



Graduation Project



Biology and Management of Downy Mildew Disease on Cucumber Grown Under Plastic-house Conditions

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Introduction into the project :

Cucurbit downy mildew caused by *Pseudoperonospora cubensis* is currently the most destructive disease of cucumbers for both field and glass-house production in Europe and elsewhere (Lebeda 1984). Knowing the biology and ecology of the pathogen may serve in preventing the disease and in knowing the basic abiotic factor influencing infection with *P. cubensis* is the free leaf moisture (Cohen et al. 1971).



Downy mildew of cucurbits is a foliar disease, and is easily recognizable by the development of chlorotic lesions on the adaxial leaf surface, sometimes with necrotic centers. These lesions can be restricted by the leaf vein, as in cucumber, giving them an angular appearance (Thomas 1996). Host plants may be infected at all developmental stages (seedlings, young and adult plants) but symptoms on young, newly developing leaves are rather rare.



Chemical control remains the major and most reliable measures for downy mildew control under the field and green-house conditions. However, this disease is considered one of the plant pathogens that shows a high risk of resistance development to fungicides (Pathogen risk list 2005, [http:// FRAC.info](http://FRAC.info))



Objectives of the project :

The main objectives for conducting this project are:

- 1.To study the effect of downy mildew on cucumber inside the faculty farm
- 2.To study the effect of fungicides and the ability of treating the disease
- 3.To study and know the best cultural practices used in disease control



Fungicides used for disease control:

Two fungicides were used for the disease control:

- 1) Ridomil
- 2) Ridomil Gold.

Details of these fungicides are shown in Table 1

Table 1: fungicides used for controlling downy mildew of cucumber in the plastic-house (Faculty farm, Tulkarm, Jan. 29 and Feb. 03 / 2020)

Trade name of fungicide	Formulation of fungicide	Active ingredient and its concentration in the formulation	Concentration of fungicide used in controlling of the disease	Safety period in days after application
Ridomil	Wettable Granules (WG)	Metalaxyl-M 40g/Kg Mancozeb 640g/Kg	4 grams / 1 liter of water	3 days
Ridomil Gold	Wettable Granules (WG)	64% w/w mancozeb 4% w/w metalaxyl-M	3 grams / 1 liter of water	2 days



Cucumber variety and method of its planting:

The variety is Rocket, it was planted in two lines per bed, 40 cm distance between seedling, irrigated 2 times a week, Fertilization was done according to the plant requirements as mentioned below:



Growth stage	N	P	K
Planting-14 days	150	150	150
14-35 days after planting	250	150	400
35 days after planting- end	425	250	670



Method of measuring the disease index:

This is done by using a scale ranging from 1 to 8 levels showing the progress of the disease symptoms on infected leaves with time in the plastic-house. This index is useful for showing the progress of disease and for timing the fungicides spray program.



Fig. 1: Levels of disease index of downy mildew of cucumber in the plastic-house (Faculty farm, Tulkarm, Feb.04.2020)

Level 1: Appearance of small yellow spots (1 to 5 mm diameter) on upper leaf surface of infected leaves





Level 2: Appearance of large yellow spots (> 5 mm diameter) on upper leaf surface of infected leaves





Level 3: Appearance of light brown downy fungus growth on lower surface of infected leaves facing the yellow spots





Level 4: Appearance of small brown necrotic spots (1-5 mm diameter) on upper surface of infected leaves facing the yellow spots





Level 5: Appearance of large brown necrotic spots (> 5 mm diameter) on upper and lower surface of infected leaves facing the yellow spots





Level 6: Appearance of dense dark brown fungus growth on the lower Surface of infected leaves





Level 7: Appearance of large brown necrotic spots (> 2 cm diameter) on the upper and lower surfaces of infected leaves

**upper side*



**lower side*





Level 8: Killing/death of infected leaves (necrosis of whole infected leaves)





Method of measuring the disease intensity:

This done by taking a random number of cucumber plants in the plastic-house then counting the number of infected leaves (having either one of the disease index from 1 to 8 levels) per plant or per certain number of leaves so the percentage of infection with the disease can be calculated as shown in table 1



Table 2: Intensity of infection with downy mildew of cucumber in the plastic-house (Faculty farm, Tulkarm, Feb. 05/2020)



No. of leaves per plant chosen randomly	No. of infected leaves per plant	% of infection with disease per plant
28	20	71.4
20	20	100
25	21	84
12	11	91.7
17	17	100
12	10	83.3
25	21	84
20	15	75
20	18	90
16	15	93.8
25	20	80
18	18	100
17	10	58.8
26	23	88.5
16	12	75
20	17	85
29	20	68.9
12	10	83.3
32	29	90.6
15	15	100
28	26	92.9
20	20	100
13	13	100
23	22	95.6
28	27	96.4
22	22	100
23	23	100
17	15	88.2
Average 20.7	18.2	88.0



Disease intensity of *P. cubensis* on cucumber leaves:

Results obtained showed that the percentage of infection with downy mildew of cucumber in the plastic-house of faculty farm ranged from 58.8 to 100% (average 88.0%) (Table 2). This indicates that the strain of the *P. cubensis* is virulent and the cucumber variety in the faculty farm is susceptible. This explains the presence of high infection with *P. cubensis* in the faculty farm.



Conclusions and recommendations of the project

1. The exposure of plants to rain and then to medium temperatures, providing suitable conditions for disease spread and its development.
2. Removing the infected leaves reduces the spread of infection with the disease.
3. We noticed all stages of infection with the disease in the farm by making an index for the disease.
4. Spraying with systemic fungicides reduces the spread of the disease such as Ridomil (matalaxyl & mancozeb)
5. It is not possible to reduce infection when environmental conditions are favorable to disease development, but applying control measures reduce the spread of the disease but not the intensity.
6. The large spread of the disease leads to the weakening and death of the crop, and the crop must be removed and disposed if the intensity of infection with the disease at level 8 of disease index.



References

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