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THE EFFECT OF TEMPERATURE ON THE GROWTH OF FUNGI *CLASTEROSPORIUM CARPOPHILUM* AND *MONILIA CINEREA*

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Abstract:

In the relationships that occur between plants and fungi, the influence of environmental factors is much greater. Especially among them, a special place is occupied by the temperature of the weather. There is much more data on temperatures affecting the growth and development of fungi that cause klasterosporiosis and moniliosis burn diseases, and they differ from each other. This article provides information that the effect of temperature on the growth of fungi that provoke klasterosporiosis and moniliosis burns on almonds has been studied in laboratory conditions, and the optimal temperature for the growth of both pathogenic fungi has been determined. If at the minimum temperature the cornflower begins to grow, then at the maximum temperature their growth slows down or stops completely. The optimal temperature index accelerates the growth and development of the fungus.

Keywords: Almonds, Spores, Fungi, Temperature,Diseases, Incubation, Thermophilic, Nutrition, Diameter, Colony.

INTRODUCTION

The scale of the impact of various diseases on fruit trees grown in gardens today in the world is increasing. It has been proven that the main part of these diseases is caused by fungi. According to FAO, fruit trees around the world have been found to lose up to 30% of the crop due to diseases and pests.

Among fruit trees, almonds occupy a special place, and it is considered an ancient and traditional type of fruit crop for many countries of the world. In the world's leading research centers, research has been carried out to study the common klyasterosporiosis and moniliosis burn diseases of the almond tree, as well as the spread, development, damage caused by the fungi *Stigmina carpophila* and *Monilinia cinerea*, which provoke them, and measures to combat them. As a result of this, the preservation of the yield of almonds lost under the influence of these diseases was achieved. Even today, it remains relevant to carry out research work aimed at developing measures to effectively combat fungal-causing diseases of the almond tree.

Moniliosis burn disease has been studied in the bone fruit trees in the central Blacksoil area of Russia. It was determined that *Monilia cinerea Ehrend*provokesthis diseaseand makes these fungi overwinter in the affected organs of the plants. In recent years in the area, it has been observed that Cherry moniliosis disease causes great damage. The main reason for this was considered to be a change in climatic conditions. It was noted that the fungi that cause this disease overwinter in the branched stems and fruits with the help of mycelium and conidia. It has been determined that the disease will develop rapidly and the harm will be great when there is a lot of precipitation [1, 2].

Moniliosis burn disease spread in apricot in Mahachkala city of Russia, during the flowering period it was observed that its prevalence was 8% in the absence of precipitation. It is noted that the prevalence of moniliosis disease in the years with precipitation of 26 and 36 mm at the time of flowering of apricots was 90-100%. 48% of the crop was lost due to moniliosis burn disease [3].

Moniliosis burn disease in Belarus has previously been very rare. But since the beginning of the XXI century, it has been noted that the harm caused by this disease on cherry trees is significant. It was found that the development of this disease in a cherry tree is 1.5-2 points and the prevalence is 100% [4].

With anthracnose disease, the flowers, fruits, leaves and body part of the almonds are damaged. In the 1980's and 1990's, due to anthracnose disease, most of the almond crop was lost in California, US and in Israil [5, 6]. Data on the incidence of this disease in the Australian territory were first reported in 1998 [7].

Klyasterosporiosis *Stigmina carpophila* and moniliosis burn diseases found in bone-fruit trees in the conditions of Uzbekistan when studying the influence of temperature on the growth and development of the causative *Monilia cinerea* fungi was found that the most favorable temperature for the growth of *S.carpophila* is 20-25^{0}C, and its growth slows down at temperatures of 8^{0}C and 35^{0}C. If the best growth of *M.cinerea* fungus was observed at a temperature of 20^{0}C, its growth slowed down at temperatures of 8^{0}C and 30^{0}C. Under natural conditions, slow development of the

fungus was observed in the leaves and fruits remaining on the surface of the soil, as well as rapid development when preserved on the stem [8].

It was noted that klyasterosroriosis and polystigmosis diseases of almonds are common in all almond growing regions of Uzbekistan, and they are among the most harmful diseases of almonds in Bustanlik district of Tashkent Region [9].

I. MATERIALS AND METOHODS

To distinguish the pure culture of disease-causing fungi and determine their type, there was used the light agar-agar (20 g agar-agar per 1L of water), sometimes Chapec or KSA medium. Before pouring into Petri dishes with a diameter of 9-10 cm against the growth of bacteria, streptomycin (1 g/l) or penicillin (1g/l) or a mixture of them (0.5 g+0.5 g/l) or ciprofloxacin (0.5-1.0 g/l) were placed in a warm (45-50°C) nutrient medium. In addition to antibiotics to nutrient media when analyzing individual samples, fundazole 50% n.kuk. solution was also added (4 mg/l).

When determining the types of fungi and studying their influence on temperature, there were used nutrient media with natural composition. In this case, in the Suslo-agar nutrient medium, all fungi grow and develop well, forming characteristic color and morphological signs. For some species that do not form macroconidia, a nutrient medium with the following composition is recommended, KH_2PO_4 – 1 r; KNO_3 – 2 g; $MgSO_4$ – 0,5 g; KCI – 0,5 g; $FeSO_4$ – 1 drop; starch – 0.1 g; sucrose – 0.1 g; glucose – 0.1 g; water – 1 L. Also, potato sucrose agar (1000 ml of potato extract, sucrose 40 g, agar 20 g) is also used in the nutrition environment. The experiment is carried out in the refrigerator and thermostats in 4 repetitions. The studied fungi is planted in the center of the Petri plate, and the growth diameter of the colonies is measured with a liner every 24 hours. Therefore, simultaneous changes in the color of the nutrition environment and mycelium growth are also taken into account and considered through the appropriate formulations [10].

To determine the types of disease-causing fungi, the data obtained in their observation processes in the primary and secondary microscope (size, morphology, number and location of spore-forming organs) were compared with diagnostic parameters in specific determinants. As additional criteria, the symptoms of the disease in the plant, the morphology of cultures and the results of artificial damage studies were taken into account. In order to determine the percentage of spread of a particular disease in the field on the leaves and other organs of the plant, it was taken as a basis from what percentage of the segments in the analyzes its causative agent grew [11]

II. RESULTSAND AND DISCUSSION

In the relationship that occurs between the plant and the organisms that cause the disease in it, including fungi, the influence of factors of the external environment is much greater. Especially among them, the weather temperature has a special place. Many are known to have the optimal temperature for the growth and development of disease-causing fungi. The fact that this temperature is less or more than the optimal size affects the growth of spores of phytopathogenic fungi. If at the minimum temperature the fungi spore begins to grow, then at the maximum temperature their growth slows down or completely stops. The optimal temperature indicator accelerates the growth and development of the fungus.

If the minimum temperature for the growth of spores of most fungi is 3-5°C, the optimal temperature will be around 10-25°C, the maximum temperature will be 30-35°C. Spores of fungi with less demand for hot temperatures begin to grow even around 0°c, while those of thermophilic continue to grow even at 40°C [12].

The pathogenesis of fungus involves processes in which the host enters the plant tissue, enters the tissue and occupies it, the appearance of signs of disease and the formation of spores. The period until the entry of the fungus into the plant tissue and the appearance of signs of disease is referred to as the incubation period. The duration of the incubation period depends on the specific development of the parasitic fungus, the host plant, factors of the external environment, which has important epiphytotiological significance. The influence of temperature on the duration of the incubation period is very large.

There is a lot of information regarding the temperature that affects the growth and development of fungi that cause klyasterosporiosis and moniliosis burn diseases, and they differ from each other. Because the causative agents of this disease are common in different geographic areas, it is natural that there is also a difference in their biological characteristics. For this reason, the study of the effect of temperature on them in particular under concrete conditions acquires particular importance. For this reason, experiments were carried out in laboratory conditions to study the effect of temperature on the growth of fungi that provoke perforated spotting and moniliosis burns on the almonds. To do this, *C. carpaphilum* and *M. cinerea*were planted in agaric potatoes Petri plates, and they were grown to the thermostat at different temperatures (-2°C, 5°C, 8°C, 11°C, 15°C, 20°C, 25°C, 30°C) for 10 days and the calculation of the growth of their colonies was carried out. The experiments were carried out on the 4th repetition.

Based on laboratory experiments it was found that the most favorable temperature for the development of *C.carpophilum* fungus is 20°C. In this case, the diameter of the colony formed by the disease-causing fungus for 10 days reached 30.6 mm (Table 1). With a decrease in temperature, the growth of the fungus slowed down. During this period, the minimum growth of the fungus was observed in conditions with a temperature of 5°C, the diameter of the colony formed by it was equal to 1.5 mm. At a temperature of -2°C, the growth of the fungus was not recorded. When the Petri plate stored under these conditions was placed in a thermostat with a temperature of 20°C, the

fungus grew and developed, forming a spore. So, as long as there is no fungi at a temperature of -2°C, but with the birth of favorable conditions, it will continue to grow and develop again.

It was found that the causative agent of burn disease *M.cinerea*fungi development in almond flowers' the most favorable temperature is 15-20°C. In this case, the colonies in Petri plates reached 81 mm in diameter, at a temperature of 15°C and 90 mm at a temperature of 20°C, that is, completely covered the Petri plate (Table 2). At a temperature of -2°C, the development of the fungus was not observed. At a temperature of 5°C, the diameter of the fungi colony in the 5th day reached 10 mm. At a temperature of 30°C, the development of fungi has slowed down significantly.

As a result of the experiments carried out, the most optimal temperature for the development of *C.carpophilum*fungus was 20-22°C, and for *M.cinerea*fungus, a temperature of 18-20°C was found to be the most comfortable.

Table 1.The influence of the temperature on the growth agent of *C.carpophilum*ofcausative agent ofklyasterosporiosis disease in the almond plant.

No.	Temperature, t°C	Diameter of *C.carpophilum*colony, mm							
		Recorded days							
		2	3	4	5	6	7	8	10
1.	-2	–	–	–	–	–	–	–	–
2.	5	–	–	0,2	0,5	0,7	0,9	1,2	1,5
3.	8	–	0,4	0,8	1,9	3,3	4,7	6,0	8,2
4.	11	–	1,3	2,2	3,7	5,8	7,9	10,4	13,5
5.	15	–	5,0	7,1	9,6	12,0	15,1	18,4	22,9
6.	20	–	8,3	12,5	15,8	18,1	21,3	25,4	30,6
7.	25	–	7,8	11,7	14,5	17,0	19,6	24,2	28,1
8.	30	–	2,2	3,5	5,9	8,1	10,0	12,3	15,4

Table 2.The influence of the temperature on the growth agent of *M.cinerea*ofcausative agent in moniliosis burn disease in the almond plant.

No	Temperature, t°C	Diameter of *M.cinerea* colony, mm				
		Recorded days				
		2	3	5	7	10
1.	-2	–	–	–	–	–
2.	5	–	–	10	18	29
3.	8	–	0,2	15	37	56
4.	11	0,1	0,5	25	44	75
5.	15	0,1	0,5	39	81	90
6.	20	0,1	0,5	42	90	90
7.	25	–	0,3	17	28	37
8.	30	–	0,2	6	12	19

CONCLUSIONS

There are several diseases caused by fungi in the almond tree, within which, in many countries, diseases of klyasterosporiosis and moniliosis lead in terms of damage size. For the development of these diseases, sufficient moisture and a comfortable temperature will be needed. The causative fungiinfection of klyasterosporiosis disease is spread around the environment by raindrops, and it was found in our studies that the most favorable temperature for the development of the fungus *Clasterosporium carpophilum*, which provokes it, is 20-22°C, and for the fungus *Monilia cinerea*, which provokes moniliosis, a temperature of 18-20°C.

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