RESULTS CONCERNING THE SUSTAINEMENT OF VEGETAL PRODUCTION AND REDUCTION OF ENVIRONMENTAL IMPACT BY FOLIAR FERTILIZATION

REZULTATE PRIVIND SUSȚINEREA PRODUCȚIEI VEGETALE ȘI REDUCEREA IMPACTULUI ASUPRA MEDIULUI PRIN FERTILIZAREA FOLIARĂ

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Abstract: *The goal of the performed researches is represented by the study of physical and economical efficiency of a few fertilizing materials with stimulating effect in order to use them in the sustainable agriculture as well as their impact upon environment in the context of its protection and conservation. The foliar fertilizers used for research contain basic nutritive elements in harmonious proportion, adapted to plant consumption during different phenology phases.*

Rezumat: *Scopul urmărit prin cercetările efectuate l-a reprezentat studiul eficienței fizice* şi *economice al unor preparate de fertilizare stimulatoare în vederea folosirii acestora în agricultura durabilă, impactul acestora asupra mediului, în contextul protecției şi conservării mediului. Îngrăşămintele foliare folosite conțin elemente nutritive de bază, în proporții armonioase, adaptate consumului plantelor în diferite fenofaze.*

Key words**:** *foliar fertilization, nutritive elements, sustainable agriculture, production spore, environmental protection and conservation.*
Cuvinte cheie: *fertilizare foliară, elemente nutritive, agricultură durabilă, sporuri de producție, protecția şi conservarea mediului.*

INTRODUCTION

The actual performances of the Romanian agriculture are far to be comparable with those of European developed countries in conditions when is often sustained the fact that agricultural potential of Romania is much higher than its present realizations.

Lack or reducing of chemical and organic fertilizers quantities used in agriculture as well as usage in practice of simple crop rotations without leguminous plants affect not only the crop production, but soils fertility to which is in a systemic decrease.

The crop rotations combined with an equilibrated fertilization are considered to be one of the most important measures in order to maintain and increase the soil fertility, to fight against weeds, diseases and pests, to increase the efficiency of all others cultivation and pedo-ameliorative measures, to obtain large productions with superior quality in profitable conditions.

Applications of foliar fertilizers at field plants became a more current practice in countries with developed and performance agriculture because of their positive effect in controlling of nutritive insufficiency states, in obtaining of spore productions and decreasing of environmental loss.

MATERIALS AND METHOD

Testing of foliar fertilizers effect was made at two culture plants (maize and soybean) in fields experiments placed on the terrain of Didactic Station of USAMVB Timişoara, on a cambic chernozem, low gleyed, medium clayish-loamy/ medium clayish-loamy.

The used foliar fertilizers were formulated within the ICNCDPAPM Bucureşti and comprise a number of assortments, which have in their composition nutritive elements in

different concentrations (table 1 and 2). Taking into account their composition were established concentrations between 0,3-1%, applied in 3 treatments in an equivalent by 500 l water/ha. Experiments were carried out in 3 field repetitions and the experimental variants were randomly placed following the method of subdivided parcels.
The phytotechnical works were classic, and the obtained results are referring to the agricultural year 2007.

Table 1

Foliar fertilizers used in maize culture

Nr.	Type of foliar fertilizers	Doze (liter /ha)	Number of treatments		
			1	2	3
1	CONTROL (unfertilized) V1	0,5 % x 500 liters/ha	11.06.07	26.06.07	10.07.07
2	LECOL 60-30-30 V2	0,5 % x 500 liters/ha	11.06.07	26.06.07	10.07.07
3	LECOL 90-60-60 V3	0,5 % x 500 liters/ha	11.06.07	26.06.07	10.07.07
4	LECOL 120-60-60 V4	0,5 % x 500 liters/ha	11.06.07	26.06.07	10.07.07
5	FERTIFAM311-PP V5	1,0 %x 500 liters/ha	11.06.07	26.06.07	10.07.07
6	FERTIFAM111-PP V6	1,0 % x 500 liters/ha	11.06.07	26.06.07	10.07.07
7	X-Zn-1 V7	0.3 % x 500 liters/ha	11.06.07	26.06.07	10.07.07

Table 2

Foliar fertilizers used in soybean culture

Nr.	Type of foliar fertilizers	Doze (liter /ha)	Number of treatments		
			1	2	3
1	CONTROL (unfertilized) V1	0,0% x 500 liters/ha	11.06.07	26.06.07	10.07.07
2	LECOL 60-30-30 V2	0,5 % x 500 liters/ha	11.06.07	26.06.07	10.07.07
3	LECOL 90-60-60 V3	0,5 % x 500 liters/ha	11.06.07	26.06.07	10.07.07
4	LECOL 120-60-60 V4	0,5 % x 500 liters/ha	11.06.07	26.06.07	10.07.07
5	FERTIFAM311-PP V5	1,0 %x 500 liters/ha	11.06.07	26.06.07	10.07.07
6	FERTIFAM111-PP V6	1,0 % x 500 liters/ha	11.06.07	26.06.07	10.07.07
7	VINAFERT 1 V7	0,5 % x 500 liters/ha	11.06.07	26.06.07	10.07.07
8	VINAFERT 2 V8	0,5 % x 500 liters/ha	11.06.07	26.06.07	10.07.07

RESULTS AND DISCUTIONS

Climatically, the researched area is characterized by a multiannual temperature media by 10,8 °C and a sum of precipitations by 601 mm (table 3).

In the agricultural year 2006-2007, under aspect of thermal regime, were registered plus-deviations by 2,1 °C reported to the multiannual average. Referring only to spring-summer vegetation period of plant cultures the monthly deviations were by +1,6 ^{0}C in April, +1,7 ^{0}C in May, +2,9 ^{0}C in June, +3,0 ^{0}C in July, +1,2 ^{0}C in August, and -1,4 ^{0}C in September.

Analyzing the pluviometrical regime can be observed that in the autumn of 2006 was registered a deficit of precipitations, comparing to the multiannual average (-86,0mm). In winter (II-III) was recorded a plus of precipitations by 76,5 mm, and during vegetation period a deficit of precipitation was observed in mostly of months.

Regarding the hoeing plants, the agricultural year 2006-2007 presented favorable conditions for germinal bed preparation, seeding and plant development in first vegetation

phases. After that, a drought period followed, in the stage of grain formation and filling. Finally, the precipitations from August and September favored the appearance of diseases and determined a delay in grains maturation.

Table 3

Climatic characterization of agricultural year 2006-2007 (Whether Station Timişoara)

Month	X	XI	XII	I	II	III	IV	V	VI	VII	VIII	IX	Average
						Air temperature (°C)							
Monthly average	12,5	6,4	2,1	4,4	5,5	8,6	12,7	18,2	22,4	24,2	23,0	14,8	12,9
Multiannual average	11,1	5,8	1,2	-1,1	1,2	5,8	11,1	16,5	19,5	21,2	20,8	16,2	10,8
Deviations (+,-)	+2,4	+0,6	+0,9	+5,5	+4,3	+2,8	+1,6	+1,7	+2,9	+3,0	+1,2	-1,4	+2,1
						Precipitation (mm)							
Monthly sum	17,4	31,3	21,3	26,4	92,0	56,8	4,4	69,4	65,2	46,4	65,0	62,1	557,7
Multiannual average	42,2	49,4	52,6	39,1	38,4	33,9	46,8	63,1	79,6	62,4	51,4	42,1	601,0
Deviations (+,-)	-24,8	-18,1	-31,3	-12,7	+53,6	+22,9	-42,4	+6,3	-14,4	-16,0	+13,6	+20,0	-43,3

Researches were carried out on a cambic chernozem low gleyed, medium clayish-loamy/ medium clayish-loamy, characterized by a middle-high fertility, with pH values between 6,- ,00 in Ap horizon and 6,70 in Am horizon, which shows an acid-neutral reaction, with middle humus content (2,97), normal supplying with azote (IN=2,58), middle supplying phosphorus (35,0 ppm) and very good supplying with potassium (322 ppm) in Ap horizon. Physical and hydrophysical characteristics are influenced by the high content in clay (44,1%), by the values of apparent density (1,54 g/cm^3) and total porosity (38,65 %), which indicate a compacted soil (table 4).

Table 4

Chemical, physical and hydrophysical characteristics of the cambic chernozem low gleyed, medium clayish-loamy (medium clayish-loamy) from Didactic Station of USAMVB Timişoara

Horizon	Ap	Atp	Am	AB	BC	Cca g_1	Cca g_1	Cca g_2
Depth	0-20	20-35	35-50	50-65	65-85	85-110	110-130	130-200
pH in water	6,00	6,60	6,70	6,90	7,75	8,10	8,15	8,25
$CaCO_3$ %	-	-	-	-	0,60	15,50	17,70	10,80
Humus	2,97	2,79	2,42	2,23	1,73	0,93		
Azote index IN	2,58	2,48	2,20	2,11	1,73	0,93		
P_{AL} ppm	35,0	7,2	6,7					
K_{AL} ppm	322,0	262,3	259,8					
V_{AH} %	87,0	89,0	91,2	94,9	100	100	100	100
T me/100 g sol	29,0	30,3	29,4	28,9				
SH me/100 g sol	3,64	3,32	2,58	1,47				
Rough sand 2,0-0,2 mm	0,2	0,6	0,2	0,6	0,6	0,5	0,3	1,1
Fine sand 0,2-0,02 mm	28,2	27,0	29,6	29,6	30,7	32,2	32,5	20,1
Dust I II 0,02-0,002 mm	27,5	29,3	24,8	24,7	23,4	26,3	28,1	33,9
Clay < 0,002 mm	44,1	43,1	45,4	45,0	45,3	41,0	39,0	44,9
Physical clay	55,2	56,4	59,3	55,2	59,4	55,6	55,9	63,9
Texture	TT	TT	TT	TT	TT	TT	TT	TP
D g/cm^3	2,51	2,51	2,62	2,57				
DA g/cm^3	1,44	1,54	1,36	1,52				
PT %	41,04	38,65	48,09	40,86				
CH %	8,9	9,1	8,8	8,8				
CO %	13,35	13,65	13,20	13,20				
CC %	28,10	28,18	29,06	26,06				
CAU %	14,75	14,53	15,86	14086				

In the climatic and pedological conditions already presented, the effect of foliar fertilizers application in maize and soybean cultures was positive, expressed in significant production spores.

Table 5

Influence of foliar complex fertilizers on maize production

Nr.	Fertilization	Production	Production spore		Signification
		Average kg/ha	kg/ha	%	
1	Control variant (unfertilized)	4026	-	100	-
2	LECOL 60-30-30	4520	494	112	***
3	LECOL 90-60-60	4958	932	123	***
4	LECOL 120-60-60	5256	1230	130	***
5	FERTIFAM 111 PP	4934	908	123	***
6	FERTIFAM 311 PP	5315	1289	132	***
7	X-Zn-1	4598	572	114	***

DL 5% 191
1% 265
0,1% 366

Thus, in maize culture, the obtained production was between 4026 kg/ha in control variant and 5315 kg/ha in the experimental variant fertilized with FERTIFAM PP 311 (table 5), the production spores being comprised between 494 kg/ha and 1230 kg/ha, respectively 12% and 30 % in the case of LECOL fertilizers, 908 kg/ha and 1289 kg/ha respectively 23% and 32 % in the case of FERTIFAM PP fertilizers, by 572 kg/ha, respectively 14% in the case of X-Zn-1 fertilizers, being very significant in all experimental variants.

The maximum production spore was obtained for FERTIFAM 311 PP (1289 kg/ha), followed by LECOL 120-60-60 (1230 kg/ha). Both for LECOL and for FERTIFAM, the production spore was dependent by the increasing of nutritive elements concentration from their composition (figure 1).

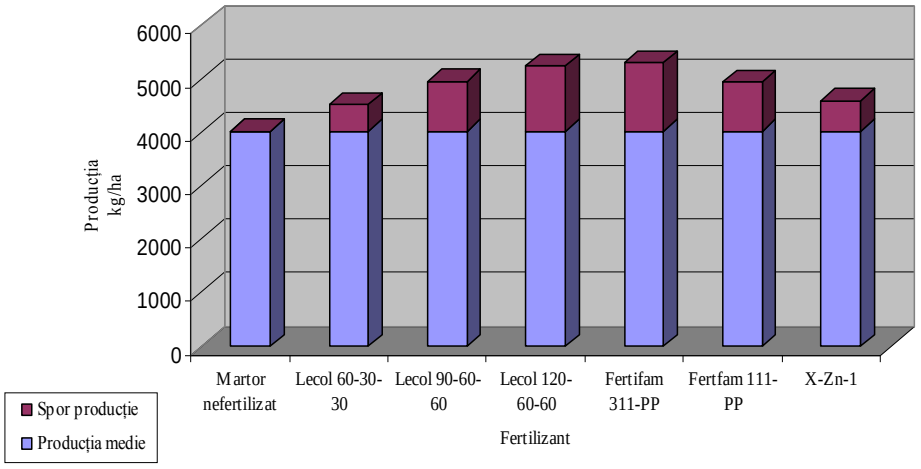

Figure 1. Production spore determined by the influence of foliar complex fertilizers in maize culture

Table 6

Influence of foliar complex fertilizers on soybean production

Nr.	Fertilization	Production Average kg/ha	Production spore		Signification
			kg/ha	%	
1	Control variant (unfertilized)	1564	-	100	-
2	LECOL 60-30-30	1769	205	113	*
3	LECOL 90-60-60	1918	354	122	**
4	LECOL 120-60-60	1954	390	125	***
5	FERTIFAM 111 PP	1893	329	121	**
6	FERTIFAM 311 PP	2026	462	129	***
7	VINAFERT 1	1942	378	124	***
8	VINAFERT 2	1878	314	120	**

DL 5% 191
1% 264
0,1% 365

In soybean culture, the obtained production was comprised between 1564 kg/ha in the control variant without fertilization and 2026 kg/ha in the variant fertilized with FERTIFAM PP 311, the production spores being between 205 kg/ha and 390 kg/ha, respectively 13% and 25 % in the case of LECOL fertilizers, 329 kg/ha and 462 kg/ha respectively 21% and 29 % in the case of FERTIFAM PP fertilizers, 314 kg/ha and 378 kg/ha respectively 20% and 24 % in the case of VINAFERT fertilizers, being significant in for the treatment with LECOL 60-30-30, distinctly significant for the treatment with LECOL 90-60-60, FERTIFAM 111 PP, VINAFERT 2 and very significant in the other experimental variants.

The maximum production spore was obtained at application of foliar fertilizer FERTIFAM 311PP (462 kg/ha), followed by LECOL 120-60-60 (390 kg/ha) and VINAFERT 1 (378 kg/ha) (figure 2).

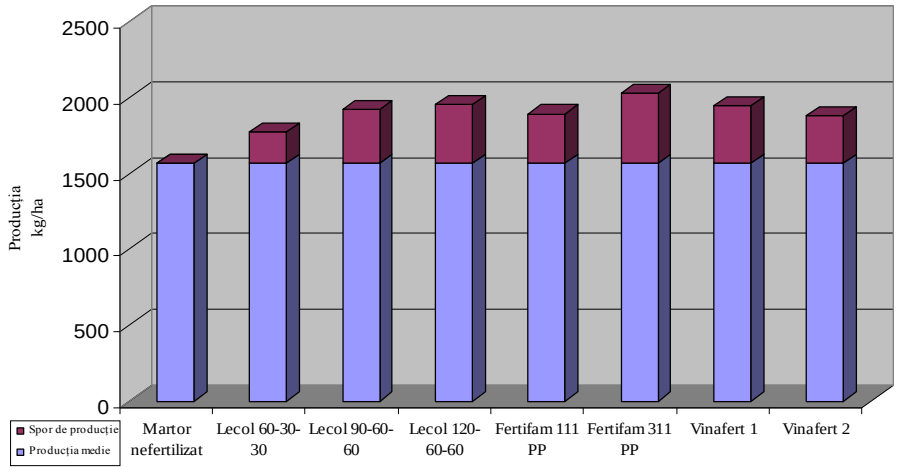

Figure 2. Production spore determined by the influence of foliar complex fertilizers in soybean culture

CONCLUSIONS

The obtained results regarding plant productions as a consequence of foliar fertilizers application show the possibility to obtain significant production spores both in maize and soybean culture.

Because the foliar fertilizers were applied in small quantities and directly on plants and because their action indirectly lead to increasing of plant assimilation capacity of nutritive elements from the soil reserve, we can conclude that the foliar fertilization represents an important mean to increase the agricultural productions in conditions of environmental protection and these can be included in the class of agrochemical measures for ecological reconstruction of degraded soils by the usage of large doses of NPK or of those poor in NPK.

These results requires to be correlated to the response that will be given by the applications of these fertilizers in other ecopedological conditions from our country, respectively in different climatic years, because the agricultural year 2006-2007 brought major problems for the spring plant cultures.

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