

PRODUCTION POTENTIAL OF MIXED CEREAL CROPS IN THE STRUMICA REGION

**Mite Ilievski, Dragica Spasova, Ljupco Mihajlov,
Milan Georgievski, Natalija Markova Ruzdik**
Goce Delchev Univeristy, Faculty of Agriculture,
Stip, Republic of Macedonia

Abstract

Three combinations associated with cereal crops were tested and the general direction was the growing production of grain. The three cereals crops were used, soft wheat, rye and triticale. The experiment was performed was in the production year 2004/2005, 2005/2006 and 2006/2007.

Soft wheat and rye, triticale and soft wheat and two varieties of soft wheat were combined. The different results are obtained. The lowest average yield (3740 kg/ha) was obtained in the year 2004/2005 by an associated two varieties of soft wheat (Lizinka and Olga), and the largest average yield (7500 kg/ha) was obtained in 2005/2006 by an associated crop of soft wheat and rye (Mila and Pelisterka).

Key words: yield, associated, crop, grain

INTRODUCTION

The most cereal crops to date have held senior positions in crop production in the world, as well as in the Republic of Macedonia. These include wheat, rice, maize, barley, rye and other grains.

The primary objective in the production of any cereal is the exercise of stable and high yields. In that direction, the breeders have until now successfully created a large number of new varieties of almost all cereal crops and their morphological, biological, productive, qualitative and other properties offer good opportunities for more correct the selection of appropriate genotypes according to the needs of industry and cattle breeding.

The majority of the investigated species and genotypes of cereal crops give good results in almost all systems of crop production.

The cultivation crops in the associated on some plant species as a opportunity is studies by a several segments.

Principles which refer to other mixtures may be used very well in various crop species. In surveys on mixing crop species in Ecological Agriculture Projects, found that, the mixed-cropping of different cereal species, such as wheat and rye, and the mixed-cropping of cereals and grain legumes has proved to be potentially successful, although trials on organic farms by Martin Wolfe and Elm Farm Research Centre indicate a need for further research to determine the optimal seed rates. In the case of cereals and grain legume mixtures, the harvested crop can be separated as part of the grain cleaning process. In some cases, markets may exist for cereal grain mixtures, but these need to be identified in advance.

To the present, the greatest success in the cultivation of mixed crops with cultural plant species in crop production is obtained in fodder plants where primary direction of the production is getting a greater amount on green vegetative mass.

The primary aim of this examination is to determine the production potential on some types on cereal plants in the cultivation of mixed crops, and the opportunities and perspectives of this kind of production.

MATERIALS AND METHODS

The examinations were conducted in laboratory and field conditions. Field trials were placed on the experimental field on Uniseristy – Agro in Strumica and laboratory tests were performed in the laboratories of Strumica on the Faculty of Agriculture, UGD – Stip.

As the material for work were used a different genotypes of three types on cereal crops: soft wheat, rye and triticale, which were placed in a certain combinations of mixed crops. In the experiment were included three variants:

1. Soft wheat (variety Mila) + rye (variety Pelisterka)
2. Soft wheat (variety Improved Orovchanka) + triticale (variety Yugo TC – 11)
3. Soft wheat (variety Lizinka) + soft wheat (variety Olga)

The examinations were carried out in the production year 2004/2005, 2005/2006 and 2006/2007.

The experiment was consisted of three repetitions with above mentioned three variants, distributed by the method on random block system, with of main dimension on block – 5 m². The distance between variants was 50 cm, and between repetitions – 100 cm. The distance between the rows was 20 cm.

In all the years of testing, the preculture on grains plants was potato.

In three years of testing the soil was identical prepared. So, each autumn was made basic processing in tillage on the surface of a depth to 35 cm, inflicted an artificial granular fertilizers with combination NPK 15:15:15 an amount of 300 kg/ha, additionally cultivated by milling and leveling.

The sowing in all the years of research have been performed in almost identical time interval, i.e. when there existed optimal conditions. Thus, the first year, sowing was performed on 5.11.2004 and in second and third year at 15.11.2006. Sowing was performed manually with pick at a depth of 5-6 cm. It was used a standard agrotechnics for the production of cereal crops and were implemented necessary measures at care to crops, such as: protection of diseases, pests and weed species.

Have a conducted treatment with herbicides 2,4 – D, against broadleaf weeds with 2 l/ha. In all the years of examination, in a fenophase of a class, the mixed cereal plants were treated with Chromorel D at a concentration of 0,1% for the suppression of a cereal leech (*Lema Melanopus*). Feeding on cereal crops with fertilizers KAN 27% in amount of 150 kg/ha was performed every tested year in the early spring of the year (end of February). Were also measured the grain yield per block and it was calculated in a kg/ha.

Every year before the experiment were setting, from the parcel is taken soil samples for agrochemical testing. The samples were taken by a several locations from the parcel at a depth of 0 to 20 cm and 20 to 40 cm, in chess method for small parcels.

The soil analyzes were performed in the agrochemical laboratories in Strumica, on the Faculty of Agriculture, UGD – Stip, with accepted methods for that aim.

SOIL AND CLIMATIC CHARACTERISTICS OF STRUMICA MICROREGION

Our examinations were placed in an experimental field where the soil is the type of alluvial sediment.

In the Table 1 is an elaborates upon the results of agrochemical properties on the soil at a depth of 0-20 and 20-40 cm, obtained by examination of average soil samples, taken into by the preparation of the soil before sowing mixed cereal

crops. Since the data in Table 1 can be seen that the soil is slightly carbonate. Has a slightly acidic reaction (pH in KCl 5,92-6,40).

Table 1. Agrochemical properties of soil in experiment

Year	depht	CaCO ₃	pH on	Humus	Total nitrogen	Easily accessible Mg / 100 g by Al - method	
	in cm	%	KCl	%	%	P ₂ O ₅	K ₂ O
2004/2005	0 - 20	0.84	6.23	1.57	0.07	31.18	23.95
	20 - 40	0.84	6.25	1.57	0.07	33.98	22.40
2005/2006	0 - 20	0.42	6.39	1.73	0.09	25.75	19.17
	20 - 40	0.42	6.37	1.75	0.09	20.23	18.13
2006/2007	0 - 20	0.42	6.25	1.31	0.08	23.15	19.34
	20 - 40	0.42	6.15	1.28	0.07	24.66	17.10

According to Filipovski et al. (1996), Strumica valley is characterized by sub – mediterranean influences from the Aegean Sea on the south, but this influence is partially stopped by the mountain ridges of Belasica, Ograzden and Plackovica and the northwest of continental climate of Ovce Pole. In comparison with other valleys in this area, in Strumica, the impact of the Mediterranean climate is increased. Strumica valley is in the 200-300 m above sea level and is in the group of continental sub – mediterranean climate. It is typically translation region and in it coming to the combined influences of mediterranean and east – continental climate. The relative humidity on air is a reverse with temperature, i.e. the same as growing up as humidity decreases. The minimum relative humidity on air has in the summer months when coming to increasing the arid period of summer.

Table 2. Average monthly temperatures in Strumica region, in degrees Celsius (°C)

year	Months												year total of temp.	Average tem. on year
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII		
2004	0.8	4.6	8.7	8.7	13.2	16.0	21.6	24.3	23.5	16.0	7.6	4.9	4896.5	12.5
2005	2.5	-0.1	7.8	12.9	18.7	21.9	25.0	23.8	19.4	13.2	5.4	4.2	4708.5	12.9
2006	-0.3	2.0	8.2	13.5	18.1	21.4	23.7	24.1	19.5	14.3	6.7	2.8	4672.0	12.8
2007	5.0	5.9	9.8	13.7	19.8	24.1	27.6	24.6	17.7	13.3	5.9	1.9	5146.5	14.1
1994-2004	1.1	4.0	7.8	12.3	18.4	22.6	25.0	24.0	18.7	13.2	7.3	2.7	4831.2	13.2

According to the information in Table 2 can be concluded that, the average monthly air temperatures during the vegetation in all three years of testing are lowest in the first months of each year, i.e. in January and February (5.9 to -0.3°C) and highest in July (23.7 to 27.6°C).

According to the information in Table 3 can be concluded that the annual amount of rainfall in three years of breeding are a good for the production of cereal crops.

RESULTS AND DISCUSSION

The results of grain yield in kg/ha produced with mixed cereal crops are shown in Table 4.

From the results of the grain yield of mixed cereal crops can be see that it varies within of 3740.0 kg/ha to 7500.0 kg/ha.

Table 3. Summary of monthly precipitation (mm) in Strumica region

year	Months												Total year precipitation (mm)
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
2004	38.9	19.2	24.5	44.8	67.3	103.0	16.9	13.3	45.2	45.2	83.8	83.3	585.4
2005	48.9	96.4	43.5	36.7	50.0	12.9	35.5	75.9	63.9	58.0	34.2	52.1	608.0
2006	58.7	56.4	75.0	31.8	34.0	107.0	26.7	19.9	63.9	85.6	39.7	34.3	632.9
2007	16.5	24.0	39.7	2.2	107.5	45.6	0.3	73.9	41.0	127.0	74.8	41.4	593.7
1994-2004	48.0	33.7	36.4	48.9	51.5	49.3	57.8	34.9	53.8	57.7	60.3	81.9	614.2

Table 4. Yield of grain in kg/ha of mixed cereal crops

Combinations of mixed cereal crops	Average yield of grain in kg/ha			
	2004/2005	2005/2006	2006/2007	Average (2004-2007)
1. Mila + Pelisterka	5260.0	7500.0	3760.0	5506.7
2. Improved Orovcanka + Jugo TC 11	4480.0	7280.0	4100.0	5286.7
3. Lizinka + Olga	3740.0	6260.0	5360.0	5120.0
Average on year	4493.3	7013.3	4406.7	General average 5304.5

Independent of years and variants, the general average yield of mixed cereal crops is 5304.5 kg/ha.

In the first year of the examination (2004/2005), the average yield of the grain mixed cereal crops, independent of variants, amounted to 4493.3 kg/ha. The highest yield of grain in these examination year given the first variant (5260.0 kg/ha), and the lowest (3740.0 kg/ha) a third variant.

In the second year of the examination (2005/2006), the average yield on grain mixed cereal crops, independent of variants, amounted to 7013.3 kg/ha. The highest yield on grain in these examination year, given the first variant (7500.0 kg/ha), and the lowest (6260.0 kg/ha) a third variants.

In the third year of the examination (2006/2007), the average yield on grain mixed cereal crops, independent of variants, amounted to 4406.7 kg/ha. The highest yield on grain in these examination year, given the third variant (5360.0 kg/ha), and the lowest (3760.0 kg/ha), first variant.

The highest average yield on grain mixed cereal crops from three years of examination, independent of the variants is obtained in the second year (2006/2007), 7013.3 kg/ha, which is absolutely for 2606.6 kg/ha or 37.16% more than the yield on grain in the third year of examination (4406.7 kg/ha), when it got the smallest average yield of all years of testing. This difference in the average yield at on year compared with the year by applying on same agro – technical measures and on same variants, is due to various agro – climatic conditions which are prevailed during the years of examination.

The lowest average yield (3740.0 kg/ha) was obtained in 2004/2005 by a mixed crop of two varieties on soft wheat (Lizinka + Olga), and highest average yield

(7500.0 kg/ha) was obtained in 2005/2006 by a mixed crops on soft wheat and rye (Mila + Pelisterka).

Independent of years of examination, the highest average yield given the first variant (Improved Orovchanka – soft wheat + Yugo TC 11 – triticale) 5506.7 kg/ha.

The lowest average yield, independent of years of examination, given the third variant (Mila – soft wheat + Pelisterka – rye), 5120.0 kg/ha.

CONCLUSIONS

Based on three years of examinations and the results obtained of mixed cereal crops, can be drawn the following important findings and conclusions:

The average monthly air temperatures during the vegetation in all three years of testing are lowest in the first months of each year, i.e. in January and February (5,9 to -0,3°C) and highest in July (23,7 to 27,6°C).

The yield on grain mixed cereal crops is ranged from 3740.0 kg/ha to 7500.0 kg/ha.

Independent of the years and variants, the general average yield on mixed cereal crops is 5304.5 kg/ha.

The highest average yield of grain on mixed cereal crops of three years of investigation, independent of the variants is produced in the second year (2006/2007), 7013.3 kg/ha.

Independent of the years of the investigation, the highest average yield give a first variant (Improved Orovchanka – soft wheat + Yugo TC-11 – triticale), 5506.7 kg/ha.

Mixed cereal crops give a good grain yield on soil and climatic conditions of Strumica region.

Produced grain yield from all three combinations of mixed cereal crops is acceptable for redemption from the milling industry.

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