THE DYNAMICS OF THE OCCURRENCE AND EVOLUTION OF THE ATTACK OF SOME PATHOGENIC AGENTS ON MELONS IN THE PEDOCLIMATIC CONDITIONS OF THE NORTH – EASTERN BĂRĂGAN IN 2016

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Abstract

The purpose of this study was following up the dynamics of the occurrence and evolution of the attack of some pathogens on melons, as well as identifying the cultivars most resistant to the attack of the specific pathogenic agents. Among these pathogenic agents, we mention different species of fungi, such as: blight (*Pseudoperonospora cubensis*), fusarium wilt (*Fusarium oxysporum* f.sp. *melonis*) and mildew (*Sphaerotheca fuliginea*). It was also followed up the dynamics of the occurrence of the attack of some phytopathogenic viruses, such as cucumber mosaic virus (*Cucumber Mosaic Virus* – C.M.V.). An experiment with 5 study variants was created for this study. Those variants consisted in 4 hybrids and a variety of melons, such as: V1 - PORTOGALIA F1, V2 - JUCAR F1, V3 – ANANAS F1, V4 – ANANAS and V5 – RAYMOND F1. The study followed up the behavior of these variants in conditions of "0" phytosanitary treatments, in order to determine their resistance to the attack of Curcubitaceae blight (*Pseudoperonospora cubensis*) and to the attack of Curcubitaceae mildew (*Sphaerotheca fuliginea*). The experiment was placed in randomised blocks, the 5 variants being placed in 4 repetitions, 20 experimental parcels in total. Among the monitored pathogenic agents, the greatest attacks were produced by *Pseudoperonospora cubensis* fungus, which produces Curcubitaceae's blight. Also, attacks of *Fusarium oxysporum* f.sp. *melonis* fungus occurred, producing the fusariosis of the melons. The observations on the occurrence of the symptoms produced by the attack of those two species of fungi had been done on the dates of July 10th and July 26th, 2016. For this, 15 leaves had been analyzed for each and every experimental parcel. Following to the observations, there had been observed significant differences in what concerns the degree of attack (G.A.%) of the blight, *Pseudoperonospora cubensis* and of the fusariosis, *Fusarium oxysporum* f.sp. *melonis.* The most sensitive cultivar proved to be Ananas variety, after which next was Ananas F1 hybrid. The other hybrids had a good behavior at the attack of these two species of fungi. Also, the productions of the hybrids: Portogalia F1, Jucar F1 and Raymond F1 were superior to Ananas variety and to Ananas F1 hybrid.

Key words: blight, *Pseudoperonospora cubensis*, Ananas F1

Cucumis melo melon is attacked by various pathogenic agents, such as the fungi: *Pseudoperonospora cubensis* - Curcubitaceae blight, *Colletotrichum lagenarium* - anthracnose, *Sphaerotheca fuliginea* - Curcubitaceae mildew, *Fusarium oxysporum* f. sp. *melonis* - fusarium wilt, *Verticillium dahliaie* – verticilium wilt. Sometimes, attacks of some species of viruses appear, such as: *Cucumber Mosaic Virus*. (Iacob Viorica *et al.*,2000). The first half of the year 2016 had been very difficult for melons, in what concerns the climatic conditions. Abundant rains and low temperatures had been registered in this period, creating very favorable conditions for the attack of some pathogenic agents. Here we especially mention *Pseudoperonospora cubensis* fungus which produces blight at melons. This pathogenic agent attacks the melons in the years when there are registered rains and low temperatures in the spring and at the beginning of summer. Also, attacks of *Fusarium oxysporum* f. sp. *niveum* fungus had appeared, producing the fusarium wilt. In the year 2016 there had not been reported attacks of the following fungi: *Sphaerotheca fuliginea* (mildew)*, Colletotrichum lagenarium* (anthracnose) *Verticillium dahliae* (verticilium wilt). *Cucumber Mosaic Virus* produced light symptoms and did not influence the evolution of the experiment from phytopathologic point of view. In the very draughty years, *Pseudoperonospora cubensis* blight attacks had been very light, even absent. During all those years, in exchange, there had appeared quite powerful attacks of the fungi which produce wilt, such as: fusarium wilt of melons, *Fusarium oxysporum* f. sp. *melonis* and verticilium wilt, *Verticillium dahliae.*

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MATERIAL AND METHOD

The experiment took place in Albina locality – Tichileşti Parish. The locality is in the north-east of Brăila County, respectively in the north-east of Bărăgan Plain. The soil is of vermic chernozem type, with medium texture. The climate is characterized by droughty and hot springs and summers. The winters are frosty, also low on rains.

The purpose of the experiment was to identify some cultivars (hybrids, varieties) which would present resistance or tolerance to the attack of some diseases, especially blight – *Pseudopenospora cubensis*. This disease had proven to be the most damaging for the melons during many years.

This experiment was set up through direct seeding, with 5 cultivars of melons, 1 variety (Ananas) and 4 hybrids (Portogalia F1, Jucar F1, Ananas F1 and Raymond F1). Portogalia F1 and Raymond F1 hybrids are creations of Hazera Company from Israel. At present, Portogalia F1 is in testing phase. Jucar F1 hybrid is a creation of the Dutch Company Rijk Zwaan. Ananas F1 hybrid is produced by the Dutch Company Pop Vriend. The control sample selected was Ananas variety, an older variety. The seeding was done on May 16th, 2016. The distance used between rows was of 1 m and between plants on a row of 50 cm (20000 pl/ha) (Dumitrescu M and col. 1997). The lane between repetitions was of 75 cm. During the vegetation period, the crop was maintained according to the technology specific to the melons. The irrigation of the experiment was done by aspersion. Fighting against the weeds was done only by manual hoeing. There were not performed any phytosanitary treatments with fungicide products for creating a certain pressure of infection on the melons cultivars, with the purpose of highlighting their resistance to the attack of different pathogenic agents.

The experiment's placement method was randomized block. The 5 variants were placed in 4 repetitions. The interpretation of the differences was done through the limit differences method (DL 5%, DL 1% and DL 0.1%).(Săulescu N. 1967).

The area of an experimental parcel was of 6 m^2 and the number of plants/experimental parcel was 12.

The harvesting was done in sequences, separately on each experimental parcel.

The degree of attack (G.A.%) of the mentioned pathogen agents attack was calculated by previous calculation of the attack frequency (F. %) and of the attack intensity (I.%). The attack frequency is calculated with the formula F%= nx100/N, where *n* is the number of plants or plants organs attacked and N is the number of organs or plants observed. The attack intensity (I %) represents the degree or percentage where a plant or a plant organ is attacked and how much from the analyzed plant or organ's surface (leaf, fruit) is covered by the disease studied. The attack intensity is calculated with the formula I% = Σ (i xf)/n, where:
- i - intensity, according to the grade given to the organ or to the plant attacked;
- f - frequency, according to the grade given to the organ or to the plant attacked;
- n – number of plants attacked.

There had been worked with plant organs (leaves) in case of the blight, *Pseudoperonospora cubensis*, where it was monitored how much from the surface of one leaf was affected by the respective pathogen (by percentage). The number of leaves observed on each experimental parcel was 15. Each leaf observed had received grades from 0 to 6, proportional to the percentage of affectation, in order to find the value of the attack intensity. For example, grade 0 corresponds to 0% attack symptoms, grade 1 to 1-3% attack symptoms, grade 2 to 4-10% attack symptoms, grade 3 to 11 – 25% attack symptoms, grade 4 to 26 – 50% attack symptoms, grade 5 to 50 – 75% attack symptoms and grade 6 to 75 – 100% attack symptoms. G.A. % value was obtained with the relation G.A.% = F% x I% /100. (M.A.I.A – Methods of Prognosis and Warning, 1980).

In the case of *Fusarium oxysporum* f.sp. *melonis* fungus attack, fungus which produces plants wilting, we worked with entire plants. In that case, each plant attacked had received grade 6 due to the fact it was affected 100%.

RESULTS AND DISCUSSIONS

From the analysis of *table 1*, the following can be observed on July 15th:

a – Portogalia F1 and Jucar F1 hybrids had the best behavior to the attack of *Pseudoperonospora cubensis* fungus – blight, where the degree of attack of the fungus was 3.5% and respectively 3.6%.

b – Raymond F1 hybrid presented a higher degree of attack of the blight, as compared to Portogalia F1 and Jucar F1, respectively G.A.%: 4.9%.

c – Ananas F1 hybrid and Ananas variety presented the highest sensibility to the attack of *Pseudopernospora cubensis* blight, the fungus degree of attack being 6.9% and respectively 9.9 %

d –Attacks of *Fusarium oxysporum* f. sp. *melonis* fungus appeared at Ananas F1 hybrid and at Ananas variety at the beginning of June, following to some torrential rains followed by heat; it produced apoplectic attacks, the plants drying very quickly, even with keeping the green color of the foliage. The plants attacked received grade 6, being affected 100%. The attack degree of that fungus was 31.1% at Ananas F1 hybrid and 29.2% at Ananas variety. Raymond F1 hybrid had a low attack degree of 2.1%. Portogalia F1and Jucar F1 hybrids had not been attacked at all G.A% = 0

Between the attack degrees of Pseudoperonospora *cubensis* fungus, there had been obtained differences ensured statistically against Ananas control sample, respectively D.L. 5%, DL1% and DL 0.1% at Portogalia FI, Jucar F1 and Raymond F1 hybrids. Between Ananas F1 hybrid and the control sample, the difference does not present any statistical insurance.

For the differences between the attack degrees of *Fusarium oxysporum* f.sp. *melonis* fungus, the statistic calculations were not necessary due to some very clear differences between the variants studied (for example, G.A% = 0 at Portogalia F1 and Jucar F1).

From the analysis of table 2, the following can be observed on July 26th:

a – Portogalia F1 hybrid presented the lowest degree of attack of *Pseudoperonospora cubensis* blight, respectively 14.55%;

b – Jucar F1 hybrid presented an attack degree of *Pseudoperonospora cubensis* blight of 27.2%;

c – Raymond F1 hybrid presented a degree of attack of *Pseudoperonospora cubensis* blight of 25.9%.

d – Ananas F1 hybrid presented an attack degree of *Pseudoperonospora cubensis* blight of 44.95%.

e – Ananas variety (control sample) presented an attack degree of *Pseudoperonospora cubensis* blight of 42.95%.

Between the attack degrees of *Pseudoperonospora cubensis* fungus, differences ensured statistically had been obtained as compared to Ananas control sample, respectively D.L. 5%, DL1% and DL 0.1% at Portogalia FI, Jucar F1 and Raymond F1 hybrids. Between Ananas F1 hybrid and the control sample, the difference did not present any statistical insurance. From statistics point of view, the situation was similar to the case of the observations performed on the date of July 15th.

Table 1

The behaviour of those 5 cultivars (4 hybrids and one variety) at the attack of the phytopahtogenic fungi: *Pseudoperonospora cubensis* – blight and *Fusarium oxysporum* f. sp. *niveum* - fusarium wilt. The observations had been performed on July 15th, 2016

Variant	Peronospora cubensis			Fusarium oxysprum f.sp. melonis	
	G.A%	Difference against the control sample	Significance	G.A%	Difference against the control sample
V1 - PORTOGALIA F1	3.5	-6.4	***	0	31.3
V2 - JUCAR F1	3.6	-6.3	***	0	29.2
V3 - ANANAS F1	6.9	3.0	***	31.3	-2.1
V4 – ANANAS (control sample [c.s.])	9.9	-	-	29.2	-
V5 - RAYMOND F1	4.9	-5.0	***	2.1	27.1

DL G.A. % for **Pseudoperonospora cubensis**
DL 5% = 0.66 x 2.18 = 1.43%
DL 1% = 0.66 x 3.06 = 2.01%
DL 0,1% =0.66 x 4.32 = 2.85%

For *Fusarium oxysprum* f.sp. *melonis* it was not necessary to calculate D.L 5% and D.L 1% due to the very obvious differences between variants

Table 2

The behaviour of those 5 cultivars (4 hybrids and one variety) at the attack of the phytopahtogenic fungi: *Pseudoperonospora cubensis* – blight and *Fusarium oxysporum* f. sp. *niveum* - fusarium wilt. The observations had been performed on July 26th, 2016

Variant	Peronospora cubensis			Fusarium oxysprum f.sp. melonis	
	G.A%	Difference against the control sample	Significance	G.A%	Difference against the control sample
V1 - PORTOGALIA F1	14.55	-27.90	***	0	-31.3
V2 - JUCAR F1	27.20	-15.25	***	0	-29.2
V3 -- ANANAS F1	44.95	2.5	-	31.3	2.1
V4 – ANANAS (c.s.)	42.45	-	-	29.2	-
V5 – RAYMOND F1	25.90	-16.55	***	2.1	-27.1

DL 5% = 2.57 x 2.18 = 5.61%
DL 1% = 2.57 x 3.06 = 7.87%
DL 0,1% = 2.57 x 4.32 =11.1%

After July 15th, no attacks of *Fusarium oxysprum* f.sp. *melonis* had been observed
The G.A% values of this pathogen remained the same

After June 5th and up to the end of the crop's exploitation period, there had not been signaled any attacks of *Fusarium oxysporum* f. sp. *melonis* fungus. Due to this, the attack degree of *Fusarium oxysporum* f.sp. *melonis* fungus was identical at all

variants of the experiment on July 26th, 2016, with the one from July 15th.

From the analysis of table 3, we observe that the most productive of variants had been:

- V5 – Raymond F1 – 20.5 t/ha;
- V2 – Jucar F1 – 19.95 t/ha;
- V1 – Portogalia F1 – 19.13 t/ha.

Ananas F1 hybrid achieved a production of 14.9 t/ha and the control sample, Ananas variety achieved a production of 15.48 t/ha. Between the productions of Portogalia F1, Jucar F1, Raymond F1 and the control sample – Ananas variety – there had been obtained differences insured statistically (D.L.5%, DL 1% and DL 0.1%).

Table 3

The results of the experience with those five cultivars (4 hybrids and one variety) in what concerns the production (t/ha)

Variant	Prod. (t/ha)	Difference against the control sample	Significance
V1- PORTOGALIA F1	19.13	3.65	***
V2- JUCAR F1	19.95	4.47	***
V3- ANANAS F1	14.90	-0.58	-
V4- ANANAS (control sample)	15.48	-	-
V5-– RAYMOND F1	20.15	4.67	***

DL 5% = 0.30 x 2.18 = 0.66t/ha
DL 1% = 0.30 x 3.06 = 0.92 t/ha
DL 0.1% = 0.30 x 4.29 = 1.30 t/h

CONCLUSIONS

Following to the experiment with hybrids and varieties performed in 2016, the following conclusions emerge:

- Portogalia F1, Jucar F1 and Raymond F1 hybrids had the best behavior at the attack of *Pseudoperonospora cubensis* fungus;
- Ananas F1 hybrid proved to be more sensitive than the hybrids mentioned, presenting an attack degree very close to Ananas variety control samples;
- Portogalia F1 and Jucar F1 hybrids did not present any symptom of the attack of *Fusarium oxysporum* f. sp. *melonis* fungus. In the climatic conditions of the year 2016, they had been practically immune to the attack of this quite dangerous pathogenic agent. Raymond F1 hybrid presented a light sensibility to the attack of melons' fuzariosis (G.A% = 2.1%). In the entire experiment, one single plant from this hybrid was attacked.
- Ananas F1 hybrid and Ananas variety proved to be quite sensitive to the attack of *Fusarium oxysporum* f. sp. *melonis* fungus. Practically, the fungus affected almost one third from the plants of the two cultivars.

- Due to the fact that the attack of *Fusarium oxysporum* f.sp. *melonis* fungus lead to losing an entire plant, we consider that the production of the control sample, Ananas variety and of Ananas F1 hybrid was due mainly to the attack of this fungus and less due to the attack of *Pseudopernospora cubensis* fungus.
- We underline the early attack of *Fusarium oxysporum* f.sp. *melonis* fungus in the climatic conditions of the year 2016, to Ananas variety and to Ananas F1 hybrid.

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