THE DYNAMICS OF THE OCCURENCE OF SOME SPECIFIC PATHOGENIC AGENTS ATTACK AT WATERMELONS (SOIL FUNGI), UNDER PEDO-CLIMATIC CONDITIONS OF NORTHERN BARAGAN (BRAILA COUNTY)

Eugen VELICHI

e-mail: eugen_velichi@yahoo.com

Abstract

An experiment was set up in 2013 for watermelons, which had as purpose the identification of some treatment variants which would prevent the occurrence of the attack of some pathogenic agents specific to them. The variants of treatment were the following: V1 not treated control sample, V2 – Topsin 500 SC-0.1%, V3-Alert-0.1%, V4 - Folpan 80 WG-0.15%, V5 - Folpan 80 WG-0.1%+ Topsin 500 SC – 0.1%. The experiment was placed in randomized blocks, with strict compliance to the experimental technique requirements. During the vegetation period, symptoms produced by *Fusarium oxysporum* f. sp. *niveum* fungus which produces the fusarium wilting of watermellons (Velichi E. 2006), have appeared differentially at each experimental variant. Other diseases, like the ones produced by the attack of *Colletotrichum lagenarium* fungus which produces the curcubitaceae anthracnose or by the attack of *Sphaerotheca fuliginea* fungus (Iacob Viorica, Hatman, M., Ulea, E., Puiu, I. 2000) which produces the mildew of cucurbitaceae, did not manifest in the watermelons experiment which were subject to the experiment. Production's harvest was done in stages. The variants: V2 – Topsin, V3 - Alert - 0.1% and V5 - Folpan 80 WG - 0.1% + Topsin 500 SC – 0.1% have achieved statistically differentiated productions against V1 – not treated control sample. Variant V4 – Folpan 80 WDG – 0.15 % has achieved a production a bit larger than the not treated control sample, but without statistic insurance.

Key words: watermelons, *Fusarium oxysporum* f. sp. *niveum*, randomized blocks, watermelons

During hot and droughty years, the watermelons (*Colletotrichum lagenarium*) are attacked by a series of dangerous pathogenic agents such as different species of phyto-pathogenous fungi such as: *Fusarium oxysporum* f. sp. *niveum* which produces watermelons fusarium wilting, *Verticillium dahliae* which produces verticillium wilt etc (Velichi E. 2012). The two species of fungi mentioned resist during winter under the form of some special resistance organs named chlamydospores, respectively mycrosclerots. The chlamydospores and respectively the mycrosclerots from soil germinate, forming an infection filament which enters into the plants through roots. The infections produced by these species of fungi are systemic and affect the entire plant which wilts, step by step. In some cases, during these years, symptoms produced by viroses have appeared at watermelons, remotely, possibly produced by *Cucumber Mosaic Virus* which rarely attacks watermelons (Velichi E. 2006). During droughty and hot years, in Northern Baragan area, the mentioned pathogenic agents are the most damaging ones, especially at the sensitive watermelons cultivars. The crops set up in conditions without irrigation have proved to be more affected. During rainy years (2004, 2005), at some sensitive cultivars, strong attacks of *Colletotrichum lagenarium* fungus which produces curcubitaceae anthracnose occurred.

Table 1

Frequency (F.%), intensity (I.%) and attack degree (G.A.%) of *Fusarium oxysporum* f.sp. *niveum* fungus at the variants of treatment for watermelons, which were the subject of the experiment from 2013.

Variant (cultivar)	F.%	I.%	G.A.% =F%xI%/100
V1- Not treated control sample	36.11	100	36.11
V2-Topsin 500 SC-0.1%,	19.44	100	19.44
V3-Alert-0.1%,	16.70%	100	16.70
V4-Folpan 80 WG-0.15%,	41.70	100	41.70
V5-Folpan 80 WG-0.1%+ Topsin 500 SC – 0.1%.	19.44	100	19.44

Table 2

The results of the experiment at watermelon crop, set up with 4 variants of treatment and 1 not treated control sample, set up in the year 2013

Variant (cultivar)	G.A.%	Prod. t/ha	Relative Prod. %	Dif. against mt.(t/ha)	Significance
V1- Not treated control sample	36.11	27.6		-	
V2-Topsin 500 SC-0.1%,	19.44	34.3	124.3	6.7	X
V3-Alert-0.1%,	16.70	36.3	131.5	8.7	X
V4-Folpan 80 WG-0.15%,	41.70	29.1	105.4	1.5	-
V5-Folpan 80 WG-0.1%+ Topsin 500 SC – 0.1%.	19.44	33.5	121.4	5.9	X
S^X = 2.61 DL 5% for prod. 2.31 X = 6.03 DL 1% for prod. 3.36 X = 8.76 t/ha					

Table 3

Description of fungicide products used within the experiment (Pest – Expert)

Commercial product	Active substance	Producing company
Topsin 500 SC	Thiophanate-methyl 500 g/l	Alchimex (Romania)
Folpan 80 WDG	folpet 80 g/l	Adama (Israel)
Alert*-	125 g/l flusilazole + 250 g/l carbendazim.	Du Pont (U.S.A.)

*- The product was redrawn from commercialization and usage in September 2014

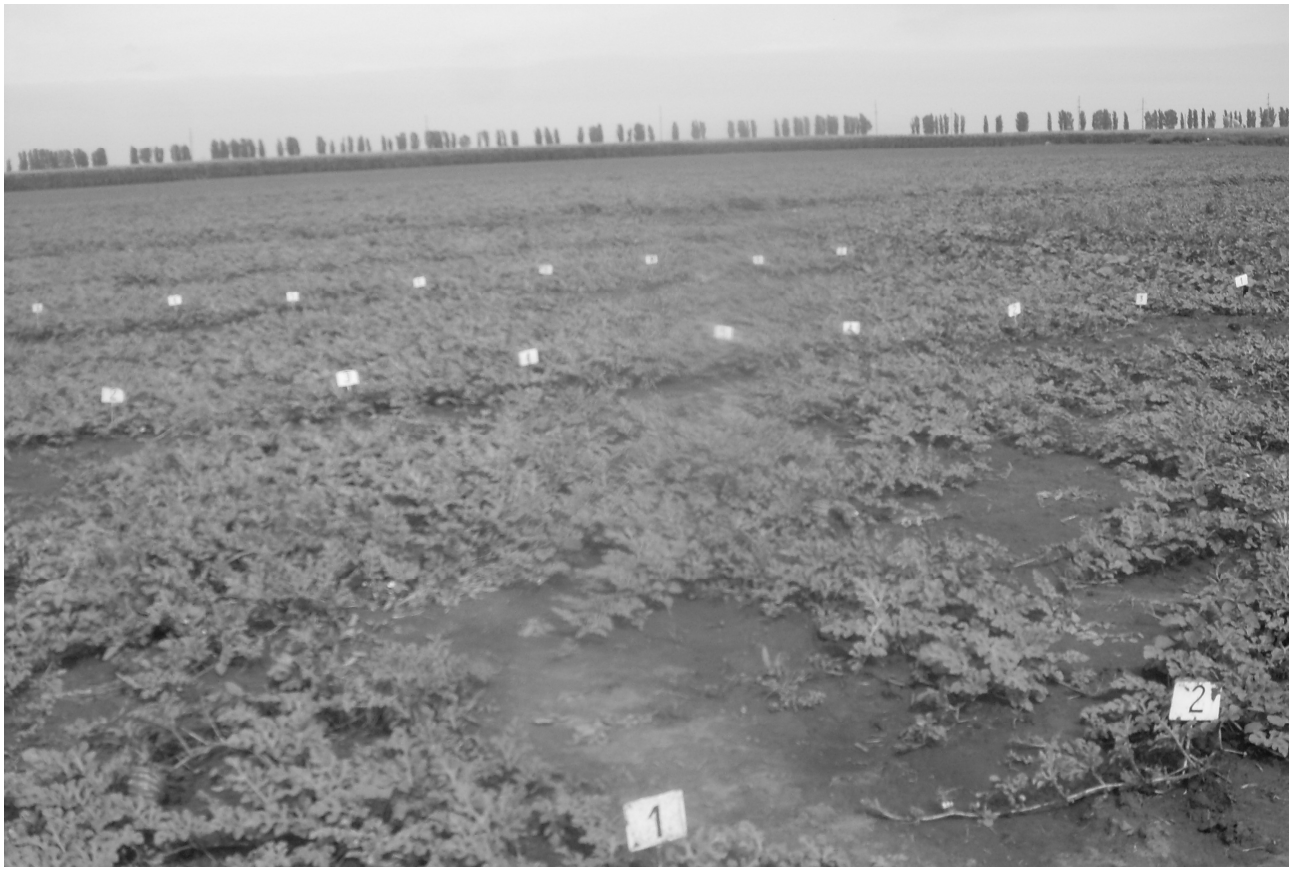

Figure 1 **Watermelons experiment with fungicide products (Crimson Sweet variety) set up in Martacesti locality (5 variants placed in 3 repetitions) on June 20th, 2013.**
Next (on the right), it can be observed another experiment with three watermelon varieties

MATERIAL AND METHOD

The experiment was placed in Martacesti locality – Silistea parish. The locality is situated in the northern part of Braila County, respectively in the northern part of Baragan Plain. The soil is of vermic chernozem type, with medium texture. The climate is characterized through hot and dry springs and summers. The winters are cold and also, poor in rain.

The scope of the experiment was to identify some efficient variants of treatment with fungicide products which would present efficiency in preventing and fighting against the attack of some species of phytopatogenous fungi which produce wilting, respectively *Fusarium oxysporium* f. sp. *niveum* and *Verticiliium dahliae*. These diseases have been the most damaging ones for watermelons for many years.

Up to now, it is well known the fact that the mentioned diseases are hard to fight against, being produced by pathogens that live in the soil. Moreso, in the last years, there have appeared cases where the products based on thiophanate-methyl (Topsin group) have not offered the results expected in what concerns the prevention and fight against the diseases produced by *Fusarium oxysporum* fungus (different specialized forms) at different vegetable crops, including watermelons.

This experiment was set up by direct seeding, using Crimson Sweet variety. The seed came from ZKI company – Hungary. The seeding was executed manually on the date of April 20th, 2013. The emergence took place in the interval May 5th – 7th.The distance used between rows was of 1.5 m and between plants on a row was of 50 cm. The lane between repetitions was of 1.0 m. During the period of vegetation, the crop was maintained according to the technology specific to watermelons. Fighting against weeds was performed only through manual hoeing. The treatment variants were the following: V1 – not treated control sample, V2 - Topsin 500 SC-0.1%, V3-Alert-0.1%, V4-Folpan 80 WG-0.15%, V5-Folpan 80 WG-0.1%+ Topsin 500 SC – 0.1%. The treatments were done as follows: the first at 30 days from emergence, using 0.5 l sol/pl. The second treatment, at soil, was done at 60 days from emergence, with the same quantity of solution per plant. The attack of the pest specific to curcubitaceae, *Aphis (Cerosipha), gossypii* was not signaled in 2013, probably due to very large presence of coccinellids predators from *Coccinella*, *Adalia*, *Hyppodamia* genera etc. (Velichi E. 2014)

The way of setting up the experiment was the randomised block. Those 5 variants were placed in 3 repetitions. Interpreting the differences was done through the method of limit differences (DL 5%, DL 1%). The surface of an experimental plot was of 6 m^2, and the number of plants/experimental plot was of 12.

The harvesting was done in stages, separately on each experimental plot.

The attack degree (G.A. %) of the attack of the pathogenic agent observed was calculated through the previous calculation of the attack frequency (F.%) and intensity (I.%). It was worked with entire plants, at which the percentage of being affected by the symptoms produced by *Fusarium oxysporum* f. sp. *niveum* was monitored. The number of entire plants, observed on each experimental plot was 12 (all/plot). Each plant observed as healthy received grade 0. Each diseased plant received 5 or 6 grade (I = 50 - 100%), because each plant attacked by *F. oxysporum* f.sp. *niveum* fungus is affected in percentage of 100%, and usually has the production compromised. G.A.% value was obtained with the relation G.A.% = FxI/100. (M.A.I.A – Methods of Prognosis and Warning, 1980).

RESULTS AND DISCUSSIONS

The first symptoms of the disease that is subject of this study had manifested starting with the date of 25th June, at V1 not treated control sample variant and at V4 Folpan 80 WDG variant – 0.15%. It then followed the occurrence of the first symptoms at the other variants which were subject to this study (V2-Topsin 500 SC-0.1%, V3-Alert-0.1% and V5 –Topsin SC 500 -0.1%+Folpan 80 WDG-0.1%. These symptoms had appeared under the form of some apoplectic wilting, accompanied sometimes by leaves torsion, followed than by the quick drying of the entire plant. Individually, the symptoms were reversible at night, but for a short time. From some wilted plants, there had been isolated typical conditions of *Fusarium oxysporum* f. sp. *niveum* fungi. Also, individually, at all 3 cultivars studies, there had appeared symptoms on fruit, produced by the attack of *Phytophthora capsici* fungi, under the form of some rotting. The symptoms produced by *F. oxysporum* f.sp. *niveum* fungus occurred firstly at the variant of the not treated control sample (July 14th, 2013) and, at a short time (July 16th) at V4 – Folpan WDG 0.15%. At the other variants of treatment, the symptoms occurred later, after the date of July 27th (*table 2*). The wilting attack degree was sensibly smaller at the variants: V2-Topsin 500 SC-0.1%, V3-Alert-0.1% and V5 – Topsin SC 500 -0.1%+Folpan 80 WDG-0.1%.. against V5 variant – not treated control sample (table 1). The productions obtained had statistic insurance at the variants: V2-Topsin 500 SC-0.1%, V3-Alert-0.1% and V5–Topsin SC 500 - 0.1%+Folpan 80 WDG-0.1%, where the differences against the control sample were significantly superior to the control sample. Variant V4 – Foplan 80 WDG had achieved a production a little bit higher than V1 – not treated control sample, but without statistic insurance.

CONCLUSIONS

The climatic conditions of the year 2013 had proved to be quite favourable for the watermelon crops. During that year, the diseases that had raised problems for watermelons, only remotely in certain areas, had been especially the mycoses that produce wilting (*F. oxysporum* f. sp. *niveum*, *Verticillium dahliae*). In rare cases, there were signalled also fungi attacks that frequently affect the foliage and sometimes, in some cases also the fruit (*Colletotrichum lagenarium, Sphaerotheca fuliginea, Phythophthora capsici* etc.). Usually, in the area of Baragan Plain, the years when the pathogenic agents affected the foliage and the fruit at watermelons were rare (1997, 2004 and 2005). In opposition, every year, there were signalled quite damaging attacks of the so-called soil fungi which produce wilting (*Fusarium and Verticillium* genera). At the experiment with those 5 watermelon variants studied (4 variants with

treatment and one not treated control sample), set up in year 2013, the most productive had proved to be V4 – Alert 0.1% (36.3 t/ha). It achieved a significantly larger production than the control sample G.A.% of fusarium wilting was of (16,7%). The following variants had followed: Topsin 500 SC 0.1%, with a difference against the control sample of 33,4 t/ha and the combination between Topsin 500 SC – 0.1% and Foplan 80 WDG-0.1%. The variant treated only with Folpan 80 WDG – 0.15% had a behavior practically similar to the variant V1-Not treated control sample. This fact leads to the conclusion that, under the climatic conditions of the year 2013, the production level from the 3 variants of treatment was negatively influenced by the attack degree of the *Fusarium oxysporum* f.sp. *niveum* fungus. This fact is very important for the watermelon farmer due to the fact that in the Baragan Plain area there have been many cases when the watermelon crops have been affected by mycotic wilting, firstly by *Fusarium oxysporum* f. sp. *niveum* and secondly by *Verticillium dahlie*.

The general conclusion of this experiment, very important for the watermelon farmer, is that treatments with plant protection products have been necessary in the last years, at soil level. At present, there are dripping irrigation installations, provided with management devices along with the water for irrigation and with some phytosanitary products or, as case maybe, with some different types of fertilisers. Unfortunately, Alert product which offered good results had been redrawn from commercialisation and usage since October 2014. Treatments application in due time is very important, before the occurrence of the first symptoms. At present, the only phytosanitary products at farmer's disposal for treatments at soil level against the attack of some phytopathogenic fungi from *Fusarium* and *Verticillium* genera remain those from Topsin group (Topsin 500 SC, Topsin 70 WDG, Topsin M 500 SC), at which the active substance is thiophanate-methyl. Crimson Sweet variety has an average resistance to the attack of soil phytopathogene fungi species. The newly created watermelon hybrids have a relatively good behavior to the attack of the *Fusarium oxysporum* f. sp. *niveum* fungus. Their growth could prove to be more efficient than applying fungicide products at soil level, but watermelon hybrid seed is very expensive (20 – 25 bani/seed). However, there were cases when wilting was signaled in the case of these hybrids. The cause might be the fact that the fungus has 3 physiologic species and it is difficult to obtain a cultivar which would cumulate resistance genes for the numerous pathogenic agents that affect the watermelon crops. In many cases, the attacks of the fungi that produce wilting occurred following to the attack of some soil pests, such as wireworms (*Agriotes* sp.). These pests have been present in Baragan Plain and they have produced large damages in the last years.

REFERENCES

Iacob Viorica, Hatman, M., Ulea, E., Puiu, I., 2000, *Horticultural Phytopathology,* "Ion Ionescu de la Brad" Publishing House, p. 67-69.

Săulescu, N. 1967, *Experiment Field,* Agro– Sylvan Publishing House, Bucharest, p. 217, 311.

Velichi, E. 2006, *Contributions to improving the technology of prevention and integrated fight against watermelon and melon's pathogenic agents within Baragan Plain (Braila area) – PhD Thesis, U.A.S.V.M. of Iasi, p. 24. 69.*

Velichi, E. 2012, *General and special Phytopathology,* University Publishing House, Bucharest, p. 379, 382.

Velichi, E. 2014, *Agricultural entomology,* University Publishing House, Bucharest, pg. 286.

***** 1980,** *Methods of Prognosis and Warning*, M.A.I.A., Bucharest, p. 7-9.