Incidence of Gray Rot Disease of Strawberry in the Farms of Tashkent Region

Eshmurzaev Jasur Elmuratovich

Independent Researcher, Tashkent State Agrarian University, Tashkent, Uzbekistan

ABSTRACT

The article provides information on the prevalence and development of gray rot disease, also known as gray mold in strawberry in Tashkent region. It has been studied and shown herein that the gray rot disease damages the fruits, pedicel, leaves and petioles of leaves of strawberry. The development and severity of the disease has been found to be caused by low air temperature, high rainfall, planting strawberries as a monoculture and a large number of weeds in the field.

Keywords: Fungus, gray rot, mycelium, conidium, spora, sclerotium, infection, pure culture, spot, humidity, temperature.

Introduction

In order to ensure food safety in the world and gain a place in the world market, scientific research is being carried out to find advanced technologies for growing agricultural products and protecting them from harmful organisms. One of the urgent issues of today is to study the fungal diseases which significantly reduce the yield of berry plants, including strawberry which is considered currently the main berry crop, and to improve the system of the control of these diseases.

Among the fungal diseases of strawberries, gray rot is one of the most common and dangerous diseases. Due to this disease, not only productivity decreases, but also its quality (Abdeyeva et al., 2015; Galiulina, 2009; Merkulova, 2012; Rudakov, 1959; Govorov, 2011; Muslimov, 1964; Marchenko, 2010). The fungus that causes strawberry gray rot is a hygrophil and has been found to overwinter using sclerotia. When there are favorable conditions, i.e. the temperature and humidity necessary for the development of the fungus, small funnel-shaped apothecia with a diameter of 1-5 mm and a leg length of 2-4 mm appear on the surface of the sclerotia. Inside the apothecia there are nodular sacs of 100-120 x 9-12 μm in size, they produce one-celled colorless ascospores of 11 x 5-6 μm in size. Spores of the disease-causing fungus spread quickly around with the help of wind and raindrops. They germinate in 5-24 hours at a temperature of 30°C and damage new plants (Govorova, Govorov, 2010).

This disease is widespread in all areas where strawberries are planted, and there are opinions that the spreading process of disease is accelerated especially when the temperature is low and humidity is high (Dorozhkin, Tishanovich, 1974;). In the north-western and northern regions of Russia, 10-18% of the crop was lost due to the disease (Kotova 1958). In the north-western and central regions of the European part of Russia, this indicator reaches 60%, and according to the data of I.V. Meshcheryakova (1986), it reaches 94%.

In 2013-2015, as a result of observations made in the field of variety testing in the Crimean branch of ESS ARRIPG of Russia, 80-100% yield loss due to gray rot disease was

recorded during the fruiting period of strawberries under the influence of low temperature and precipitation (Gorelikova, 2016).

During the summer, it was observed that the fungus produces 11-12 generations but they can be killed by direct sunlight. The fungus overwinters by forming sclerotia (Natalina, 1963; Maas, 1984) and mycelium (Kotova, 1958) in the affected parts of the plant. Spores formed in early spring on the surface of overwintered sclerotia in plant residues and formed as a source of primary infection can infect various organs of strawberry plants.

This disease-causing fungus is polyphagous (infecting most plants), but not omnivorous (or pantophagous). This fungus infects all berry crops, most fruit and vegetable crops, ornamental plants, etc., and these plants serve as a source of infection. This fungus does not infect corn plants and potatoes. A species of *B. cinerea* fungus that infects many agricultural crops has been identified, but its species that only infects strawberries has not been studied yet. The fungus grows in the temperature range of 0-25°C. An environment with a temperature of 18-20°C and a relative humidity of 100% is considered the most favorable for the development of the fungus. A drop of water is necessary for the spores to grow.

B. cinerea is a parasite fungus, but it also lives well as a saprophyte. For this reason, this fungus grows and develops in plant residues, produces many spores and remains saprophytic in the soil. If the infested plant debris or residues are not removed from the harvested fields, the source of infection in the soil there can increase and cause the epiphytoty of gray rot in high humidity conditions. Different enzymes secreted by the fungus allow it to use different substrates as food. The toxins released by the fungus destroy the plant tissue, and the fungus lives at the expense of this tissue (Grishanovich, 1969; Andreyeva, 1977).

Materials And Methods

Recording of strawberry gray rot disease is carried out at the time of fruit collection and is carried out on the basis of the following scale:

0 score – berries are healthy;

1 score – berries have some disease symptoms;

2 scores –10% of berries are infected and rotten;

3 scores – 10-20% of berries are infected and rotten;

4 scores – more than 20% of berries are infected and rotten; (Govorova, Govorov, 2010).

Isolation of pure culture of disease-causing fungi of strawberry was carried out by the moisture chamber method. For this purpose, a filter paper was placed on the bottom of the Petri dishes and these paper wrapped dishes were sterilized in an autoclave at a temperature of 121°C for 30 minutes under a pressure of 1 atm. After taking from autoclave, Petri dishes were cooled and then wetted with sterile water in a laminar box. Then infected strawberry samples were planted in these Petri dishes.

Samples of strawberry plants were washed thoroughly in running water and then water was poured over them for 15-20 minutes before conducting laboratory tests. Samples were cut by 5-8 mm, then sterilized by immersing them in 0.5% sodium hypochlorite (NaOCl) solution for 30 minutes and thoroughly washed 2-3 times in sterile water before planting them in Petri dishes in a laminar box. Then they were placed in Petri dishes by 5-10 pieces.

Petri dishes were placed in thermostats with a temperature of 18-20°C to isolate fungi in pure form. At this temperature, it took 8-12 days for the fungi to grow.

Fungi grown in samples in Petri dish were planted in laminar boxes in test tubes filled with agar wort and agar potato broth media, and these test tubes were placed in a thermostat with a temperature of 24-26°C for fungal growth and development. After the fungi were fully grown and germinated, they were observed under a microscope and the required dimensions were recorded and their types was determined using specifiers.

Results

According to the results of research conducted in Tashkent region in 2017-2019, strawberry gray rot disease was recorded in all the farms where the observations were carried out. It was observed that strawberry fruits, pedicels, calyx, leaves and leaf petioles were damaged by gray rot. Many black sclerotia appeared on the surface of the infected parts of the plant. Rapidly growing light brown spots were formed on the berries of the plant, and the surface of these spots was covered with a gray mold consisting of fungal mycelia. Such berries became firstly mushy, then dry and leathery. It was found that the damage of strawberry by gray rot disease occurs in berries and other organs without any mechanical cracks. But it was also observed that the disease accelerated in plant parts where mechanical cracks were observed. It was determined that the spread and development of this disease is caused by low temperature, high rainfall, planting strawberries as a monoculture, and a large number of weeds in the field.

The most incidence of grey rot disease was observed in "Turdiboev Kurbonboy" farm. In this farm, the prevalence of the disease was 12,6-25,7%, its development was 5,9-12,1%. (see the table-1).

Among the rest of the farms, there was no significant difference in the prevalence and development of grey rot disease. "TURDIBOEV KURBONBOY" farm is close to a mountainous area, where higher humidity and relatively lower temperature than other farms may have led to a greater spread of the disease. The impact of grey rot disease on strawberry yield was also studied. As can be seen from Table 2, it was observed that the yield loss of strawberry in "TURDIBOEV KURBONBOY" farm with high prevalence and development of grey rot was more than other farms. It was determined that 12,3% of the yield was lost in this farm, i.e 3,8 c/ha more yield was lost compared to healthy strawberry plants. In other farms, the yield loss due to the disease compared to healthy strawberry plants on 1 ha was 2,3-3,1 c/ha, which is 6,0-9,2% when expressed as a percentage.

Table 1.
The incidence of grey rot disease of strawberry

№	Farms	In 2017			In 2018			In 2019		
		Grey rot disease								
		Disease incidence, %	Disease severity, %	Disease index, %	Disease incidence, %	Disease severity, %	Disease index, %	Disease incidence, %	Disease severity, %	Disease index, %
1	"Rikhsiboyobod"	17,6	7,7	1.4	7,0	3,1	0,2	11,8	4,6	0,5
2	"Turdiboev Kurbonboy"	25,7	12,1	3,1	12,6	5,9	0,7	22,5	10,3	2,3
3	"Sharofboy Nurov"	18,4	8,5	1,6	8,1	3,8	0,3	14,0	6,2	0,9
4	IAC SUE at TashSAU	20,2	9,3	1,9	9,8	4,7	0,5	16,3	6,8	1,1

Table 2
The impact of grey rot disease on the yield of strawberry

№	Farms	Physiological condition of strawberry	Disease			Strawberry yield, c/ha	Yield loss relative to healthy plant yield
			Disease incidence, %	Disease severity, %	Disease index, %		

							c/ha	%
1	"Rikhsiboyobod"	healthy	-	-	-	38,6	-	-
		infected	12,1	5,1	0,6	36,3	2,3	6,0
2	"TURDIBOEV KURBONBOY"	healthy	-	-	-	30,8	-	-
		infected	20,3	9,4	1,9	27,0	3,8	12,3
3	"Sharofboy Nurov"	healthy	-	-	-	37,2	-	-
		infected	13,5	6,2	2,6	34,5	2,7	7,3
4	IAC SUE at tashSAU	healthy	-	-	-	33,8	-	-
		infected	15,4	6,9	2,4	30,7	3,1	9,2

It can be considered that the reason of higher yield loss due to grey rot disease of strawberry in "Turdiboev Kurbonboy" farm compared to other farms is its location in the foothills area with relatively high humidity and low temperature.

Conclusion

It was found that strawberry grey rot disease is widespread and one of the most dangerous diseases in Tashkent region.

It was determined that the spread and development of grey rot disease are caused by low air temperature, high rainfall, planting strawberries as a monoculture and a lot of weeds in the field.

It has been noted that grey rot disease causing fungus in strawberries are preserved in plants with the help of its sclerotia.

References

1. Andreyeva N.F. Wilting-type diseases of strawberries, gray rot and measures to control them: Abstract of diss. for. cand. agr.sci. Moscow: 1977.
2. Abdeyeva Z.A., Ivanova E.A., Mursalimova G.R. Resistance of varieties of genetic collection of strawberries to gray rot in the Orenburuzhye region // Innovative achievements in modern berry growing. Fruit growing and berry growing. Russia: Intern. distance scientific conf. -M.: 2015. Vol.XXXXI. – Pp.19-22.
3. Grishanovich A.K. Gray rot of strawberry and some biological features of its pathogen// Bulletin of SA B SSR Ser. Sg.Navuk. 1969, №1. – Pp. 91-93.
4. Galiulina A.A. Resistance of strawberry varieties to diseases and pests in the conditions of the Boshkird Urals // Bulletin of the OTU No. 10 (104), 2009.- Pp 96-99.
5. Govorova G.F., Govorov D.N. Fungal diseases of strawberries. Moscow: IN QUARTA, 2010.- p.160.
6. Govorov V.N. Evaluation of the resistance of new varieties and hybrids of strawberries to the main fungal diseases and pests in the conditions of the central zone of the Krasnodar Territory // Abstract of the thesis. diss. cand. agr.sc.-Krasnodar, 2011.-P. 22.
7. Gorelikova O.A. Evaluation of the resistance of introduced garden strawberry varieties to diseases in the conditions of the Krasnodar Territory // Fruit growing and berry growing in Russia.Volume 45, 2016. – Pp. 58-68.
8. Dorozhkin N.A., Grishanovich A.K. Development of gray rot in strawberry and measures to combat it // Fruit growing, 1974. 3rd edit. - Pp.108-113.
9. Kotova V.V. Browning of strawberry leaves caused by the fungus *Dendrophoma obscurans* // Proceedings of the Leningrad Agricultural Institute. 1958, No. 13.-Pp. 187-189.
10. Muslimov Z. Research and use of antagonist microbes-antogonists in the fight against strawberry gray rot - Botrytiscinereapers. // Abstract. can.dis.-Tashkent: 1964.—P.16.

11. Mesheryakova I.V. Post-harvesting of berries // Plant Protection. - 1986. No. 7. -Pp. 56-57.
12. Marchenko L.A., Pshikhacheva Z.U. Strawberry resistance to fungal leaf diseases // Fruit growing and berry growing. Russia. No. 2, 2010.- Pp. 204-207.
13. Merkulova L.S. Protection of strawberries from pests and diseases in the Moscow region // Protection and quarantine of plants, No. 4, 2012. - P. 47.
14. Natalina O.B. Diseases of berries.-M.: Publishing house of agricultural literature, magazines and posters, 1963.-P. 272.
15. Maas J.L. Compenium of strawberry diseases. Am. Phytopathol. Sac.,St. Paul, MN. – 1984. – P.140.
16. Khakimov A.A., Utaganov S.B., Omonlikov A.U. Current status and prospects of the use of biofungicides against plant diseases. GSC Biological and Pharmaceutical Sciences, 2020, 13(03), 119-126 https://doi.org/10.30574/gscbps.2020.13.3.0403
17. Khakimov A., Salakhutdinov I., Omolikov A., Utaganov S. Traditional and current-prospective methods of agricultural plant diseases detection: A review. 3rd International Conference on Agriculture and Bio-industry (ICAGRI 2021), Banda Aceh, Indonesia, 13-14 October 2021. IOP Conference Series: Earth and Environmental Science, 2022, 951(1), 012002. doi:10.1088/1755-1315/951/1/012002
18. Mamiev M.S., Khakimov A.A., Zuparov M.A., Rakhmonov U.N. Effectiveness of different fungicides in controlling botrytis grey mould of tomato. 1st International Conference on Energetics, Civil and Agricultural Engineering 2020" (ICECAE 2020), 14-16 October 2020, Tashkent, Tashkent Institute of Irrigation and Agricultural Mechanization Engineers (TIIAME)
19. Zuparov M.A., Khakimov A.A., Mamiev M.S., Allayarov A.N. In vitro efficacy testing of fungicides on *Botrytis cinerea* causing gray mold of tomato. International Journal on Emerging Technologies, 2020, 11(5), pp. 50-55.
20. Allayarov A.N., Abdurakhmonova S.B., Khakimov A.A. The spread of alternaria leaf spot disease in cabbage vegetable plants, its damages and the efficacy of fungicides used against them. EPRA International Journal of Research and Development (IJRD), 2019, 4(2), pp. 118-122.