DYNAMICS OF APPEARANCE AND EVOLUTION TO THE WATER MELON (*CITRULLUS LANATUS* L.), OF DOWNY MILDEW [*PSEUDOPERONOSPORA CUBENSIS* (BERK. ET CURT.) ROSTOW.], IN THE RAINY YEARS 2004, 2005, IN BARAGAN FIELD, (BRAILA AREA).

DINAMICA APARIȚIEI ŞI EVOLUȚIEI LA PEPENELE VERDE (*CITRULLUS LANATUS* L.), A MANEI CUCURBITACEELOR [*PSEUDOPERONOSPORA CUBENSIS* (BERK. ET CURT.). ROSTOV.], ÎN ANII 2004, 2005 ANI PLOIOŞI, ÎN CONDIȚIILE CÂMPIEI BĂRĂGANULUI (ZONA BRĂILA).

Eugen VELICHI

''Dunarea de Jos„ University – Galați Faculty of Engineering – Brăila Departament of Agriculture
Calea Calarasilor No. 29 Code 810017 eugen _velichi @yahoo.com

Abstract: *During some rainy years, water melons can be affected by a series of pathogenic agents that might produce, in some situations, some important damages. One of these pathogenic agents is the downy mildew produced by Pseudoperonospora cubensis (Berk. et Curt.) Rostov. The aim of the research was to establish the moments of disease apparition, favouring factors for starting the attack, as well as the possibilities of prevention and fight. Downy mildew was the subject of some thorough studies of the cucumbers, both in the field and in protected spaces (green houses, solariums). Nowadays, unlike the cucumber, the level of the researchers in this domain, in the proper area, both to the water melon and to the yellow melon, is practically inexistent. For making the notices, there have been organized experiences that respected the requests of an experimental technique. The experimented methods included different schemes of treatment + the witness method – 0 treatments. For interpretation of the results, there has been used the statistic analysis, according to the experimental technique. For the respective area, research has a great practical importance, as in some certain years, the pathogenic agents can cause great damages, being for many times the decisive factor for obtaining some good productions in quantity and especially in quality. During observations, more attention for the meteorological factors has been paid: the average temperature, precipitations, relative humidity of air and humidity on leaves (the dew).*

Key words**:** *mildew, watermelon, pathogenous agent*
Cuvinte cheie**:** *mană, pepene verde, agent patogen*

Rezumat: *În unii ani, mai ploioşi, pepenii verzi pot fi afectați de o serie de agenți patogeni, care pot produce în anumite situații pagube importante. Unul dintre aceşti agenți patogeni este mana produsă de ciuperca Pseudoperonospora cubensis (Berk. et Curt.) Rostov. Scopul cercetării a fost acela de a stabili momentele de apariție a bolii, factorii favorizanți ai declanşării atacului, precum şi posibilitățile de prevenire şi combatere. Mana cucurbitaceelor a facut obiectul unor studii aprofundate la castraveți, atât în condiții de câmp, cât şi în condiții de spații protejate (sere, solarii). În prezent, spre deosebire de castraveți, atât la pepenii verzi, cât şi la pepenii galbeni, stadiul cercetărilor în acest domeniu, în zona respectivă, este practic inexistent. Pentru realizarea observațiilor, au fost înființate experiențe, care au respectat cerințele tehnicii experimentale. Variantele experimentate au cuprins diferite scheme de tratament + varianta martor – 0 tratamente. Observațiile asupra dinamicii apariției şi evoluției atacului manei au fost efectutate la varianta martor – 0 tratamente. În interpretarea rezultatelor a fost utilizată analiza statistică, conform tehnicii experimentale. Pentru zona respectivă, cercetarea are o deosebită importanță practică, deoarece, în anumiți ani, agenții patogeni pot provoca pagube mari, fiind de multe ori factorul hotărâtor, în obținerea unor producții bune cantitativ şi mai ales calitativ. Pe parcursul observațiilor, o importanță deosebită a fost acordată factorilor meteorologici: temperatura medie, precipitații, umiditatea relativă a aerului şi umiditatea pe frunze (roua).*

INTRODUCTION

In our country, the mildew of cucurbitaceous was for the first time noticed by Tr. Savulescu and mentioned in The Phyto-sanitary State from 1928-1929, on the pumpkin. In the whole world, the spread of the pathogenic has a wide range, identical with the one of the cucurbitaceous host plants. Thus, it was recorded as a parasite on the cucumber in 70 countries, on the honeydew melon in 50 countries, on the pumpkin in 40 countries, and on the water melon in 25 countries, usually situated at latitudes of under 30 degrees.

The attacks produced in entire world are the main of cause of losses especially to the cucumbers and honeydew melon.

To the watermelons, the cucurbitaceous mildew was recorded for the first time in our country on the Miniş 1 species, at Supersem Arad, in 1992.

Usually in our country the watermelons are affected by mildew, only in the years with very rainy summers and medium moderate temperatures (20-26C^0).

The disease appears only on leaves, irrespective of the phenological stage in which the plant is. On the upper part of the leaves it is noticed spots with a jagged form, yellow, delimited by the secondary nervures which in the secondary evolutions become brown. On the inferior spot side of the leaves, it is formed a grey-violet down made of the "conidia" (zoosporangia caducei) and the siphonoplast of the fungus. In favourable conditions for attack, the spots spread and join including the whole surface of the lamina of the leaves that fade away and the plants are rapidly defoliated. MARINESCU GH., COSTACHE M. STOENESCU A.

MATERIAL AND METHODS

The experiences have been performed in Braila. There have been used the species of watermelon Crimson Sweet in 2004 and the species of Charleston Gray in 2005. These experiences have been settled in the strict respect of the culture technology, proper to the watermelon.

For collecting, analysis and processing of meteorological information, it has been used the "Agroexpert" system, of the Phyto-sanitary Unit from The Office for Agriculture and Rural Development (D.A.D.R) Braila.

Apparition and evolution of the *Pseudoperonospora cubensis* has been recorded to the untreated reference variant.

The experimental results have been also treated according to the experimental technique by a statistic analysis (the method of limit differences – LD 5% and LD 1%). SAULESCU N.A SAULESCU N.N.,

For evaluation of the attack, it has been used the notification system that needs calculation of the following values: F% (frequency of the attack), I% (intensity of the attack) and AD% (attack degree). To calculate the mentioned values, there have been analyzed 18 leaves to each experimental parcel.

RESULTS AND DISCUSSIONS

RECORDINGS IN 2004. In 2004, in contrast with the previous years, when the cucurbitaceous mildew manifested later (at the end of July), the pathogenic agent occurred on 15^{th} of July. In comparison with apparition of first symptoms from the other studied years (2002, 2003 and 2005), this is the earliest recording of the disease to the watermelons. Evolution of the pathogenic agent was quite slow to the studies species (Crimson Sweet), thus not raising special problems until the end of the second decade of August when the degree of attack was 4,45%. However, due to the fact that in the third decade of August there have been recorded very heavy rains (14b 8l/m^2) for this period of year in Braila in this decade, the attack

degree of the mildew has almost doubled, reaching the value of 11.51% to the untreated reference variant, influencing the production.

RECORDINGS IN 2005. The attack of the cucurbitaceous mildew to the studied species – Charleston Gray, has manifested starting with 19th of July (AD – 0.60%) after 10 days from the recording of the attack to the honeydew melons and after 15 days after recording of the attack on the cucumbers. Evolution of the pathogenic agent was quiet slow at the end of August, the attack degree reaching the value of 4.78%, this being quite small taking into consideration the very heavy rains fallen in June – 222 l/m^2 and in July 216 l/ m^2. During these two months, there had been recorded 438 l/m^2, while the annual average of rains for Braila County was 447 l/m^2 during 1993-1997. It is important to emphasize that the average value of the medium decadal temperatures in June-July was optimum for development of this fungus, its slow evolution being quite surprising.

Evolution quite slow of the mildew to the watermelon in 2005, on the ground of very heavy rains in June and July, and of some optimum temperatures for the disease, can be explained by different causes:

1 - The medium decadal temperatures of May and June in 2005 were lower that in the previous years, for example in the first and second decades of May and the first decade of June as it can be noticed in the following table:

Table 1

The medium decadal temperatures of May (1st and 2nd) and June (1st) from 2004 and 2005

Year	Period		
	May		June
	1st decade	2nd decade	1st decade
2004	19,4	18,1	21,3
2005	15,6	15,1	16,7

These values, lower in 2005 than the previous years, have determined a reduction of the fungus development (although there were very heavy rains) being known that the optimum development of the fungus is made at temperatures of 18-22^0 C, and the maximum sporulation of the fungus is made at the temperature of 20^0 C.

2 – studied culture – Charleston Gray species is known as being resistant to the mildew, fact confirmed by its behaviour under the climatic conditions of 2005

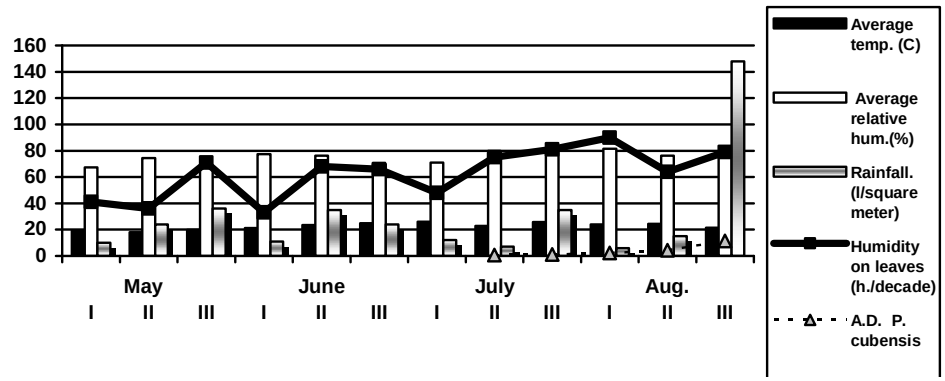

Figure 1. Evolution of the attack of *Pseudoperonospora cubensis* to the watermelon of Crimson Sweet species, according to the climatic conditions of 2004, to the untreated reference variant – V4.

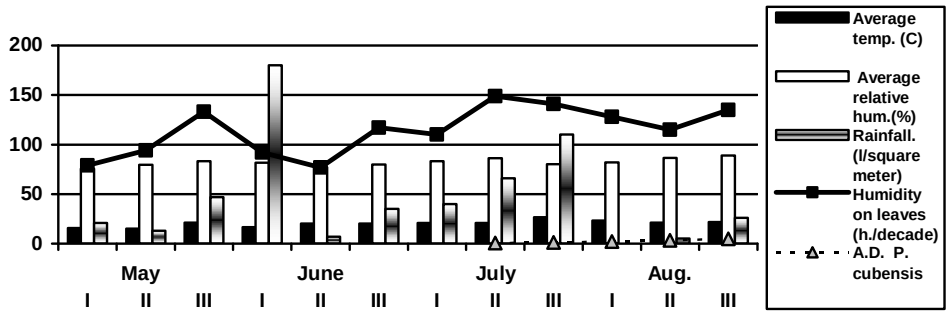

Figure 2. Evolution of the attack of *Pseudoperonospora cubensis* to the watermelon of Charleston Gray species, according to the climatic conditions of 2005, to the untreated reference variant – V5

In 2004, there have been tested on the watermelons (Crimson Sweet species) three variants of treatment + 1 untreated reference variant, as follows:

V1 – Topsin 0,1 % + Bravo 500 0,20%
V2 – Benlate 0,1% + Dithane M 45 0,20%
V3 – Carbendazim 0,1 + Folpan 80 0,15%
V4 – An untreated reference variant

Table 2

Effectiveness of some fungicide products, in fighting against the *Pseudoperonospora cubensis* fungus to the watermelon (Crimson Sweet species - 2004)

	Product	A.D. %	Difference to the reference (%)	Effectiveness %	Production (t/ha)	Difference to the reference (t/ha)
1	Topsin 0,1 % + Bravo 500 0,20%	3,30	8,10**	71,0	29,9	6,9
2	Benlate 0,1% + Dithane M 45 0,20%	3,03	8,37**	73,4	30,6	7,6*
3	Carbendazim 0,1 % + Folpan 80 0,15%	2,74	8,66**	75,9	31,2	8,2*
4	Untreated reference variant	11,40	-	-	23,0	-

Analysis of the variance, for AD% - *Pseudoperonospora cubensis* (transformation. arc sin percent).

Sd = 3,54
LD 5% = 3,54 x 2,45 = 8,67 = 2,5%-*
LD 1%=3,54 x 3,71=13,13 = 3,0%-**
Analysis of the variance for production:
Sd = 2,85
LD 5% = 2,85X2,45 = 6,98 t/ha-*
LD 1%=2,85X3,71=10,57 t/ha-**

In 2005 there have been tested on the watermelons (Charleston Gray species) four variants of treatment + 1 untreated reference variant, as follows:

V1 – Topsin 0,1 % + Bravo 500 0,20%
V2 – Benlate 0,1% + Dithane M 45 0,20%
V3 – Carbendazim 0,1 + Folpan 80 0,15%
V4 – Manoxin Total 0,25%
V5 – An untreated reference variant

Table 2.

Effectiveness of some fungicide products, in fighting against the *Pseudoperonospora cubensis* fungus to the watermelon (Charleston Gray species - 2004)

	Product	A.D. %	Difference to the reference (%)	Effectiveness %	Production (t/ha)	Difference to the reference (t/ha)
1	Topsin 0,1 % + Bravo 500 0,20%	3,11	0,34	9,9	32,8	1,9
2	Benlate 0,1% + Dithane M 45 0,20%	2,87	0,58	16,8	30,1	-0,8
3	Carbendazim 0,1 % + Folpan 80 0,15%	2,56	0,89	25,8	31,6	0,7
4	Manoxin Total – 0,25 %	3,23	0,22	6,4	29,8	-1,1
5	Untreated reference variant	11,40	-	-	23,0	-

Under the climatic conditions of 2005, the combinations of studied fungicide products obtained very similar productions, thus not having significant differences between the treated variants and the untreated variant (5), both regarding the production and regarding the behavior to the attack of the different pathogenic agents.

This thing proves a better tolerance of the used species – Charleston Gray to the attack of *Pseudoperonospora cubensis.*

Topsin, benlate and Carbedazim have been used because the experience has also followed the fight against the anthracnose of cucurbitaceous – *Colletotrichum lagenarium.* This pathogenic agent does not constitute interest of this material.

CONCLUSIONS

From the above mentioned, we can conclude that the most likely period of time for apparition of the fungus attack *Pseudoperonospora cubensis* in Braila, is determined by the values of the favoring meteorological factors, recorded in May and in the first two decades of June.

In each studied year, the cucurbitaceous mildew occurred for the first time to the cucumbers, after that to the honeydew melon, the last ones being the watermelons.

The Charleston Gray species, that was used in 2005, proved to be very resistant to the pathogenic agents proper to the cucurbitaceous, the results of the experiences (testing of an effectiveness of some phyto-sanitary products to an untreated reference) being less conclusive.

The Crimson Sweet species proved to be more sensitive, giving in 2004, significant differences regarding apparition and evolution of the mildew attack.

Usually, in climatic conditions of our country, the cucurbitaceous mildew does not affect the watermelons, but only to a limited extent. Only in the years with rainy and moderately warm springs and summers, this disease can affect the watermelons and only the species and hybrids that are more sensitive. Usually, in these conditions, the damages produced by the mildew are first of all qualitative and to a limited extent quantitative. The fruits from the affected plants have a less sugar and are hardly sold.

In years with rainy and moderately warm springs and summers, it is necessary to apply phyto-sanitary treatments for mildew control to the watermelons. These are absolutely necessary especially if there is used a sensitive species and if the weather is rainy and moderately warm in June and at the beginning of July. In favourable years for disease apparition to the watermelons, there can be used a wide variety of products, homologated for cucurbitaceous mildew control as: Dithane (mancozeb), Folpan (folpet), Bravo (clorotalonil), etc. The treatments shall be applied according to evolution of the meteorological factors, especially during June.

The species and hybrids that prove to be resistant (for example Charleston Gray) can make good, quantitative, and especially qualitative productions, and without applying phyto-

sanitary treatments, even during the very favourable years for disease apparition - years with rainy and moderately warm springs and summers.

In 2004, cucurbitaceous mildew had an early apparition and a rapid evolution to the cucumbers, honeydew melons and even watermelons. This, taking into consideration that the year 2003 was very drought and warm, completely unfavourable to the disease and the reserve of implant of the fungus remained during winter of 2004 was very small. In exchange for 2005 (even if it was more rainy than 2004), the law temperatures recorded in may and June determined a tardy apparition of the disease to the cucumbers, honeydew melons and watermelons, as well as a slow evolution.

From the analysis of the information from 2004 and 2005 we can conclude that in the dynamics of apparition and evolution of the mildew attacks, the favouring meteorological factors proved to be more important than the size of the source of implant.

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