THE INFLUENCE OF BIO-EFFECTORS ON OIL SEED RAPE, WINTER WHEAT, SUN-FLOWER AND MAIZE CROP PRODUCTION

C.G. FORA, S. STANCIU, Mihaela MOATĂR, C. BANU, Carolina ŞTEFAN

Banat's Univerity of Agricultural Sciences and Veterinary Medicine "Regele Mihai I al României" from Timişoara, Romania
Address: Timişoara, Calea Aradului Str., no. 119, E-mail: foraciprian@yahoo.com

Abstract: *The trial was conducted during 2014 in didactic/experimental field Voiteg (Romania), to evaluate the effect of bio-effector products on crop production in oil seed rape, winter wheat, sun-flower and maize. Bio-effector Amagerol was jointly applied with different foliar fertilizers and pesticides. The experimental design consisted as randomized block design in four replications. Used combinations demonstrate high efficacy, especially in oil seed rape with 30% in average, in winter wheat with 26% in average, and just 9% in average to sun-flower or 4% in average to maize, compared with untreated plants.*

Key words: bio-effectors, efficacy, crop production

INTRODUCTION

In accordance with minutes of the 6th International Symposium Plant Protection and Plant Health in Europe (2014), bio-effectors is a "viable microorganism or active natural compounds which directly or indirectly affects plant performance (bio-fertilizer), and thus has the potential to reduce fertilizer and pesticide use in crop production". In this line we consider Amalgerol as a bio-effector because it is described by producers as organic product, a bio-stimulator/bio-fertilizer, with effect on plant performance by influencing the functional activation of biological mechanisms, particularly those interfering with soil-plant-microbe interactions.

Bio-fertilizers could have significant role in sustainable agro-ecosystems, because they help to maintain soil fertility (WU et al., 2005), and can contribute to yield increase (GOULD, 1990).

Applying foliar fertilizers, independently or together with pesticides, allow increasing the economic effect of mineral fertilization, to reduce the environment risk of pollution by reducing the rates of nutrients (TEJADA AND GONZALEZ, 2003). This work was conducted to investigate the effect of bio-effector Amalgerol together with foliar fertilizers and pesticides on the crop production in oil seed rape, winter wheat, sun-flower and maize.

MATERIAL AND METHODS

Soil in didactic/experimental field Voiteg is cambic chernozem, light gleyed, mezocalcaric.

To oil seed rape culture, soil was prepared in 07.09.2013, with heavy disk at 20-25 cm depth. After that soil was prepared with combinator, shortly before sowing the oil seed rape. In 09.09.2013 sowing of oil seed rape was done with standard machinery. Oil seed rape variety was Pollen (Procera). Before preparing the soil for sowing we used chemical fertilizers in dosages: 135 kg/ha 16N:48P:0K. In winter time, 12.02.2014, culture was fertilized with urea 200 kg/ha in equivalent of 92 N active substance/ha. Oil seed rape variants were:
Variant 1: Untreated/Control

Variant 2: Riza 25 EW 1l/ha + Amalgerol 3 l/ha + Zoom 2l/ha
Variant 3: Riza 25 EW 1l/ha + Amalgerol 4 l/ha + Zoom 2l/ha
Variant 4: Riza 25 EW 1l/ha + Amalgerol 5 l/ha + Zoom 2l/ha
Variant 5: Riza 25 EW 1l/ha + Amalgerol 3 l/ha + Bo-La 1l/ha
Variant 6: Riza 25 EW 1l/ha + Amalgerol 3 l/ha + Sulphur Headland 5l/ha

Plot size was 24 m^2 (12 m length and 2 m width). Application date of products was in 30.10.2013 and 29.03.2014. Harvest was done with Hege Harvester with working width of 2 m in 05.07.2014.

To winter wheat culture, soil was prepared in 07.09.2013, with heavy disk at 20-25 cm depth. After that soil was prepared with disk harrow, shortly before sowing the winter wheat. In 10.10.2013 sowing of winter wheat was done with standard machinery. Winter wheat variety was Alex (SCDA Lovrin). Before preparing the soil for sowing we used chemical fertilizers in dosages: 135 kg/ha 16N:48P:0K. In winter time, 12.02.2014, culture was fertilized with urea 200 kg/ha in equivalent of 92 N active substance/ha. Winter wheat variants were:

Variant 1: Untreated/Control
Variant 2: Pelican Delta 606 WG 100 g/ha + Impact 25 SC 0.5 l/ha + Vantex 60 CS 100 ml/ha + Vertex Hi/N 34 3 l/ha
Variant 3: Pelican Delta 606 WG 100 g/ha + Impact 25 SC 0.5 l/ha + Vantex 60 CS 100 ml/ha + Hi-Phos Headland 5 l/ha
Variant 4: Pelican Delta 606 WG 100 g/ha + Impact 25 SC 0.5 l/ha + Vantex 60 CS 100 ml/ha + Amalgerol 3 l/ha
Variant 5: Pelican Delta 606 WG 100 g/ha + Impact 25 SC 0.5 l/ha + Vantex 60 CS 100 ml/ha + Microcereals 1 l/ha
Variant 6: Pelican Delta 606 WG 100 g/ha + Impact 25 SC 0.5 l/ha + Vantex 60 CS 100 ml/ha + Foliar Extra 3 l/ha

Plot size was 24 m^2 (12 m length and 2 m width). Application date of products was in 29.03.2014. Harvest was done with Hege Harvester with working width of 2 m in 05.07.2014.

To sun-flower culture, soil was prepared in 25.09.2013, with plow at 30-35 cm depth. In spring, shortly before sowing soil was prepared with Grubber at 20-25 cm depth. In 10.04.2014 sowing of sun flower was done with standard machinery. Sun-flower variety was P64LE19 (Pioneer). Before preparing the soil for sowing we used chemical fertilizers in dosages: 200 kg/ha 15N:15P:15K. Sun-flower variants were:

Variant 1: Untreated/Control
Variant 2: Pelican 500 250 ml/ha (pre-emergent) + Amalgerol 5 l/ha
Variant 3: Pelican 500 250 ml/ha (pre-emergent) + Pantera 2 l/ha (post-emergent) + Amalgerol 4 l/ha
Variant 4: Pelican 500 250 ml/ha (pre-emergent) + Amalgerol 3 l/ha + Bo-La 1 l/ha + KTS 3 l/ha
Variant 5: Pelican 500 250 ml/ha (pre-emergent) + Pantera 2 l/ha (post-emergent) + Amalgerol 3 l/ha + Hi-Phos Headland 3 l/ha

Plot size was 30 m^2 (10 m length and 3 m width). Application date of products pre-emergent was in 10.04.2014 and post-emergent in 14.05.2014. Harvest was done with Hege Harvester with working width 1 row in 19.09.2014.

For maize culture soil was prepared in 30.09.2013, with plow at 30-35 cm depth. In spring, shortly before sowing soil was prepared with Grubber at 20-25 cm depth. In 04.04.2014 sowing of maize was done with standard machinery. Maize variety was Cera 270 (Procera).

Before preparing the soil for sowing we used chemical fertilizers in dosages: 200 kg/ha 15N:15P:15K. Maize variants were:

Variant 1: Untreated/Control
Variant 2: Guardian 2.5 l/ha (pre-emergent) + Innovate 240 SC 250 ml/ha + Amalgerol 2 l/ha
Variant 3: Guardian 2.5 l/ha (pre-emergent) + Innovate 240 SC 250 ml/ha + Amalgerol 3 l/ha
Variant 4: Guardian 2.5 l/ha (pre-emergent) + Innovate 240 SC 250 ml/ha + Amalgerol 3 l/ha + Micro-Maize 1 l/ha
Variant 5: Guardian 2.5 l/ha (pre-emergent) + Innovate 240 SC 250 ml/ha + Amalgerol 4 l/ha + Micro-Maize 1 l/ha
Variant 6: Guardian 2.5 l/ha (pre-emergent) + Innovate 240 SC 250 ml/ha + Amalgerol 5 l/ha + Micro-Maize 1 l/ha

Plot size was 30 m^2 (10 m length and 3 m width). Application date of products pre-emergent was in 04.04.2014 and post-emergent in 24.05.2014. Harvest was done with Hege Harvester with working width 1 row in 20.09.2014.

After harvest, crop production provided from all plots was weighed, was determined moisture and was calculated standard weight.

Statistical interpretation of the results were obtained by analysis of variance using Excel program.

RESULTS AND DISCUSSIONS

Oil seed rape statistically checked best variant (significant differences in comparison with others) was variant 6 (Riza 25 EW 1l/ha + Amalgerol 3 l/ha + Sulphur Headland 5l/ha). This variant can be recommended for practice. Variant 4 (Riza 25 EW 1l/ha + Amalgerol 5 l/ha + Zoom 2l/ha) ensure significant differences to, but plants from variant 6 was more healthy and vigorous in comparison with plants from variant 4. Increasing of yield in case of variant 4 seems to be the effect of maximum dozes of Amalgerol and not Zoom. The other variants were no significant differences. Yield recorded, in case of oil seed rape, is presented in figure 1.

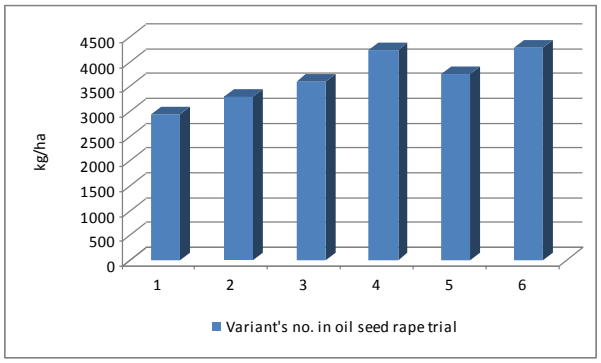

Figure 1. The yield of oil seed rape in experimental year 2014

On winter wheat in 2014 because humidity was more than usual in May, all diseases was found especially *Blumeria* graminis, *Septoria tritici*, *Puccinia striiforimis*. Because plants were recumbent by wind, assessment of diseases shows no significant differences between

variants and yield was strongly affected. The same situation was in case of pests like *Lema melanopa* larva. Yield recorded is presented in figure 2.

In winter wheat trial, results show significant differences in comparison with untreated variant in case of variant 4 (Pelican Delta 606 WG 100 g/ha + Impact 25 SC 0.5 l/ha + Vantex 60 CS 100 ml/ha + Amalgerol 3 l/ha). That underlines the fact that this combination was the best in comparison with all others. Important is the optimum moment of application (29.03.2014) in winter wheat BBCH stage between 31 (first node at least 1 cm above tillering node) - 33 (Node 3 at least 2 cm above node 2).

In conclusion, Pelican Delta 606 WG 100 g/ha + Impact 25 SC 0.5 l/ha + Vantex 60 CS 100 ml/ha + Amalgerol 3 l/ha, can be recommended to be applied in BBCH stages 31-33 of winter wheat (in spring).

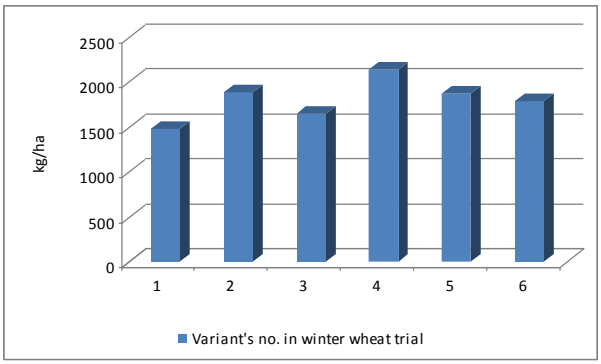

Figure 2. The yield of winter wheat in experimental year 2014

Positive effect, but not significant differences, shows variants 2 (Pelican Delta 606 WG 100 g/ha + Impact 25 SC 0.5 l/ha + Vantex 60 CS 100 ml/ha + Vertex Hi/N 34 3 l/ha) and 5 (Pelican Delta 606 WG 100 g/ha + Impact 25 SC 0.5 l/ha + Vantex 60 CS 100 ml/ha + Microcereals 1 l/ha). Negative effect, but not significant differences, shows variants 3 (Pelican Delta 606 WG 100 g/ha + Impact 25 SC 0.5 l/ha + Vantex 60 CS 100 ml/ha + Hi-Phos Headland 5 l/ha) and 6 (Pelican Delta 606 WG 100 g/ha + Impact 25 SC 0.5 l/ha + Vantex 60 CS 100 ml/ha + Foliar Extra 3 l/ha).

In sun-flower trial visual assessment was done on plants in different variants. At 6 weeks after treatments were no significant differences between variants by the point of view of plant size. In 27.06.2014 was made an assessment of flowering and can be observed that an advance of flowering at variant 3 and 4. In 15.07.2014 flowering comes to end. Main diseases in this year were *Phomopsis helianthi* and *Phoma macdonaldi*, especially in untreated variant. Yield recorded is presented in figure 3.

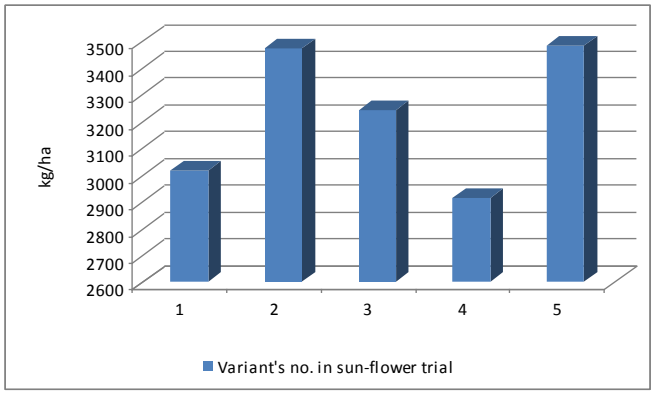

Figure 3. The yield of sun-flower in experimental year 2014

In sun-flower positive distinct significant differences (DL=1%) was obtained, in comparison with other variants, in variant 5 (Pelican 500 250 ml/ha (pre-emergent) + Pantera 2 l/ha (post-emergent) + Amalgerol 3 l/ha + Hi-Phos Headland 3 l/ha) and 2 (Pelican 500 250 ml/ha (pre-emergent) + Amalgerol 5 l/ha). Between this to variants differences was practically unobserved. Economically speaking, variant 2 is chipper than variant 5 and can be recommended. The moment of application was at 3-4 (BBCH 13-14) sun flower leafs. Positive significant differences was obtained even with variant 3 (Pelican 500 250 ml/ha (pre-emergent) + Pantera 2 l/ha (post-emergent) + Amalgerol 4 l/ha). No significant differences was obtain with variant 4 (Pelican 500 250 ml/ha (pre-emergent) + Amalgerol 3 l/ha + Bo-La 1 l/ha + KTS 3 l/ha). In comparison with untreated shown low yield, possible caused by interactions between Bo-La and KTS.

In maize visual assessment was done on plants in different variants. No significant differences were observed between variants by the point of view of plant size, vigurosity, fructification. By the point of view of yield no statistically significant differences was observed between variants. Yield recorded is presented in figure 4.

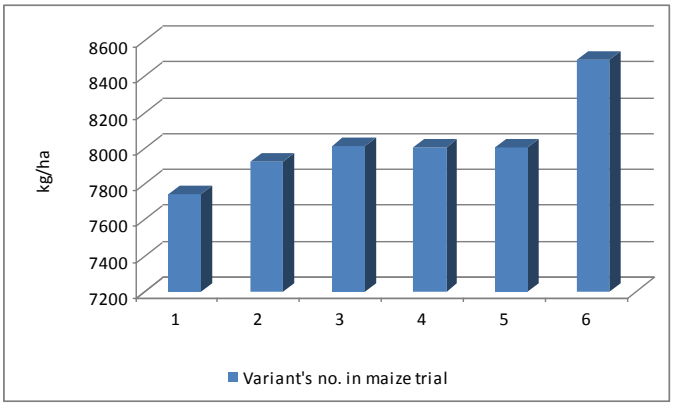

Figure 4. The yield of oil seed rape in experimental year 2014

In contrast with our results, Kalinova et al. (2014), found high efficiency under unfavorable climate conditions during maize vegetation, if they used Amalgerol in addition to foliar products Cereal mix.

CONCLUSIONS

In accordance with results from field trials, it can be formulated next conclusions: on oil seed rape culture Riza 25 EW 1l/ha + Amalgerol 3 l/ha + Sulphur Headland 5l/ha shown very good effect on yield applied in autumn and spring; on winter wheat culture Pelican Delta 606 WG 100 g/ha + Impact 25 SC 0,5 l/ha + Vantex 60 CS 100 ml/ha + Amalgerol 3 l/ha shown very good effect on yield applied in BBCH 31-33, in spring; on sun-flower culture Pelican 500 250 ml/ha (pre-emergent) + Amalgerol 5 l/ha applied in BBCH 13-14, shown very good effect on yield and is more economically than other variant with similar effect; on maize culture an explanation for no significant differences can be the moment of application which can be tasted for future in different BBCH maize growth stages.

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