областен управител на област Кърджали*
Инж. Хасан Азис – *Кмет на община Кърджали*

СЪОРГАНИЗАТОРИ:

СЪЮЗ НА УЧЕНИТЕ – КЪРДЖАЛИ
ПУ, ФИЛИАЛ "Л. КАРАВЕЛОВ" – КЪРДЖАЛИ
ЗЕМЕДЕЛСКИ КОЛЕЖ – ПЛОВДИВ
МИННО-ГЕОЛОЖКИ КОЛЕЖ – КЪРДЖАЛИ
НАУЧНО-ТЕХНИЧЕСКИ СЪЮЗИ - КЪРДЖАЛИ

ОРГАНИЗАЦИОНЕН КОМИТЕТ:

Почетен председател:
Проф. д-р Дамян Дамянов, дмн – Председател на СУБ

Председател:
Ст.н.с. д-р Дора Янчева – Председател на СУБ, Клон Кърджали

Зам. председатели:
Ст.н.с. д-р Николай Николов – Зам. председател на СУБ, клон Кърджали
Проф.дин Людмил Спасов – Директор на ПУ, филиал "Л.Каравелов"
Доц. д-р Васко Василев – Директор на Земеделски колеж- Кърджали
Проф. дтн Владко Панайотов – Директор на Минно-геоложки колеж – Кърджали
Инж. Захари Захариев - Председател на ТО на НТС – Кърджали

Секретари:
д-р Жени Стайкова дм, д-р Дора Щерева, н.с. Даниела Коджаманова

Членове:
Доц. д-р Маринела Панайотова
Доц. д-р Грозданка Ленкова
Доц. д-р Ваня Найденова
Д-р инж. Дончо Драганов
Д-р Тодор Черкезов
Д-р Руско Русков дм
Инж. Златка Сиджимова
Инж. Магда Диева
Инж.Людмила Радева
Павел Петков
Гл.ас. Петър Хаджинаков
Н.с. Радка Славчева

UNION OF SCIENTISTS IN BULGARIA – BRANCH KARDZHALI
KARDZHALI MUNICIPALITY

SCIENCE IN GLOBALIZATION

SCIENTIFIC CONFERENCE WITH INTERNATIONAL PARTICIPATION

25 YEARS UNION OF SCIENTISTS IN BULGARIA – BRANCH KARDZHALI

SCIENTIFIC RESEARCHES
Volume III, part II

01– 02.10.2008
Kardzhali

НАУЧНИ ТРУДОВЕ, том III
Част II

- Пленарни доклади
- Аграрни науки
- Технически науки

ISBN 978 954 9634 33 4

GRAIN YIELD DEPENDING OF THE GROWING SYSTEM AT OAT IN STRUMICA REGION

Dragica Spasova, G. Vasilevski, D. Spasov, M. Ilievski, Biljana Atanasova
University "Goce Delcev" - Stip, Faculty of Agriculture,
Goce Delcev b.b. 2400 Strumica, R. Macedonia
University "St. Cyril and Methodius" – Skopje, Faculty of agricultural sciences and food, Aleksandar Makedonski b.b.1000 Skopje, R. Macedonia.

Abstract

During the period of 2005-2007 examinations were conducted with five oat populations (population Krivogastani, population Trebenista, population Radolista, population from Bulgaria, population Kuceviste) and three oat varieties (Rajac, Slavuj and Lovken), which were set in conditions of organic and conventional production. Independently of the years and the genotypes, overall average grain yield of oat growing in conditions of organic production was 4450 kg/ha and is more absolutely for 626 kg/ha or relatively for 14,07 % from the overall average grain yield of oat growing in conditions of conventional production which was 3824 kg/ha.

Key words: *Oat, yield, variety, population, organic production, conventional production*

Introduction

The oat (*Avena sativa* L.) is a culture which is mainly grown for the grain and the straw. According to the present findings the oat derives from centers: Europe, East and Southeast Asia and Africa. As a culture the oat is established in Europe before more than 3500 years and therefore it is considered as "European cereal". It is assumed that oat comes from two oat varieties: the wild oat (*Avena fatua* L.) and the red wild oat (*Avena sterilis* L.) (Suttie J. M., 2000).

Today, the oat is counted in the most important cultures in the human feeding, with increased request in the modern-day culinary and the foodstuff industry.

The bigger request for oat in human feeding is a result of the higher biological value and the feeding components that oat consists. It contains also soluble diet fibers, mainly β-glucans whose contents vary from 2,5% to 6, and 5% (Pržulj N., et al. 1998). The content of the β-glucans in the oat grain affects in reducing the cholesterol in the blood, so the modern-day diet feeding is based on oat flakes (Welch, 1991, cited by: R. Mlinar, 1996).

Growing area of oat in world magnitude is in constant dropping. In the period 1934-1938 the oat was sawn on 50 million hectares, in 1967 on 31 million hectares, in 1983 on 26 million hectares, and in 1999 on 13,9 million hectares (Vasilevski, G. 2004). The grates oat production countries are: Russian Federation with over 4,9 million hectares, which is 35% of overall growing area in the world. In Europe, the oat in 1999 was sawn on 3,2 million hectares, and in North and Central America on 2,6 million hectares. On the other continents this culture is sawn on considerable minor areas.

The average yield of oat in the world is 1781 kg/ha.

In Macedonia the oat is sawn on 2162 hectares (Statistical review: Agriculture 5.4.7.01/564, July 2007) with average yield of 1746 kg/ha.

The production potential, respectively the grain yield by unit area is the main characteristic for each culture and variety, as well as for oat.

For increasing and stabilizing of the yields, it is necessary to be made systematic approach in the choice of high yields varieties, which will achieve their genetic potential in accurate soil and climatic conditions in that region, as well as in specific agro technical measures.

Nowadays, there are two ways of oat production, respectively two different approaches to the application of the agro technical measures, which means conventional and organic production.

Doing comparative examination of the two types of oat production it will be easily seen the positive and negative sides of the organic in comparison with conventional production from agro technical aspect, as well as to sort over the best agro technical measures, varieties, populations for the two types of production.

Material and methods

The examinations started in 2005 and lasted until 2007. The field experiment was conducted on the fields of Institute of Southern crops in Strumica. Five oat populations and three oat varieties were analyzed. Four of the populations were home populations (*population Krivogastani, population Trebenista, population Radolista, population Kuceviste*), and one was introduced from Bulgaria (*population from Bulgaria*). The three oat varieties were introduced from Serbia (varieties *Rajac, Slavuj and Lovcen*).

Two experiments were set. One was in conditions of conventional production, and the other was in conditions of organic production. The experiments were consisting of 8 variants in four repetitions, set by the method of randomized block system, with dimension of the basic parcel of 5 m^2. The distance between the variants was 0,50 m, and between the repetitions was 1 m. The distance between the rows was 20 cm at conventional production, and 10 cm at organic production.

The seeding rate at both types of production was 550 seeds on 1m^2. In the all years of examinations the soil was prepared in the same way. In the autumn there was basic plowing on 30-35 cm, and then dividing of the area and fertilizing by the methodological principal was following. So the area that was planned for conventional production of oat was fertilized with artificial grainy NPK fertilizer in combination 15:15:15, 300 kg/ha, while the other area was treated with cow manure 20 t/ha. After that the area was additionally cultivated, and flushed. The seeding in the all years of the examinations was done in March, by hands in rows on 5-6 cm depth.

During the field examinations two types of agricultural engineering were used. In the conventional experiment standard agricultural engineering was used for field production of oat and the necessary measures for caring of the crop were done, like protection of the crop from diseases, pests and weeds, fertilizing with KAN 27%, 150 kg/ha, in the tillering phase of oat. In the organic experiment is has been used allowed and proper agricultural engineering for field oat production and the necessary measures for caring of the crop were done.

The grain yield was counted in kg/ha from the grain mass of each parcel, propor-

tional on unite area. The grain yield results were elaborated statistically by the method analyses of variance, and the differences were tested by the LSD-test.

Results and discussion

The results for the grain yield in organic oat production are presented in Table 1.

The average three years yield, independently of the years and genotypes, is 4450 kg/ha, which says that the oat as a culture in Strumica region can be profitable.

The highest average grain yield in the three years examinations, independently of the varieties and populations, was gained in the third (2007) year, 4612 kg/ha, that is absolutely for 244 kg/ha, or relatively for 5,30 % more than the grain yield in the first (2005) year, respectively for 241 kg/ha or relatively for 5,20 % more than the grain yield in the second (2006) year. This is a result of the optimal temperatures (19,8 °C in May and 24,1 °C in June) that prevailed in the period when the vegetative and generative organs of oat were forming. Also, in this year, ideal conditions were made in the soil for the usage of the nutritive components from the cow manure by the crop, because of the total rainfalls in May (107 mm) and June (45,6 mm) that helped in the decomposition of the cow manure and its usage by the crop.

Table 1. **Grain yield in conditions of organic oat production (kg/ha)**

Variety/population	Year			Average by variety/ population
	2005	2006	2007	
Krivogaštani	3 250	4 125	4 125	3 833
Trebeništa	4 375**	4 275	4 450	4 366
Radolišta	4 250**	4 250	4 175	4 225
Bugarija	5 125**	4 500	4 750	4 791
Kučevište	4 000**	3 425	4 375	3 933
Rajac	4 250**	4 225	5 125	4 533
Slavuj	4 825**	4 900*	4 900	4 875
Lovćen	4 875**	5 275*	5 000	5 050
Average by year	4 368	4 371	4 612	4450
LSD 0,05	510	610	n.s.	
0,01	740	n.s.	n.s.	

From the results for gained grain yield in kg/ha at organic oat production, it can be seen that the biggest average yield, independently of the year is got by the variety *Lovćen* (5050 kg/ha), and the smallest (3830kg/ha) population *Krivogaštani*, that is more for absolutely 1220 kg/ha or relatively for 24,20 %.

The differences that appear between the varieties and populations at equal growing conditions are owe to the sort specification, respectively the specification of the genetic characteristics that poses the examined populations, that is in agreement with the results of Zinta Gailė et al. (2004), who made examinations of the oat varieties in conditions of organic production.

The results for the grain yield in conventional oat production are presented in Table 2. The average three years yield, independently of the years and genotypes, is 3824 kg/ha.

Table 2. **Grain yield in conditions of conventional oat production (kg/ha)**

Variety/population	Year			Average by variety/ population
	2005	2006	2007	
Krivogaštani	2 925	3 250	3 750	3 308
Trebeništa	3 625*	3 500	3 750	3 625
Radolišta	3 375	3 125	3 500	3 333
Bugarija	5 000**	3 750	3 875	4 208
Kučevište	3 750**	3 775	4 125	3 883
Rajac	4 250**	3 625	4 625	4 166
Slavuj	4 250**	3 250	3 625	3 708
Lovćen	4 775**	4 025	4 300	4 366
Average by year	3 993	3 537	3 943	3824
LSD 0,05	510	n.s.	n.s.	
0,01	740	n.s.	n.s.	

In the conditions of conventional oat production the highest average yield, independently of the year gave variety *Lovćen* (4366 kg/ha), and the smallest (3308 kg/ha) the population *Krivogaštani*, that is absolutely for 1058 kg/ha or relatively for 24,30 % more.

In comparison of the common averages of the both growing systems, independently of the years, genotypes and climatic conditions, and in correlation with applied agtotechnical engineering, it could be said that the yield in conditions of organic production (4450 kg/ha) is more for absolutely 626 kg/ha or relatively for 14,07 % from the yield in the conventional production (3824 kg/ha).

Sarah Clarke et al. (2007) made examinations of oat in conditions of organic production, on west and east Great Britain. The experiments were set on conventional farm in Suffolk and on organic farm in Berkshire. The average grain yield was 6,95 t/ha in organic production, and 9,80 t/ha in conventional production. Our results are not in agreement with the results of these examinations.

On world level the organic oat production gave lower yields than conventional.

In our country in the conventional oat production we do not use as much mineral fertilizers as it is used in Europe, and therefore we do not have that high yields. With adding organic cow manure, the structure of the soil is improved, the evaporation is smaller and there is bigger usage of the nutrient components.

All varieties and populations in the conditions of organic production have higher average grain yield than the yield in the conditions of conventional production. Therefore, it should be accomplished a complete agricultural engineering measures, varieties and seed production for complete success of that type of growing system.

The varieties and populations that have bigger distinction of the yield in both growing systems as populations *Trebeništa* and *Radolišta* and varieties *Slavuj* and *Lovćen* are more adaptable on usage of nutrients of organic manure, and could be recommended in organic production. Populations *Bugarija* and *Kučevište* and the variety *Rajac* showed the smallest distinction in the yield in both growing systems could be recommended in conventional production.

Independently of the year, soil-climatic conditions and the growing system, respec-

tively the used agricultural engineering, and the best genotype for getting high grain yield of the examined varieties and populations is the variety *Lovćen*, which gave average yield of 5050 kg/ha in organic production, and 4366 kg/ha in conventional production.

Conclusions

The following conclusions could be said for the grain yield on the base of the three year examinations:

The grain yield by unite area is higher for organic production (4450 kg/ha) absolutely for 626 kg/ha or relatively for 14,07 % than the grain yield in conventional oat production (3824 kg/ha).

Variety *Lovćen* obtained the highest yield in both conditions of growing systems. In the conditions of organic production gained average grain yield of 5050 kg/ha, and in conventional production 4366 kg/ha.

Variety *Lovćen* could be recommended as the most favourable variety for organic production according to the yield. The smallest grain yield in both growing systems showed the population *Krivogaštani*. In organic production gave 3833 kg/ha, that is 24,1% less than the yield of the variety *Lovćen* (5050 kg/ha), and in the conventional production achieved 3308 kg/ha, that is 24,0% less than the yield of variety *Lovćen* (4366 kg/ha).

The population *Krivogaštani*, as yield less, is not recommended for both growing systems, because the rest varieties and populations are yieldable for the Strumica region.

From forehead for the grain yield, it could be concluded that the same depends of the genetic characteristics of the variety, climatic conditions of the year and most of all of the growing system.

The oat could be grown with success in Strumica region and wider in Macedonia, because it is gained average grain yield for the three year examinations, independently of the growing system and varieties, 4137 kg/ha, which average yield is bigger for 42,7% of the European average yield of this crop that takes out 2898 kg/ha. Beside the variety and its genetic potential, the influence of the ecological factors and the growing system are very important in growing of oat.

Literature:

1. Vasilevski, G. (2004): Zrnesti i klubenesti kulturi, (Univerzitetski učebnik). Univerzitet "Sv. Kiril i Metodij", Skopje, Fakultet za zemjodelski nauki i hrana, Skopje.

2. Georgieva, T., Antonova, N. (2000): Vlijanie na d'lbočinata na seidba v'rhu razvitieto i produktivnosta na zimuvaštija oves (*Avena sativa* L.). IV. Elementi na metlicata i korelativni zavismosti meždu tjah. Rasteniev'dni nauki, 37, br. 7, 470 – 475, Sofija.

3. Zinta, G., Bleidere, M., Skrabule, I., Vigovskis, J. (2004): The first steps in variety testing for organic agriculture in Latvia: oats and potatoes. Proceedings of the First World Conference on Organic Seed. Challenges and Opportunities for Organic Agriculture and the Seed Industry, FAO Headquarters, Rome, 173-174, Italy.

4. Mlinar, R., Martinić – Jerčić, Z. (1996): Program oplemenjivanja jare zobi u Bc Institutu, d.d., Zagreb. Agronomski glasnik, 49-61.

5. Pržulj, N., Momčilović, V., Veselinka Đurić (1998): Proizvodnja i prerada jecma i ovsa za ljudsku ishranu XIII Savetovanje žito-hleb, 15-16, Novi Sad, Jugoslavija.

6. Sarah, C., Haigh, Z., Wolfe, M., Jones, H., Hinchl Iffe (2007): Varieties, mixtures and populations in

organic oats. Varietal characteristics of cereals in different growing systems with special emphasis on below ground traits. Valence, Hungary.

7. Sutti e J. M. (2000): Avena sativa L. http://www.fao.org/ag/AGP/AGPC/doc/Gbase/DATA/Pf000466.htm.