THE FERTILIZERS WITH CHELATE PROTEINIC SUBSTANCES WITH FOR USE IN THE ORGANIC AGRICULTURE

FERTILIZANŢI CU STRUCTURI PROTEICE CHELATANTE UTILIZABILI ÎN AGRICULTURA ECOLOGICĂ

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Abstract. *A less study domain from plant nutrition section is represented by leaf fertilization. For this reason, this paper work bring new results of some tests made using several new leaf fertilizers with chelate proteinic, some we can call ecological. Organic agriculture represents a sustainable alternative to the traditional agriculture system. To satisfy the new quality exigencies which are a necessity for modern agriculture, specialists must to develop new cultivation systems, depending on natural mechanisms, which must guarantee the environment protection. The researches followed to perform fertilizers and the agrochemical attempts on fertilizers that contain chelates proteinic substances applicable in organic agriculture. This paper refers to chemical characteristics for four experimental fertilizers and to agrochemical tests realized on soy and sunflower cultures.*

Key words: fertilizers, hydrolyzate, collagen, biostimulator, chelates.

Rezumat*. Cu scopul de a satisface noile exigente ale calitatii care sunt o necesitate pentru agricultura moderna, specialistii trebuie sa dezvolta un nou sistem de cultura tinand cont de mecanismele naturale ce garanteaza protectia mediului. Agricultura organica reprezinta o alternative sustenabila fata de sistemul classic. Fertilizarea foliara si fertilizantii aplicati folosind aceasta tehnologie, reprezinta un domeniu mai putin studiat. Din acest motiv, in aceasta lucrare, sunt prezentate rezultatele obtinute la teatarea unor noi fertilizanti cu structuri proteice chelatante cu posibilitatea utilizarii in agricultura ecologica. Cercetarile efectuate au urmarit realizarea si testarea agrochimica a unor fertilizanti ce contin hidrolizate proteice chelatante utilizabili si in agricultura ecologica. Sunt prezentate caracteristicile chimice pentru patru fertilizanti experimentali si testarile agrochimice efectuate pe culturile de soia si floarea soarelui.*

Cuvinte cheie: fertilizanţi, hidrolizat, colagen, biostimulator, chelaţi

INTRODUCTION

Romania disposes of major conditions to develop ecological agriculture as well as a favorable conjunction that would motivate this system's development, of which can be mentioned:

- Rich and productive soils that cover a significant surface of plough land;

- Soils fertilization has not reached the level in UE, registering a major decrease after 1990;
- There is the possibility to locale ecological areas, unpolluted where ecological agriculture practices can be applied;
- Traditional ecological agriculture is based on clean technologies;
- The request for ecological products is increasing offering to Romania the possibility to export such sort of products;
- Prices for ecological products are accessible and allow to increase the income for farmers.

Within the Grant Agreement 141708/2008 signed with Grant Competitive Scheme in MAPDR, have been realized activities of testing and obtaining agro-chemically fertilized solutions that contain organic chelates proteic substances.

Within the Laboratory of Testing and Fertilizers Quality Control in ICPA-Bucharest (National Research & Development Institute for Soil Sciences, Agro-chemistry and Environment Protection, Bucharest – I.N.C.D.P.A.P.M -ICPA) and the Laboratory of Fertilizers Testing of S.C. Chimro .S.R.L have been developed experiments that led to accomplishment of 4 technological process and fertilizers formulas that can be used in both in classical and ecological agriculture system, being agro-chemically tested.

The principles that were applied to determinate raw stock and to define technological process of obtaining these fertilizers were in addition to / specific to ecological agriculture standards, such as Council Regulation EEC 2092/91, Regulation CE 834/2007 regarding ecological production and ecological products labeling, Regulation (CE) 889/2008 - settles application standards of Regulation (CE) nr. 834/2007 of Council of ecological production and product labeling as well as Regulation (CE) 2003/2003 regarding classical fertilizers, that is mentioned in Anex 1 of Regulation (CE) 834/2007.

MATERIAL AND METHOD

To carry out the agro-chemical tests have been obtained in laboratory phase different extraradicular fertilizers having in their composition organic substances with stimulator role, obtained through neutral collagen. Substances with fito-stimulator role had the following composition: glycin 30 – 40 %, alanine 10 – 15 %, proline 10 – 15 %, glutamic acid 5 – 10%, hydroxyproline 5 – 10 %, aspargic acid 4 – 6 %, arginine 4 – 6 %, serine 3 – 5 %, threonine 1 – 3 %, and as essential amino-acids in significant proportions : lizine 2 – 4 %, valine 2 – 4 %, leucine 2 – 3 %, phenyalanine 1,5 – 2 %, izoleucine 1 – 1,5 %, histidine 0,7 – 1,5 %, methionine 0,2 – 0,5 %.

Carried out activities aimed:

- Compositional structures stabilization
- Experimental schemes realization at installation level in laboratory;
- Preliminary establishments of processing for access parameters;
- Control establishment on process phases and final;
- Sample creation to characterize physicochemical ;
- Sample creation to test agro-chemically;

Formulas of extraradicular fertilizers, experimentally tested and obtained in agro-chemically tests were:

- NPK type with chelates organic substances an microelements of trace elements in the array (one variant, coded “Fert 1”);

- NK type chelates organic substances and microelements introduced in the obtaining process (2 variants with chelates organic substances in 2 compositional and structural formulas coded “Fert 2” and “Fert 3”);

- N type chelates organic substances and microelements introduces in the obtaining process (one variant, coded “Fert 4”).

Experimental fertilizers have been comparatively tested with one unfertilized and foliar witness (M0), 2 witnesses – certificate fertilizers as “ECO” (ECO 1R and ECO 2F) and one witness represented of one classic extraradicular fertilizer of NPK type with microelements in which have been introduced and hydrolisated proteic (MO F, experiments ruled on Soya). Agro-chemically experiments were carried out in the House of Vegetation of I.N.C.D.P.A.P.M. – ICPA Bucharest using pots of Mitscherlich type with 20 kg of sol. Agro-chemically experiments were carried out of sunflower, Justin category, on mold vermouth soil type with: 3,18 – 3.55 % humus, 0.18 – 0.26 % azote, mobile phosphor (P in AL) 37.6 – 138 ppm, with mobile potassium (K in AL) 199 – 364 ppm and an alkaline pH of 8.0 – 8.2 units of pH. There have been created 14 types / variants of 4 repetitions, with 3 plants each, of which 2 plants have been kept for agro-chemically experiments.

Experimental fertilizers were applied as concentration solution of 1%, in quantities of 30 ml/pot in number of 3 treatments at intervals of 10-15 days.

After 15 days from last application one repetition of all variants has been sacrificed and from whole plant (excepting the radicular system) chemical analyses were conducted for: N, P, K and microelements. At the end of vegetation and after the appreciation of production parameters on the medium sample of seeds from the 3 repetitions remained in vegetation, have been carried out the analysis of chemical elements and oil. The agro-chemical experiments on Soya culture, Columna category, have been carried out on mold bill, medium fertilized and with a high composition of argil (30 – 35%): humus 3.5%, total azote (N) 0,170%, mobile phosphor (P) 50 ppm, mobile potassium (K) 300 ppm, V 81(%) and pH: 6,2 – 6.4.

There have been created 10 variants of 3 repetitions each, of 3 plants / pot. The experiments have been realized on and unfertilized agro-fond, as well and on high fertilized agro-fond, realized with NPK (15.15.15) fertilizer.

Experimental fertilizers were applied as solution in concentration of 1% in quantities of 30ml/ pot, in a number of 3 treatments in periods/intervals of 10-15 days.

RESULTS AND DISCUSSIONS

The usage of some proteic substances that contain proteins, protides and free amino acids into a complex array with macro and micro chelates elements leads to the achievement of stabile fertilizers solutions, from physical and chemical point of view.

Except the role of chelates, the used proteic hydrolysate plays the role of protective colloid which helps to maintain the stability of the fertilizer; and through the components with molecular weight of aprox. 14000 Da forms at the surface of plant tissue some sort of films.

These films have the capacity to waste in time chelates micro-elements of the collagen polypeptide, acting as a hydrophilic protector at environment factors and as well as fitostimulator.

In the case of the experiments carried out on sunflower culture, Justin Category, cultivated in vegetation pots, at the end of the culture and after the

appreciation of production parameters, of average seeds sample of the 3 repetitions remained in vegetation has been carried out the analysis of chemical elements involved and oil.

Results of agro-chemical testing of fertilizers on sunflower, and also the results of the analysis crried out of plant sample, seeds after the vegetation cycle ends are presented in 1 to 3 figures.

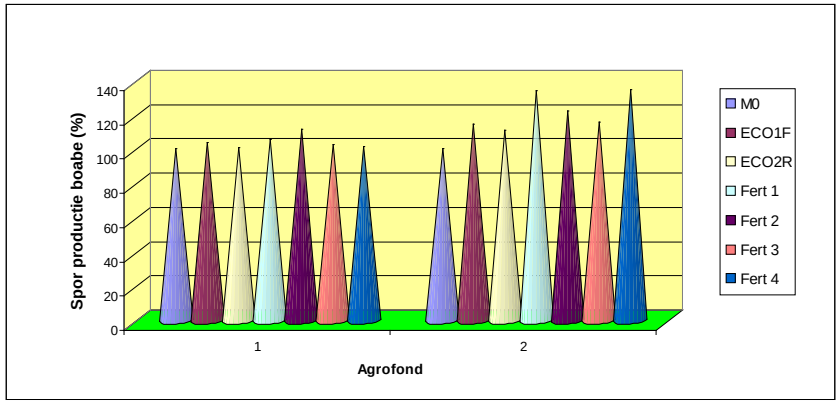

Fig.1. The evolution of production elements depending on the extraradicular fertilization applied to sunflower, Justin category (1 – without base fertilization, 2 – with base fertilization)

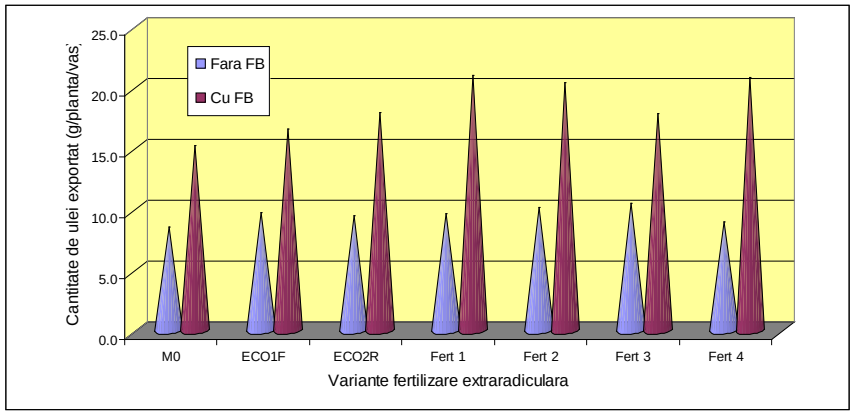

Fig. 2. The quantity of oil exported by crop depending on extraradicular fertilization applied to sunflower, variety Justin (with and without base fertilization)

Increased production level of sunflower for the experimented variants on an agro-fond without base fertilization have been with 1% (ECO 2R) up to 15,5% (Fert 2) higher than the extraradicular unfertilized witness (M0) and evolved ascending in the following order : ECO R2, Fer 4, Fert 3, ECI 1F, Fert 1, Fert 2. In the case of the experiments carried out on an agro-fond with base fertilization, increased production levels towards the M0 witness have been higher with 10.7% (ECO 2R) and up to 31,9% (Fert 4) and evolved ascending as follows: ECO 2R, ECO 1F, Fert 3, Fert 2, Fert 1 and Fert 4. The data analysis obtained in the case of oil culture export, indicated the fact that

this is with 1.7 up to 2.3 times higher that in the cases of experiments carried out on an agro-fond with base fertilization towards the unfertilized one. Oil content (g/plant/pot) situated between 8.9 (Fert 4) and 10.4 (Fert 3), for the experiment carried out on unfertilized agro-fond and 16.6 (ECO 1F) and 21.0 (Fert 4 and Fert 1). Oil content exportet through the extraradicular fertilizers application towards the foliar unfertilized witness (M0) has been higher with 4.8 4.8 ÷ 22.4%, in case of unfertilized variants and with 9.0 ÷ 37.7% for fertilized variants.

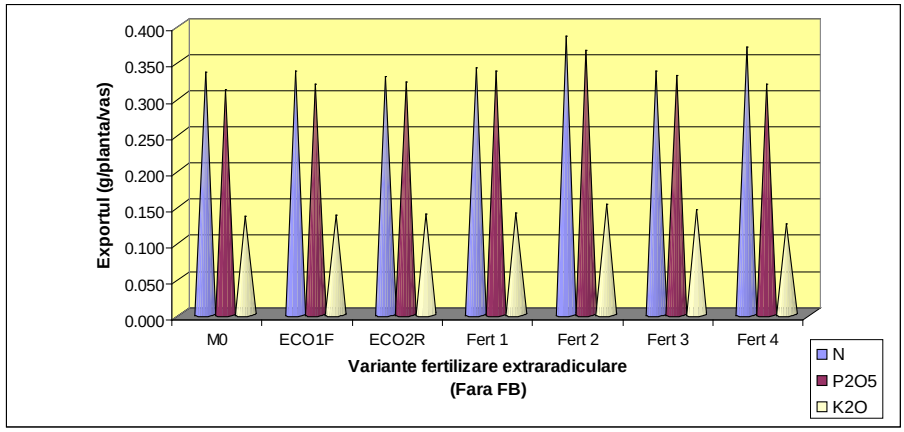

Fig. 3. Macronutrient export (N, P, K) depending on the version of radicular fertilization applied to sunflower, Justin Variety (without base fertilization)

For fertilized variants applied extraradicular to sunflower cultivated on an unfertilized agro-fond, export of macronutrients with seeds production, situated between 0.328 ÷ 0.383 g N/plant (ECO 2R ÷ Fert 2), 0.317 ÷ 0.365 g P/plant (Fert 4 ÷ Fert 2) and, respectively 0.125 ÷ 0.151 g K/plant (Fert 4 ÷ Fert 2). In case of carried out experiments to sunflower cultivated on an fertilized agro-fond the export of nutrients towards the extraradicular unfertilized witness has situated between 8.4 ÷ 36.5% N (ECO 2R ÷ Fert 4), 10.2 ÷ 35.7% P (ECO 2R ÷ Fert 1, Fert 4) and , respectively 8.3 ÷ 31.4 % K (ECO 2R ÷ Fert 4). In case of experiments to sunflower cultivated on an unfertilized agro-fond, it has been observed that the experimented fertilizer Fert 2 provides the highest export of macronutrients (N, P, K).

The results of agrochemical testing of fertilizers on Soya culture, Columna category, after the vegetation cycle ends are presented in figures no. 4. For Soya culture, Columna type, the extraradicular fertilization provided high levels of production till 18.7% towards the unfertilized foliar witness M0. The evolution of all levels of production has been increasingly as follows: Fert 3 (2.2%), Fert 1 (3.3%), Fert 2 (7.2%) and M0F (18.7%). The spore production registered in case of M0F variant can be applied through the presence of substances with stimulation properties as well as for the complex matrix NPK with a high content of macro and micro element towards the fertilizers from Fert range. The export of macronutrients towards the mM0 witness for M0F variant is higher with 15.2% in case of azote, 25,4% for phosphor and 25.7 for potassium.

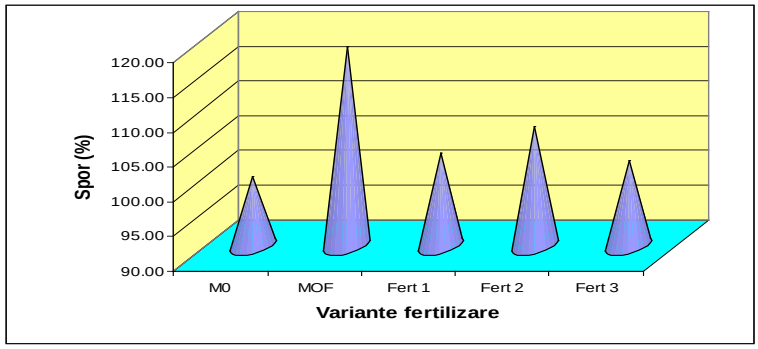

Fig. 4. The evolution of spore production (%) depending on the fertilization variant (bean Soya, Columna category)

CONCLUSIONS

1. In case of agro-chemicals experiments it has been found one evolution descendent of spore beans production in the next order: M0 F (18.7%), Fert 2 (7.2%), Fert 1 (3.3) and Fert 3 (2.2%); maximum spore obtained with extraradicular fertilizer is below 40% in comparison to the one realized with M0 F witness..

2. Macronutrients export N, P, K towards the M0 witness for the experiments realized on Soya culture has an ascending evolution as follows: Fert 3 (4 – 4.5% for potassium and phosphor), Fert 1 (7 – 9% for phosphor and potassium and 1% for azote), Fert 2 (11 – 14.6% for potassium and phosphor and 4.4 % for azote) and M0 F (26.7 – 25.4% for potassium and phosphor and 15.2% for azote).

3. In case of sunflower experiments for the unfertilized variants has been found an ascending evolution of spore beans production in the next order : ECO 2R (0.6 %), Fert 4 (1.2%), Fert 3 (2.4 %), ECO 1F (3.6 %), Fert 1 (5.5 %) and Fert 2 (11.5%), and in case of experimental variants on maximum spore fertilized agro-fond it has been found with extraradicular fertilizers Fert 1, Fert 4 with 33.8 % respectively 34.9%, followed by Fert 2, Fert 3 cu 22.1% and respectively 15.7 %.

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