

WHEAT CROPS PROTECTION AGAINST HARMFUL ORGANISMS USING CHEMICAL TREATMENT OF SEED

Elena TROTUȘ^{1*}, Margareta NAIE¹, Alexandra-Andreea BUBURUZ¹,
P. ZAHARIA²

*E-mail: scdasec@scda.ro ; etrotus@yahoo.com

Received March 15, 2011

ABSTRACT - In the conditions of the central area of Moldavia, losses in quantitative and qualitative wheat productions are determined by pathogen agents which are transmitted by groundside and seed, like *Fusarium sp.* and *Tilletia tritici*, but also by some soil pests like the wire worms (*Agriotes sp.*) and the hunchback bug (*Zabrus tenebrioides*). The prevention or decreasing of the attacks was achieved in the conditions of the Agricultural Research and Development Station (ARDS) of Secuieni, Neamț county, Romania, by the chemical treatment of the seed using a range of insectofungicides (Yunta 246 FS, Nuprid Max, Austral Plus Net, Lamardor + Gaucho, Yunta Quattro, Yunta Succesor, Alios 300 FS). The experienced insectofungicides insured a good plant protection against the attack of *Agriotes sp.*, the plants frequency at the untreated variant was 6.37% and between 0.77% and 1.42% at the treated variants, and against *Zabrus tenebrioides* species, the frequency of damaged plants at the untreated variant was 1.76%, compared

with 0.16% and 0.54% at the treated variants. Differences statistically insured were registered also in the attack produce by *Fusarium sp.* and *Tilletia tritici*, between the treated variants with the experimented insectofungicides and the untreated variant. The experienced insectofungicides in the seed treatment haven't influence in the negative way on the seed germination, plants growth, development of plants root system as well as plants fraternally; between the treated variants and the untreated variant have been registered differences statistically insured in all the made biometric observations. The good protection, insured by the experienced insectofungicides, had a positive influence on the wheat production to hectare which was 4852 kg/ha in the untreated variant and between 5225 kg/ha and 5930 kg/ha in the treated variants; the production differences between the treated variants and untreated variant were statistically insured.

Key words: Insectofungicides; Pathogen agents; Pests; Production; Wheat.

¹ Agricultural Research and Development Station of Secuieni, Neamț County, Romania

² University "Petre Andrei" of Iași, Romania

REZUMAT. Protecția culturilor de grâu împotriva organismelor dăunătoare prin tratamentul chimical al seminței. În condițiile din centrul Moldovei, pierderi cantitative și calitative la grâu sunt produse de agenți patogeni, care se transmit prin sol și sămânță, precum *Fusarium sp.* și *Tilletia tritici*, dar și de unii dăunători de sol, cum sunt viermii sârmă (*Agriotes sp.*) și gândacul ghebos (*Zabrus tenebrioides*). Prevenirea sau diminuarea atacurilor s-a realizat, în condițiile de la S.C.D.A. Secuieni-Neamț, prin tratamentul chimic al seminței, utilizând o gamă de insectofungicide (Yunta 246 FS, Nuprid Max, Austral Plus Net, Lamardor + Gaucho, Yunta Quattro, Yunta Succesor, Alios 300 FS). Insectofungicidele experimentate au asigurat o protecție bună a plantelor împotriva atacului viermilor sârmă (*Agriotes sp.*), frecvența plantelor la varianta martor netratată a fost de 6,37% și cuprinsă între 0,77% și 1,42% la variantele tratate, și împotriva speciei *Zabrus tenebrioides*, frecvența plantelor atacate la varianta martor netratată fiind de 1,76%, comparativ cu valorile cuprinse între 0,16% și 0,54% la variantele tratate. Diferențe asigurate statistic s-au înregistrat și în ceea ce privește atacul produs de *Fusarium sp.* și *Tilletia tritici*, între variantele tratate cu insectofungicidele experimentate și varianta martor netratată. Insectofungicidele experimentate în tratamentul seminței nu au influențat negativ germinația semințelor, creșterea plantelor, dezvoltarea sistemului radicular al plantelor, precum și înfrățirea plantelor; între variantele tratate și varianta martor netratată s-au înregistrat diferențe asigurate statistic la toate observațiile biometrice efectuate. Protecția bună, asigurată de insectofungicidele experimentate, a influențat pozitiv producția de grâu la hectar, care a fost de 4852 kg/ha la varianta martor netratată, fiind cuprinsă între 5225 kg/ha și 5930 kg/ha la variantele tratate; diferențele de producție dintre variantele tratate și varianta martor netratată au fost asigurate statistic.

Cuvinte cheie: agenți patogeni; dăunători; grâu; insectofungicide; producție.

INTRODUCTION

In the conditions of the central area of Moldavia losses in quantitative and qualitative wheat crops are produced by pathogen agents, that are transmitted by soil and seed, and by soil pests. Growing on large areas, in monoculture or after other cereals, of wheat crops has favored, in recent years, the infestation of lands with larvae of *Agriotes sp.* (wire worms) and hunchback beetle (*Zabrus tenebrioides*), but also intensified the attack of common smut (*Tilletia tritici*) and fusarium (*Fusarium sp.*) (Bărbulescu *et al.*, 2002; Cană *et al.*, 2010).

Achieve high – quality crops, in terms of minimized costs, can be realized only by applying improved specific technologies, to allow a higher recovery of natural resources and inputs (Popov *et al.*, 2010; Trotuș *et al.*, 1998; Trotuș and Sirițanu, 2007). Using the seed treatment method, initiated in 1965, represents a particular component in sustainable agriculture perspective, answering perfectly to the concept grain treated – healthy plant (Bărbulescu and Popov, 2001). Thus permanent required to improve chemical control technology by introducing new insecticides or insectofungicides products, with all the best qualities of effectiveness, but also for reducing the ecotoxicological

WHEAT CROPS PROTECTION AGAINST PESTS

risk and environmental pollution (Popov *et al.*, 1998, 2007, 2008).

In this paper we present the results obtained in preventing the attacks of pathogen agents that are transmitted by soil and seed and the attacks of soil pests, by the chemical treatment of wheat seed with new insectofungicides.

MATERIALS AND METHODS

The experiments were performed at ARDS Secuieni during 2006 – 2010 and were placed on a typical chernozem cambic soil with 6.29 pH, 2.1 nitrogen index, P₂O₅ 39 ppm P₂O₅ mobile, 161 K₂O mobile. The land on which were placed the experiences was infested with larvae of *Agriotes* genus, the average density ranged between 6 – 8 specimens/sqm and with *Zabrus tenebrioides* species whose density was more reduce 1 to 3 specimens/sqm.

In all the years of experimentations, the pre – plant was the wheat monoculture, the tillage and seedbed preparations were made under the wheat cultivation technology for the conditions of the central area of Moldavia. The sowing was effectuated in the optimum sowing time, the wheat variety used in the experiment was Crina.

The seed has been treated with experimental insectofungicides, the sowing was done with SEA8 experimental field seeder. The experiments were placed after the randomized block method in four repetitions, the experimental area plot was 10 square meters. From the treated and untreated (control) seed were retained 0.5 kg of each variant was examined in the laboratory under the terms of the

influence of experimented insectofungicides on the average germination time (AGT).

Observations and measurements were made in the field, from plant emergence to adulthood and were as follows: determining the frequency of plant attacks caused by wire worms and hunchback beetle from emergence and into winter; determining the frequency of plant attacks caused by *Fusarium* sp. until 3 – 5 leaves stage; collecting samples of plants (100 plants/variant in four repetitions) and making biometric observations in order to know the influence of the tested insecticides in seed treatment on plants growth and development; determining the frequency of *Tilletia tritici* attack; recording the production.

Data from performed notaries were calculated statistically, using the variance analysis.

RESULTS AND DISCUSSION

The experienced insectofungicides in the chemical treatment of wheat seeds have provided a good protection of plants against the attack of soil pests and pathogen agents that are transmitted by soil and seed as follow:

- the average frequency of the attack produced by larvae of *Agriotes* genus was 6,37% at the untreated control and from 0.77% (Yunta Succesor – 1.6 l/t seed) to 1.42% (Nuprid Max – 2.5l/t seed); the differences in the attack frequency between the treated and untreated variants were highly significant negative (*Table 1*);

Table 1 - The influence of some insectofungicides applied in seed treatment in the pests and pathogen agents attack and on the wheat production , Secuieni, Neamț county, 2006-2010

| No. | Experimental variant | Dose, l/t | F%, attack | | | F%, attack | | Production | | Sign. |
|-----|-----------------------------|------------|--------------|---------------------|--------------|--------------|-------|------------|---------------------------|--------------|
| | | | Agriotes sp. | Zabrus tenebrioides | Fusarium sp. | Tilletia sp. | kg/ha | % | Dif. to unt. var. , kg/ha | |
| 1. | Untreated variant (control) | - | 6.37 | 1.76 | 2.36 | 1.29 | 4852 | 100 | unt. control | unt. control |
| 2. | Yunta 246 FS (STD) | 2.5 | 0.89 | 0.16 | 0.2 | 0.0 | 5935 | 122 | 1063 | XXX |
| 3. | Nuprid max | 2.5 | 1.42 | 0.34 | 0.4 | 0.0 | 5471 | 113 | 619 | XXX |
| 4. | Austral plus net | 5.0 | 1.36 | 0.39 | 0.42 | 0.0 | 5225 | 108 | 373 | XXX |
| 5. | Lamardor + Gaucho | 0.15 + 0.6 | 0.93 | 0.23 | 0.21 | 0.0 | 5930 | 122 | 1078 | XXX |
| 6. | Yunta Quattro | 1.6 | 0.81 | 0.19 | 0.18 | 0.0 | 5920 | 122 | 1068 | XXX |
| 7. | Yunta Sucesor | 1.6 | 0.77 | 0.21 | 0.16 | 0.0 | 5926 | 122 | 1074 | XXX |
| 8. | Alios 300 FS | 0.15 | 1.03 | 0.54 | 0.38 | 0.0 | 5630 | 116 | 778 | XXX |
| | DL 5% - | | 0.49% | 0.34% | 0.30% | | | | | 340 kg/ha |
| | DL 1% - | | 0.97% | 0.79 | 0.45 | | | | | 515 |
| | DL 0.1% - | | 1.83 | 1.14 | 0.90 | | | | | 825 |

WHEAT CROPS PROTECTION AGAINST PESTS

Table 2 - The influence of some insecticides applied to wheat seed treatment on seed germination, Secuieni, Neamț county, 2006 – 2010

| No. | Experimental variant | Dose, l/t | Germination, % | | | | | | AGT |
|-----|-----------------------------|-----------------|----------------|----------------|-----------|--------|----------------|-----------|------|
| | | | 4 days | | | 7 days | | | |
| | | | P, % | Dif. unt. var. | Sign. | P, % | Dif. unt. var. | Sign. | |
| 1. | Untreated variant (control) | - | 90 | unt. var. | unt. var. | 93 | unt. var. | unt. var. | 4.02 |
| 2. | Yunta 246 (std) | 2.5 | 91 | 1 | - | 97 | 4 | XXX | 4.18 |
| 3. | Nuprid Max | 2.5 | 90 | 0 | - | 97 | 4 | XXX | 4.22 |
| 4. | Austral Plus Net | 5.0 | 90 | 0 | - | 96 | 3 | XX | 4.19 |
| 5. | Lamardor Gaucho | + 0.15 + 0.6 | 93 | 3 | XX | 99 | 6 | XXX | 4.18 |
| 6. | Yunta Quattro | 1.6 | 91 | 1 | - | 98 | 5 | XXX | 4.2 |
| 7. | Yunta Succesor | 1.6 | 92 | 2 | X | 98 | 5 | XXX | 4.18 |
| 8. | Alios 300 FS | 0.15 | 89 | -1 | - | 96 | 3 | XX | 4.22 |
| | DL 5% | | 1.27% | | | 1.46% | | | |
| | DL 1% | | 2.19 | | | 2.37 | | | |
| | DL 0.1 % | | 3.23 | | | 3.54 | | | |

Table 3 - The influence of some fungicides applied in seed treatment on growth of wheat plants, Secuieni, Neamț county, 2006 – 2010

| No. | Experimental variant | Dose, l/t | Biometrical observations | | | | Average number of brothers/plant |
|-----|-----------------------------|-----------------|--------------------------|--------------------------|-------------------|-------------------------|----------------------------------|
| | | | Plant length, cm | Average number of leaves | Root length, cm | Average number of roots | |
| 1. | Untreated variant (control) | - | 10.32 unt. var. | 3.31 unt. var. | 6.14 unt. var. | 4.79 | 1.07 |
| 2. | Yunta 246 FS (STD) | 2.5 | 11.10 XX | 3.81 X | 7.04 XX | 5.03 | 1.53 X |
| 3. | Nuprid Max | 2.5 | 10.97 XX | 3.68 X | 6.86 X | 4.97 | 1.40 |
| 4. | Austral Plus Net | 5.,0 | 11.01 XX | 3.49 | 6.81 X | 4.95 | 1.39 |
| 5. | Lamardor Gaucho | + 0.15 + 0.6 | 12.6 XXX | 3.92 XX | 7.81 XXX | 5.77 | 1.64 XX |
| 6. | Yunta Quattro | 1.6 | 11.18 XX | 3.89 X | 7.13 XX | 5.71 | 1.48 X |
| 7. | Yunta Succesor | 1.6 | 11.26 XX | 3.86 X | 7.01 XX | 5.63 | 1.42 |
| 8. | Alios 300 FS | 0.15 | 10.89 XX | 3.65 | 6.84 X | 5.24 | 1.38 |
| | DL 5% | | 0.18 cm | 0.36 nr. | 0.51 cm | 0.46 nr. | 0.36 nr. |
| | DL 1% | | 0.47 | 0.59 | 0.73 | | 0.50 |
| | DL 0.1 % | | 0.93 | 0.94 | 1.40 | 0.64 0.89 | 0.69 |

- the attack produced by *Zabrus tenebrioides* was much lower, the average frequency of plants attacked at the untreated control was 1.76% and at the treated variants ranged between 0.16% (Yunta 246 FS – 2.5l/t seed) and up to 0.54% (Alios 300 FS – 0.15 l/t); the differences in the frequency of attacked plants between treated and untreated variants were statistically negative (*Table 1*).

- the frequency of plants attacked by *Fusarium* sp. was 2.36% at the untreated control and between 0.16% (Yunta Succesor – 1.6 l/t seed) and up to 0.42% (Austral Plus Net – 5.0 l/t) and in the case of *Tilletia tritici* were recorded attacked plants only in the untreated control, the frequency of attacked plants was 1.29% (*Table 1*).

The good protection provided by the experienced insectofungicides in the chemical treatment of wheat seed against the attack produced by larvae of *Agriotes* genus, *Zabrus tenebrioides*, *Fusarium* sp. and *Tilletia tritici* positively influenced the production of wheat per hectare which was 4852 kg/ha at the untreated control and between 5225 kg/ha (Austral Plus Net) and 5930 kg/ha (Lamardor + Gaucho); the differences in the production between treated and untreated variants were statistically ensured (*Table 1*).

Regarding the influence of the applied insectofungicides in seed treatment on the seminal traits and plant growth was found out that:

- the average percentage of seed germinated, at 4 days from the date they were put to germinate, was 90%

at the untreated control and between 90% and 93% at the treated variants, significant differences were recorded separately for the treatment with Lamardor + Gaucho; after 7 days from the date when the seeds were put to germinate, the average percentage of germinated seeds was 93% at the untreated control and between 96% and 99% at the treated variants; the differences in the percentage of germinated seeds between the treated and untreated variants were statistically ensured (*Table 2*);

- the average germination time (AGT) was 4.02 days at the untreated control and from 4.12 days until 4.22 days at the treated variants (*Table 2*);

- the biometric observations made on plants harvested from the field, in each fall, showed that the tested insectofungicides in the seed treatment did not negatively influenced the plant growth, the average number of leaves, root growth, the average number of roots and plant twinning process; between treated and untreated variants were statistically recorded differences (*Table 2*).

CONCLUSIONS

The tested insectofungicides in the chemical treatment of seed have provided a good wheat plant protection against the attack produced by : larvae of *Agriotes* genus, *Zabrus tenebrioides*, *Fusarium* sp. and *Tilletia tritici*.

WHEAT CROPS PROTECTION AGAINST PESTS

The products with insectofuncicide action applied in the chemical treatment of wheat seed had positively influenced the seeds germination; after 7 days from the date when the seeds were put to germinate, there were differences statistically ensured between the treated and untreated variants.

Differences statistically ensured between the treated and untreated variants were registered in the terms of plants growth, the growth and branching of roots and also on the average number of brothers per plant.

REFERENCES

- Bărbulescu A., Popov C., 2001** – Elaborarea unui sistem de combatere integrată a bolilor și dăunătorilor din culturile de grâu și orz (The development of an integrated control system of diseases and pests in wheat and barley crops). *Analele ICCPT Fundulea, București, LXVIII*, 373 – 384.
- Bărbulescu Al., Popov C., Mateiaș M.C., 2002** – Bolile și dăunătorii culturilor de câmp (The diseases and pests of field crops). Edit. Ceres, București, p. 279.
- Cană Lidia, Nagy Elena, Goga N., Stoica V., Popov C., 2010** – Cercetări privind perfecționarea sistemului de protecție a cerealelor păioase împotriva agenților patogeni transmiși prin sămânță și sol (Researches on the improving the protection system of straw cereals against the pathogen agents transmitted through seed and soil). *Analele INCDA Fundulea, București, LXXVIII (1)*, 132 – 138.
- Popov C., Bărbulescu Al., Roșca I., Mincu Mihaela, Spiridon Cristina, 1998** – Tratatamentul chimic al semințelor de grâu și orz – metodă eficientă și nepoluantă de protejare a culturilor (The chemical treatment of wheat and barley seeds – efficient and clean method of crops protection). A IV-a Conferință Națională de Protecția mediului. Prima Conferință Națională de Ecosanogeneză, Brașov, 139 – 142.
- Popov C., Raranciuc Steluța, Cană Lidia, 2007** – Măsuri de prevenire și de combatere a bolilor și dăunătorilor grâului, secarei și triticale, recomandate în toamna 2007 (Measures to prevent and control diseases and pests of wheat, rye and triticals, recommended in the 2007 fall). *Probleme de protecția plantelor, București, XXXV (2)*, 33 – 41.
- Popov C., Bărbulescu A., Raranciuc Steluța, 2008** – Tratatamentul semințelor – metodă eficientă, modernă și puțin poluantă de protecție a culturilor de câmp (The seed treatment – a efficient, modern and less polluting method for field crop protection. *Analele INCDA Fundulea, București, LXXIV*, 133 – 139.
- Popov C., Lidia Cană, Elena Troțuș, Stoica V., Florica Vilău, Georgeta Trașcă, Cornelia Ciobanu, 2010** – Cercetări privind îmbunătățirea tehnologiei de combatere a gândacului *Zabrus tenebrioides* Goeze., prin tratarea semințelor de grâu și orz (Researches on improving the technology of combating the *Zabrus tenebrioides* Goeze beetle by treating the wheat and barley seeds). *Analele INCDA Fundulea, București, vol. LXXVIII, nr. 2*, 135 – 151.
- Troțuș Elena, Popov C., Sîrițanu Carmen, 1998** – Tratatamentul chimic al seminței de grâu, mijloc eficient de prevenire a bolilor și dăunătorilor de sol (The chemical treatment of

Elena TROTUȘ, Margareta NAIE, Alexandra-Andreea BUBURUZ, P. ZAHARIA

wheat seed, effective means to prevent soil diseases and pests). Cercetări Agronomice în Moldova, Iași, An XXXI, vol. 3 – 4 (112), 45 – 49.

Trotuș Elena, Sirițanu Carmen, 2007 – – Date noi privind protecția culturilor de grâu împotriva agenților patogeni și a dăunătorilor specifici, SCDA Secuieni-Neamț – 45 de ani de

cercetare științifică – Volum omagial (New data on wheat crops protection against specific pathogen agents and pests, Agricultural Research and Development Station of Secuieni, Neamț County, Romania – 45 years of scientific research – Anniversary volume). Edit. Ion Ionescu de la Brad, Iași, 68 – 75.