RESEARCH ON ORGANIC WINTER WHEAT CULTIVATION

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Abstract. *The objectives in organic farming are to create and maintain a balance between enviromnent protection and the techology applied to each crop variety, starting with the tillage system which has the capacity to preserve the balance between the natural resources and can asure the optimum on plants cultural requirements.The yields level depends on the optimum application of all techological steps starting with variety choice and finishing with crop harvest. The output has to give satisfactory results both in quantity and quality. Nowadays the quantity is overwhelmed by the quality issue. Consumers are more and more oriented to buy healthy food, and they are awared that healthy food is produced mainly in organic farming system.*

Keywords: wheat, biofertilizers, organic farming

INTRODUCTION

The organic farming system originates, on one hand, in the human aspiration of dealing with nature according to it's laws and patterns and, on the other hand, in the necessity to preserve the human habitats, where the soil fertility and biodiversity are basic pillars which have to be preserved and improved.The organic farming system (similar to „biologic" or „ecologic" terms) it's a "modern" plant growing, animal breeding and food processing system fundamentaly different from the conventional farming system. The goal of the organic farming system is to enhance the „clean" food production, more adequate to human methabolism, in compliance with the environment preservation issue and full respect for nature. The organic farming system contributes to the added value economic activities development and to the interest for rural areas growing. The organic farming model is quite different from the intensive conventional agriculture or the traditional subsitence farming model. The organic farming system is a creative, instructive, scientific well developed model, which enhances the severe environmental, social and medical problems adjustment and gives solutions to solve the unbalances farmers are nowadays dealing with.

MATERIAL AND METHOD

Studies have been conducted in two different ecologic locations, in Chimindia, Hunedoara County and in Firiteaz, Arad County. There have been studied four winter wheat varieties: *Triticum aestivum spp. vulgare* GK Kalasz, *Triticum aestivum spp. vulgare* Arieşan, *Triticum turgidum ssp turgidum conv. durum* GK Betadur, *Triticum aestivum spp.spelta* Franckenkorn. In the two

experimental fields there have been cultivated the same winter wheat varieties during 2006-2009 farming seasons, with different techologies application: the clasic techology (crop rotation, fertilization, soil tillage, seeding, nursing works, a.s.o) and the Eco-Dyn technology (organic farming system).
The researches have been conducted in three fertilization variants: with Azotofertil (10 l/ha), Ecofertil P (10 l/ha) and Biomit Plussz (4 l/ha) and two types of biodynamic fertilizers: horn-manure (0,5kg/ha) and horn-silica (0,5 kg/ha).The biofertilizers have been used as following:

- on soil fertilization (before sowing) with the **Azotofertil** biofertilizer - 10 l/ha
- in green fertilization (in springing) with the **Ecofertil P** biofertilizer - 10 l/ha
- on soil fertilization (before sowing) with the **Azotofertil** biofertilizer - 10 l/ha + in green fertilization (in springing) with the **BIOMIT PLUSSZ** on leaves biofertilizer - 4 l/ha
- on soil fertilization (before sowing) with horn-manure 0.5 kg/ha + fertilizat pe vegetaţie (la desprimăvărare) balega-corn 0.5 kg/ha + horn-silica 0.5 kg/ha.

There have been studied the Ecofertil, Azotofertil and Biomit plus biofertilizers influence on the yields obtained.

RESULTS AND DISCUSSION

The winter wheat yields obtained on Chimindia and Fireteaz experimental fields have been influenced by the two experimental factors: variety and fertilization. The fertilization factor has had five graduations, and the variety factor has had four graduations. The unfertilized variant has been considered witness for the fertilization factor, and Kalasz variety has been considered witness in the variety factor case. In Chimindia experimental field, the average yields obtained in the three experimental years were inbetween 2100 kg/ha and 5034 kg/ha. The experimental factors influence has been registered every year.

The three years yields analysis for the 4 varieties (table 1) points out that the highest yield has been obtained for Arieşan (4038,65 kg/ha) and Betadur varieties, with a very significant difference and, respectively, distinguished significant difference. In the Frankencorn variety case, the differences are very significant negative (-485,16 kg/ha). The variants comparision (table 1) as regarding the variety factor influence through the Duncan test, is ranking the obtained yields as following: Frankencorn (A), Kalasz (B), Betadur (C) and Arieşan (D).

Table 1

The A factor (Variety) influence on the wheat yields (Chimindia, 2007- 2009)

Variety	Yield (kg/ha)	%	Difference (kg/ha)	Significance	Duncan Test
Kalasz	3218,58	100	0	Mt.	B
Arieşan	4038,65	125,5	820,07	***	D
Betadur	3234,76	100,5	16,18	*	C
Frankencorn	2733,42	84,9	-485,16	000	A
DL (p 5%)/ DS 5%			14,94	14,92-15,74	
DL (p 1%)				22,62	
DL (p 0,1%)				36,34	

In average, in the three experimental years, through fertilization there have been obtained higher yields with very significant differences; the obtained over outputs have been situated inbetween 9,4 and 27,1% according to the fertilization scheme (table 2). Duncan test data processing tool is ranking the fertilization variants as following: on soil + in green fertilization II (E – 3651,06 kg/ha), on soil + in green fertilization I (D – 3569,86 kg/ha), in green fertilization (C – 3323,22 kg/ha) and on soil fertilization (B -3144,39 kg/ha).

Table 2

The B factor (Fertilization) influence on the wheat yields (Chimindia, 2007-2009)

Fertilization scheme	Yield (kg/ha)	%	Difference (kg/ha)	Significance	Duncan Test
Unfertilized	2873,22	100	0	Mt.	A
On soil fertilization	3144,39	109,4	271,17	***	B
In green fertilization	3323,22	115,7	450,00	***	C
On soil+in green fertilization I	3539,86	123,2	666,64	***	D
On soil+in green fertilization II	3651,06	127,1	777,83	***	E
DL (p 5%)/ DS 5%			14,17		14,19-15,72
DL (p 1%)				19,05	
DL (p 0,1%)				25,23	

Table 3

The fertilization and variety factors interraction (B x A) influence on the wheat yields (Chimindia, 2007-2009)

Variety	Fertilization scheme	Yield (Kg./ha)	%	Difference	Significance	Duncan Test
Kalasz	Unfertilized	2729,67	100	0	Mt.	C
	On soil fertilization	3044,33	111,5	314,67	***	F
	In green fertilization	3263,11	119,5	533,44	***	H
	On soil+in green fertilization I	3444,56	126,2	714,89	***	I
	On soil+in green fertilization II	3611,22	132,3	881,56	***	K
Arieşan	Unfertilized	3592,67	100	0	Mt.	JK
	On soil fertilization	3851,89	107,2	259,22	***	L
	In green fertilization	4048,22	112,7	455,56	***	M
	On soil+in green fertilization I	4296,44	119,6	703,78	***	N
	On soil+in green fertilization II	4404,00	122,6	811,33	***	O
Betadur	Unfertilized	2803,78	100	0	Mt.	D
	On soil fertilization	3084,78	110,0	281,00	***	G
	In green fertilization	3263,22	116,4	459,44	***	H
	On soil+in green fertilization I	3455,33	123,2	651,56	***	I
	On soil+in green fertilization II	3566,67	127,2	762,89	***	J
Franken	Unfertilized	2366,78	100	0	Mt.	A
	On soil fertilization	2596,56	109,7	229,78	***	B
	In green fertilization	2718,33	114,9	351,56	***	C
	On soil+in green fertilization I	2963,11	125,2	596,33	***	E
	On soil+in green fertilization II	3022,33	127,7	655,56	***	F
DL (p 5%)/ DS 5%				28,33	28,38-34,15	

DL (p 1%)	38,10
DL (p 0,1%)	50,46

Average yields on Chimindia experimental field obtained through different fertilization schemes analysis shows higher yields, with very significant differences for all the studied varieties (table 3). The highest yields were registered for Arieşan variety (on soil + in green fertilization II – 4404,00 kg/ha), and the lowest yields for Frankencorn variety (unfertilized – 2366,78 kg/ha).

Average yields analysis for the Fireteaz exeprimental field in the three experimental years shows the highest yields for Arieşan variety, differences being very significant positive compared to the witness (Kalasz variety). In the Betadur variety case there are no differences, as for Frankencorn variety, the yield differences are very significant negative (Table 4).

Table 4

The A factor (Variety) influence on the wheat yields (Fireteaz, 2007-2009)

Variety	Yield (kg/ha)	%	Difference (kg/ha)	Significance	Duncan Test
Kalasz	3334,16	100	0	Mt.	B
Arieşan	4211,09	126,3	876,93	***	C
Betadur	3323,89	99,7	-10,27	-	B
Frankencorn	2808,89	84,2	-525,27	000	A
DL (p 5%)/ DS 5%			42,12	42,07-44,38	
DL (p 1%)				63,79	
DL (p 0,1%)				102,47	

In average, in the three experimental years and the four studied varieties, through fertilization there have been obtained higher yields with very significant differences; the plus in the yields level was inbetween 7,3 and 24,9% according to the fertilization variant (Table 5). Duncan test is ranking the fertilization variants as following: on soil + in green fertilization II (E – 3765,83 kg/ha), on soil + in green fertilization I (D – 3642,67 kg/ha), in green fertilization (C – 3437,33 kg/ha) and on soil fertilization (B -3236,00 kg/ha).

Table 5

The B factor (Fertilization) influence on the wheat yields (Fireteaz, 2007-2009)

Fertilization scheme	Yield (kg/ha)	%	Difference (kg/ha)	Significance	Duncan Test
Unfertilized	3015,69	100	0	Mt.	A
On soil fertilization	3236,00	107,3	220,31	***	B
In green fertilization	3437,33	114,0	421,64	***	C
On soil+in green fertilization I	3642,67	120,8	626,97	***	D
On soil+in green fertilization II	3765,83	124,9	750,14	***	E
DL (p 5%)/ DS 5%			36,28	36,33-40,24	
DL (p 1%)				48,78	
DL (p 0,1%)				64,61	

In average, in the three experimental years, on Fireteaz experimental field, through the different fertilization variants there have been obtained higher wheat yields with very significant differences (table 6). The highest yields were registered for Arieşan variety (on soil + in green fertilization II – 4555,56 kg/ha), and the lowest yields for Frankencorn variety (unfertilized – 2477,67 kg/ha) (Table 6).

Table 6

The fertilization to variety factors interraction (B x A) influence on wheat yields (Fireteaz, 2007-2009)

Variety	Fertilization scheme	Yield (kg/ha)	%	Difference (kg/ha)	Significance	Duncan Test
Kalasz	Nefertilizat	2877,67	100	0	Mt.	CD
	Sol	3170,22	110,2	292,56	***	F
	Vegetaţie	3356,11	116,6	478,44	***	G
	Sol+vegetaţie (I)	3518,67	122,3	641,00	***	H
	Sol+vegetaţie (II)	3748,11	130,2	870,44	***	J
Arieşan	Nefertilizat	3788,67	100	0	Mt.	J
	Sol	4018,33	106,1	229,67	***	K
	Vegetaţie	4241,00	111,9	452,33	***	L
	Sol+vegetaţie (I)	4451,89	117,5	663,22	***	M
	Sol+vegetaţie (II)	4555,56	120,2	766,89	***	N
Betadur	Nefertilizat	2918,78	100	0	Mt.	D
	Sol	3144,56	107,7	225,78	***	F
	Vegetaţie	3337,33	114,3	418,56	***	G
	Sol+vegetaţie (I)	3559,33	121,9	640,56	***	H
	Sol+vegetaţie (II)	3659,44	125,4	740,67	***	I
Frankencorn	Nefertilizat	2477,67	100	0	Mt.	A
	Sol	2610,89	105,4	133,22	***	B
	Vegetaţie	2814,89	113,6	337,22	***	C
	Sol+vegetaţie (I)	3040,78	122,7	563,11	***	E
	Sol+vegetaţie (II)	3100,22	125,1	622,56	***	EF
DL (p 5%)/ DS5% DL (p 1%) DL (p 0,1%)				72,55 97,57 129,21	72,67-87,43	

CONCLUSIONS

- As regarding the fertilization variants influence on the yields there have been observed for all variants and varieties higher yield levels and positive significance compared to the witness.

- The Duncan Test comparision tool is ranking the variants in decreasing yields order as following: Ariesan variety - On soil + in green fertilization (II); Betadur variety - On soil+in green fertilization (I); Kalasz variety - On soil+in green fertilization (II); Franckenkorn - On soil+in green fertilization (I); a.s.o.
- The variety interraction on fertilization scheme is much more diversified as influence on the obtained yields and shows the overall superiority of Ariesan and Betadur varieties.
- The choise of a suitable wheat variety in compliance with the region's soil and climate conditions is a prerequisite for high and stable yields.
- The yields level depens on the technological steps, starting with the variety choise and ending with harvesting.
- ''In agriculture there have to be chosen not the most biological methods among the economic solutions, but the most economic solutions from the biological ones'' (**Papacostea, P.** 1976).