



Evaluating the Resistance of Parthenocarpic Cucumber Varieties Suitable for Cucumber Greenhouse Cultivation to Powdery Mildew

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Annotation: Nowadays, the population of the world is increasing dramatically, therefore it is important to plant disease resistant varieties of vegetable crops in greenhouses to provide them with pure products.

Keywords: greenhouse, cucumber, hybrid, disease, powdery mildew, damage, resistance.

The newly harvested fruits of agriculture are cherished and consumed throughout the year by our population, having been pickled and preserved. Accordingly, meeting the demand of consumers by growing vegetables in greenhouses according to their requirements, resisting diseases and having high productivity, is considered one of the important tasks of providing the population with food [7].

Growing disease-resistant and productive vegetable crops play a crucial role in agriculture. In our country, diseases such as powdery mildew are widespread in both greenhouse and open-field conditions. On both sides of the leaves, white, yellowish-brown or reddish-brown spots appear, later the leaves become wrinkled, the stems become twisted, and the plant dries up. Powdery mildew sometimes occurs on the surface of plant leaves and stem joints, and in rare cases, it affects fruits. In greenhouses, powdery mildew damages flowering plants from the stage of bud formation [2]."

The fungus is affected by wind. The disease forms at a moderate temperature of 25-27 °C, with humidity ranging from 50-90%. However, fungus' can harm dry leaves even at temperatures of 15-25°C and 20% humidity [3]. Insufficient moisture (inadequate watering) significantly exacerbates the disease. The latent period of the disease lasts 3-4 days in greenhouses, and fungus produces a new generation every 6 days [4].

The fungus lays eggs on plant residues and weeds in autumn and emerges as adults in spring. Controlling powdery mildew can reduce yield losses by 20-30% in the field and 50-70% in greenhouses [6].

In the Republic of Uzbekistan, according to the decree PQ-5853 of October 23, 2019, which approved the "Strategy for Actions on the Development of the Republic of Uzbekistan in 2020-2030," ensuring food safety and improving consumption patterns by growing the required amount of food products have been identified as the main tasks [1].

To accomplish these tasks, it is crucial to plant disease-resistant the fungus varieties. Additionally, implementing agro-technical measures (planting scheme, temperature and humidity control) and adopting organic farming practices based on the demands of consumers play a crucial role in

cultivating this crop and providing the population with food beyond the seasonal periods, while also avoiding damage from this disease [5]."

The importance of research. Parthenocarpic-type varieties, primarily suitable for growing cucumbers in greenhouses, are considered highly resistant to diseases. Additionally, such varieties have abundant female flowers and high productivity. Selecting 50 seed samples resistant to powdery mildew, suitable for growing in greenhouses, and supplying the population with environmentally friendly products is one of the urgent tasks.

Research objectives. Investigating the susceptibility of local and foreign germplasms of cucumbers to powdery mildew in selected seed samples suitable for greenhouse cultivation. Studying and distinguishing varieties that are resistant to powdery mildew among the studied seed samples."

Research results. When growing cucumber crops in our country's greenhouses, they are consistently vulnerable to powdery mildew, especially during the winter-spring season. Combating powdery mildew by selecting and isolating varieties that are resistant to the disease, productive, and have good product quality is considered an important biological means for future creation of new varieties and hybrids. Fifty seed samples suitable for greenhouse cultivation were studied, originating from local and foreign germplasms, to identify varieties that are resistant to powdery mildew and understand the degree of susceptibility to the disease. Cucumber seedlings were sown in 10×10 cm peat-perlite (3:1) mixture in polyethylene containers at the greenhouse of the Vegetable, Melon, and Potato Research Institute. The seedlings were kept at a temperature of 27°C to ensure simultaneous emergence and uniform growth for subsequent transplanting. Cucumber beds in the greenhouse were arranged in rows with an inter-row spacing of 80 cm, and the spacing between beds was 35 cm. To study the susceptibility to powdery mildew and understand the disease's degree, phenological observations were conducted during the growing period. Based on the observed phenological results, the development and progression of powdery mildew on cucumber varieties were determined using the formulation proposed by Chumakov (1974).

The progression of the disease was determined using the following formula:

$$P = \frac{n \cdot 100}{N} \text{ where:}$$

P is the progression of the disease in percentage (%),

n is the number of infected plants in the sample,

N is the total number of plants in the sample.

The development of the disease in cucumber varieties was assessed on a 5-point scale according to the following criteria:

0 - Healthy plants,

1 - Damaged up to 10%,

2 - Damaged from 11% to 25%,

3 - Damaged from 26% to 50%,

4 - Damaged more than 50% (Dementyeva, 1985).

The progression of the disease is determined based on the formula developed by Chumakov in 1974:

$$P = \frac{\sum(a \cdot b)}{N} \text{ where:}$$

P – is the average degree of disease progression in percentage (%) or points,

$\sum(a \cdot b)$ is the sum of the product of the number of plants (a) and the corresponding percentage or score of damage (b),

N - is the total number of assessed plants.

The development and prevalence of powdery mildew in cucumber plant samples

1-table. The incidence of powdery mildew in cucumber F₁ hybrid varieties suitable for greenhouse cultivation (SPEvaKITI greenhouse 2023).

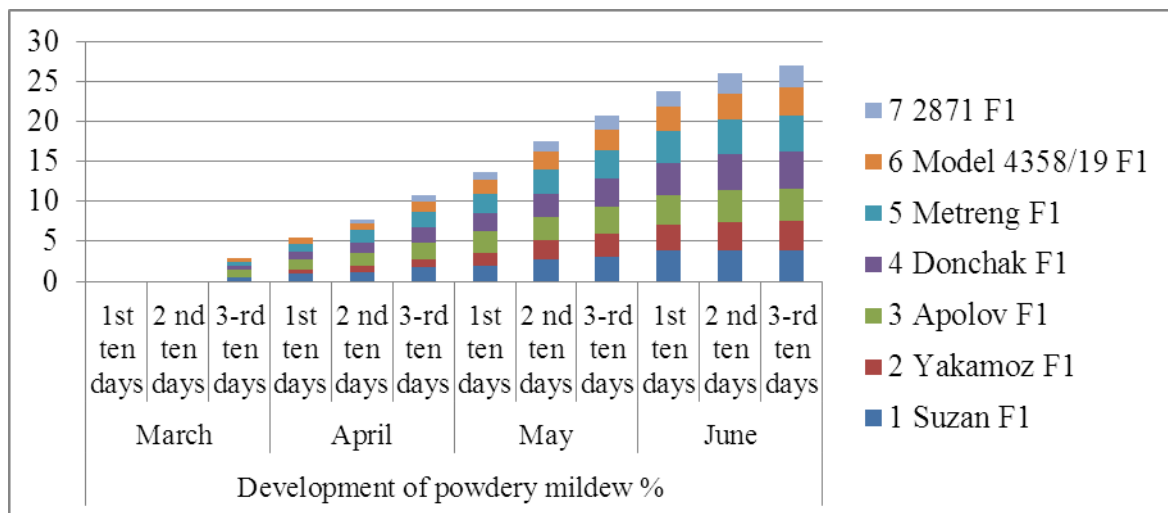
№	Hybrid forms	Damage average score	Disease development %	Spread of disease %	№	Hybrid forms	Damage average score	Disease development %	Spread of disease %
1	Sardor F ₁ (n-t)	0	0	0	26	Xuligan F ₁	0	0	0
2	Sevinch F ₁	0	0	0	27	Model 6128/18 F ₁	0	0	0
3	Dayara F ₁	0	0	0	28	Model 4358/19 F ₁	1.0	3.5	10.0
4	Samar F ₁	0	0	0	29	ES 2981 F ₁	0	0	0
5	Baxora F ₁	0	0	0	30	Bulldozer	0	0	0
6	Sherin F ₁	0	0	0	31	Mamlyuk F ₁	0	0	0
7	Durafshon F ₁	0	0	0	32	Omar F ₁	0	0	0
8	Metreng F ₁	1.5	4.5	32.5	33	Maksim us F ₁	0	0	0
9	Avrora F ₁	0	0	0	34	Model 4357/19 F ₁	0	0	0
10	Smart F ₁	0	0	0	35	2871 F ₁	2.0	2.7	45.3
11	Dinamit F ₁	0	0	0	36	Ezgi F ₁	0	0	0
12	Konkur F ₁	0	0	0	37	Sesie F ₁	0	0	0
13	Rekord F ₁	0	0	0	38	Suzan F ₁	1.0	3.9	10.0
14	Pikolino F ₁	0	0	0	39	Yakamoz F ₁	1.0	3.6	10.0
15	Insi F ₁	0	0	0	40	Sulton F ₁	0	0	0
16	Iskandar F ₁	0	0	0	41	Apolov F ₁	1.0	4.0	10.0
17	Baby mini F ₁	0	0	0	42	Klyon F ₁	0	0	0
18	Orzu F ₁	0	0	0	43	Roket F ₁	0	0	0
19	Kuraj F ₁	0	0	0	44	Lyutiy F ₁	0	0	0
20	Spiny F ₁	0	0	0	45	Aksinya F ₁	0	0	0
21	Didim F ₁	0	0	0	46	Bavarets F ₁	0	0	0
22	Kansler F ₁	0	0	0	47	Ataman F ₁	0	0	0
23	Fenomeno F ₁	0	0	0	48	Argument F ₁	0	0	0
24	Model 4363/18 F ₁	0	0	0	49	Valset F ₁	0	0	0
25	ES 2718 F ₁	0	0	0	50	Donchak F ₁	1.0	4.8	44.7

In the experiments, when phenological observations were conducted, the following cucumber hybrids, Sardor F₁ (n-t), Sevinch F₁, Dayara F₁, Samar F₁, Baxora F₁, Sherin F₁, Durafshon F₁, Avrora F₁, Smart F₁, Konkur F₁, Rekord F₁, Pikolino F₁, Insi F₁, Iskandar F₁, Baby mini F₁, Orzu F₁, Kuraj F₁, Spiny F₁, Fenomeno F₁, Model 4363/18 F₁, ES 2718 F₁, Xuligan F₁, and Model 6128/18 F₁, did not show any signs of infection with powdery mildew during the entire growth period.

However, the following cucumber varieties incurred damage from powdery mildew during the technical ripening period of their fruits. In the case of Metreng F₁, the damage was rated at 1.5 points, and the disease progression reached 30%. For Model 4358/19 F₁, Suzan F₁, Yakamoz F₁, and Apolov F₁, similar indicators were observed, with damage rated at 1.0 point and disease progression at 10%. As for 2871 F₁, the damage from powdery mildew reached 2.0 points, and the disease progression was recorded at 45.3%. Donchak F₁ exhibited damage rated at 1.0 point and disease progression at 44.7%.

The progression of powdery mildew in the observed F₁ cucumber varieties was illustrated in the graph and can be summarized as follows: In Suzan F₁, the development of the disease commenced in the third decade of March, representing about 0.5% at the beginning, then increased to 1.8% in the third decade of April, and further escalated to 3.0% in May, with a subsequent rise to 0.9% in June.

The studied F₁ cucumber varieties demonstrated strong progression of powdery mildew in Apolov F₁, Donchak F₁, and Metreng F₁ forms, with these indicators reaching 4.0-4.8-4.5%, as confirmed by our experiments. The average development of the disease was observed in Yakamoz F₁ (3.6%) and Model 4358/19 F₁ (3.5%) forms. The disease showed weak progression in the Model 4358/19 F₁ form, with an average of 2.7% in one plant, as supported by the findings of our observations and analyses as outlined in the provided picture.



Picture: Progression of powdery mildew development in F₁ cucumber hybrids during the greenhouse period (percentage).

Summary: To select cucumber varieties resistant to powdery mildew for cultivation in greenhouses, 50 cucumber samples were studied from local and foreign germplasm. According to the research findings, Sardor F₁ (n-t), Sevinch F₁, Dayara F₁, Samar F₁, Baxora F₁, Sherin F₁, Durafshon F₁, Avrora F₁, Smart F₁, Konkur F₁, Rekord F₁, Pikolino F₁, Insi F₁, Iskandar F₁, Baby mini F₁, Orzu F₁, Kuraj F₁, Spiny F₁, Fenomeno F₁, Model 4363/18 F₁, ES 2718 F₁, Xuligan F₁, Model 6128/18 F₁ cucumber hybrids did not show signs of infection with powdery mildew during the entire greenhouse growth period. Therefore, these varieties were identified and selected as suitable candidates for cultivation in greenhouses due to their resistance to powdery mildew.

The development of powdery mildew in F₁ cucumber varieties was observed, and it was found that the progression of the disease is strong in Apolov F₁ and Donchak F₁ forms. The average progression of the disease was observed in Yakamoz F₁ (3.6%) and Model 4358/19 F₁ (3.5%) forms. Additionally, the disease exhibited weak progression in the Model 4358/19 F₁ form.

List of Used Literature

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