ISSN (Online): 2455-3662
EPRA International Journal of Multidisciplinary Research (IJMR) - Peer Reviewed Journal
Volume: 8| Issue: 7| July 2022|| Journal DOI: 10.36713/epra2013 || SJIF Impact Factor 2022: 8.205 || ISI Value: 1.188

# INCIDENCE OF FUSARIUM DISEASE IN STRAWBERRY FIELDS IN TASHKENT REGION

**Eshmurzaev Jasur Elmuratovich[1], Zuparov Mirakbar Abzalovich[2]**
[1]*Independent Researcher, Tashkent State Agrarian University,Tashkent, Uzbekistan*

[2]*Professor of the Department Plant Pathology and Agrobiotechnology, Tashkent State Agrarian University, Tashkent, Uzbekistan*

**Article DOI: https://doi.org/10.36713/epra10941**
**DOI No: 10.36713/epra10941**

## ABSTRACT
***The article presents the data on the prevalence, severity and development of fusarium disease in strawberries grown in the fields of Tashkent region. The symptoms of this disease in strawberries are explained in detail. The impact of precipitation and temperature on the incidence of fusarium is revealed here in.***

**KEY WORDS:** ***disease, fungus, wilting, colony, microconidia, macroconidia, chlamydaspora, pure culture, nutrient media, sclerotinia.***

## INTRODUCTION

Taking into account that the demand for fruit and vegetable products is increasing, and especially the issue of increasing the yield of agricultural crops for export is urgent, it is one of the actual issues to study the diseases of strawberry and their severity, which are considered to be one of the factors that prevent the increase of the yield, and to implement effective measures to control these diseases.

Among strawberry diseases, fungal diseases are more common than others. During the study of scientific sources dedicated to the study of fungal diseases of strawberries, it was witnessed that a lot of research work has been carried out by world scientists in this regard.

Fusarium wilt disease of strawberry, caused by a fungus, is one of the diseases that causes a decrease in yield and in its quality (Govorova, Govorova, 2010; Grishanovich, 1971; Govorova, 1992; Golovin, 2001; Gorelikova, 2016). Fusarium disease of strawberry was first identified by the American scientist Neal in 1923 (Andreyeva 1971). This disease is most common in North America and England, and its causative agent is *Fusarium bulbigenum* Cke. et Maas. There are opinions that F.orthoceros App. et Wr. may be a synonym for it or other species of Fusarium. This disease is widespread in Western Europe, USA and Canada too (Natalina, 1963). The appearance of the disease is similar to verticillium wilt. Fusarium disease has been found to cause by *Fusarium oxysporum* f.sp. *fragaria* Winks et Williams. But there are also opinions that this disease can be caused by other species belonging to the Fusarium family. The leaves of strawberries infected with the disease begin to dry and die, the root neck and the main root decay. When the air humidity is high, the root of the plant is covered with a powder consisting of mycelium and spores of the fungus. *F.oxysporum* f.sp. *fragaria* mycelia are pale pink in color, the macroconidia are long, loop-shaped, the tip is thinned, ellipsoidal bent or straight, they have three septa, the size of the spores is 21-49 x 2.3-4 μm, and they form sclerotia (Govorov, 2011).

Due to the accumulation of mycelia of the disease-causing fungus in the plant's transmission tubes, water from the soil does not reach the surface of the plant, as a result, the plant wilts.

A lot of information about fusarium disease is covered in foreign scientific literature, in some sources it is said that this disease is one of the common diseases of strawberries, while in some sources it is said that this fungus is one of the components of microorganisms involved in the root rot of the plant.

N.F. Andreyeva (1971) found and recorded fusarium wilt in the fields of strawberry farms in Gatchinsky District of Leningrad region of Russia.

A pure culture of the fungus Fusarium sporotrichiella was isolated from infected strawberry samples. In these fields, it was observed that strawberry variety “Mysovka” was affected by fusarium disease up to 25% and the variety Komsomolka up to 10-12%.

In order to determine the pathogenicity of this disease-causing fungus to strawberry, its culture grown on wheat grain was added to the soil in the pot in the amount of 50 g/kg. Then the “Festivalnaya” variety of strawberry was planted in this pot. Fusarium symptoms appeared after one month. Strawberry plants planted in the pots with healthy and undamaged soil were healthy.

ISSN (Online): 2455-3662
EPRA International Journal of Multidisciplinary Research (IJMR) - Peer Reviewed Journal
Volume: 8| Issue: 7| July 2022|| Journal DOI: 10.36713/epra2013 || SJIF Impact Factor 2022: 8.205 || ISI Value: 1.188

While in strawberry plants planted on an infected background in field conditions, the first symptoms of the disease appeared after 40-45 days.

When the root of a strawberry plant was immersed in the 20-day cultural fluid of the fungus *F. sporotrichiella* grown in the Czapek nutrient medium, wilting of leaves in the seedlings of "Misovka", "Shedraya", "Raketa", "Zenga", "Prekas" and other varieties was observed from the 4th day.

In other varieties, symptoms of the disease appeared gradually. Strawberry seedlings with roots immersed in Czapek liquid fluid were taken as control variant.

## MATERIALS AND METHODS

Records on fusarium wilt disease of strawberry are taken twice during the growing season, in mid-summer and in late September, using the following scale:

0 score – strawberry plant is healthy;

1 score – very weakly infected, necrosis or other signs of disease were observed on the lowest leaf;

2 scores – significantly infected, wilting symptoms were observed in up to 10% of leaves.

3 scores – severely infected, up to 25% of leaves show signs of necrosis or wilting;

4 scores – very strongly infected, more than 50% of the leaves of the plant wither or the plant completely dries up (Govorova, Govorov, 2010).

A moisture chamber method was used to isolate a pure culture of the fungus that causes Fusarium wilt disease in strawberries. Filter paper was placed on the bottom of Petri dishes to form a moisture chamber and they were sterilized in an autoclave at 1 atm pressure and at 121°C temperature for 30 minutes. After taking from the autoclav, Petri dishes were cooled, the filter papers were wetted with sterile water in a laminar box.

Samples of diseased strawberry plants were washed thoroughly in running water and then water was poured over them before conducting laboratory tests. Then, the 5-8 mm cut samples were 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 planted with samples were placed in thermostats with a temperature of 18-20°C. 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 germinated and grown, their type was determined.

## RESULTS AND DISCUSSION

Fusarium disease of strawberry is caused by *Fusarium oxysporum* f. sp. *fragaria* Winks et Williams fungus type. The initial symptoms of the disease were observed from the period of fruit ripening. In this case, light brown spots appeared on the edges of the leaves and vascular and cortical tissues of infected plants. It was observed that the infected and wilting leaves and stems first fade to yellow, then to brown, and then die. When leaf bands and roots of diseased plants were cut crosswise, it was noted that their conductive tissues turned brown due to the toxins released by the disease-causing fungus. As a result of the disease, wilting of the plant was first observed and then drying and death. When such infected plants were pulled out of the soil to observe, their roots were rotted and covered with mycelia of the disease-causing fungus.

It was also found that Fusarium disease spreads severely in the strawberry field as a focus and it is more common in the place where water is collected, that is in higher humidity.

The fungus that causes Fusarium wilt, when grown on an agar wort medium, has been found to produce rapidly growing, well-developed white colonies with slightly raised mycelia. The microconidia of the fungal stroma are single-celled, some are spherical or elongated, the size is 12.2-14.0 x 3.1-3.7 µm. Its macroconidia are elongated sickle-shaped, with 3-5 transverse septa.

Macroconidia formed in aerial mycelia, sporodochia, and pionnots, they were fusiform, arcuate, straight or partially curved, body equal in width, tip cell covered with a thin skin is curved, with foot-shaped basal shape. Macroconidia with three septa is 25-40 x 3.7 -5 µm in size, and with five septa is 30-50 x 3-5 µm in size. If the macroconidia are grown for a long time in the nutrient medium, they have the characteristic of disappearing.

Fusarium wilt disease was observed in all strawberry farms of the Tashkent region where the research was conducted in 2017-2019.

It was found that this disease causes great damage to both young plants and strawberry plants that have already entered the harvest. Under the influence of the disease, the development of the plant was delayed and the yield was significantly reduced. It was observed that the plant dies quickly due to fusarium, and its development is slow if the disease has a chronic form. Fewer runners form due to the infestation. The disease affects strawberries at all ages. Its strong development and severity was evident especially during fruit ripening. In the later stages, the development of the disease was smooth. The development of foliage in diseased plants delayed that of healthy ones. It was noted that total number of leaves decreased and their color became light green. By the end of the growing season, the leaf bands turned red, and the plant itself became stunted. Such bushes were unable to withstand the winter cold and dried up soon. When the roots of infected plants were cross-sectioned, it was observed that their conducting tissue tubes discolored and turned brown. It was found that this disease spreads as a focus in many cases in strawberry planted fields. The most common occurrence of this disease among the researched farms was recorded

ISSN (Online): 2455-3662
EPRA International Journal of Multidisciplinary Research (IJMR) - Peer Reviewed Journal
Volume: 8| Issue: 7| July 2022|| Journal DOI: 10.36713/epra2013 || SJIF Impact Factor 2022: 8.205 || ISI Value: 1.188

in "Rikhsiboyobod" farm. Here, the spread of the disease was 10.4-14.7%, the development was 4.1-7.9%. The lowest indicator in this regard was recorded in the farm of Information and Advice Center (IAC) State Unitary Enterprise (SUE) at Tashkent State Agrarian University (TashSAU) (see Table 1). Such a difference in occurrence of the disease may depend on the variety of strawberry planted in these farms, agrotechnical measures and their quality.

Analyzing the occurrence of fusarium wilt by years, the most occurrence of this disease was observed in 2018, this year the prevalence of the disease was 7.6-14.7%, and its development was 2.8-7.9% (see Table 1). No significant difference was observed in the remaining years according to these indicators.

**Table 1**
**The Incidence of Fusarium in Strawberry**

| Farms | In 2017 | | | In 2018 | | | In 2019 | | |
|---|---|---|---|---|---|---|---|---|---|
| | Leafspot | | | | | | | | |
| | Disease incidence, % | Disease severity, % | Disease index, % | Disease incidence, % | Disease severity, % | Disease index, % | Disease incidence, % | Disease severity, % | Disease index, % |
| "Rikhsiboyobod" | 10,4 | 4,1 | 0,4 | 14,7 | 7,9 | 1,2 | 11,4 | 4,8 | 0,5 |
| IAC SUE at TashSAU | 5,3 | 2,2 | 0,1 | 7,6 | 2,8 | 0,2 | 6,7 | 3,0 | 0,2 |
| "Sharofboy Nurov" | 6,8 | 3,9 | 0,3 | 9,4 | 4,5 | 0,4 | 7,9 | 4,1 | 0,3 |
| "TURDIBOEV KURBONBOY" | 9,1 | 4,0 | 0,4 | 12,3 | 6,1 | 0,8 | 10,2 | 4,7 | 0,5 |

**Table 2**
**Impact of fusarium disease on the yield of strawberry plant**

| Farms | Physiological condition of strawberry | Disease | | | Strawberry yield, c/ha | Yield loss relative to healthy plant | |
|---|---|---|---|---|---|---|---|
| | | Disease incidence, % | Disease severity, % | Disease index, % | | c/ha | % |
| "Rikhsiboyobod" | healthy | - | - | - | 36,4 | - | - |
| | infected | 12,2 | 5,6 | 0,7 | 32,5 | 3,5 | 9,7 |
| IAC SUE at TashSAU | healthy | - | - | - | 32,5 | - | - |
| | infected | 6,5 | 2,7 | 0,2 | 31,2 | 1,3 | 4,1 |
| "Sharofboy Nurov" | healthy | - | - | - | 34,9 | - | - |
| | infected | 8,0 | 4,2 | 0,3 | 32,9 | 2,0 | 5,6 |
| "TURDIBOEV KURBONBOY" | healthy | - | - | - | 35,7 | - | - |
| | infected | 10,5 | 5,4 | 0,6 | 32,9 | 2,8 | 8,0 |

In 2017 this indicator was 5,3-10,4% and 2,2-4,1% respectively, while in 2019 it was equal to 6,7-11,4% and 3,0-4,8%.

Fusarium wilt disease was more common in 2018 compared to other years due to low rainfall and slightly lower air humidity that year. The effect of fusarium wilt on strawberry yield was also studied. As a result of this disease 4,1-9,7% yield loss was noted (see table - 2). Yield loss was higher in "Rikhsiboyobod" farm (9,7%) compared to the yield of healthy plants. Lower loss of yield was noted in IAC SUE at TashSAU (4,1%).

Such a difference in strawberry yield loss may be due to disease control measures, agronomic practices and strawberry varieties planted in these farms.

ISSN (Online): 2455-3662
EPRA International Journal of Multidisciplinary Research (IJMR) - Peer Reviewed Journal
Volume: 8| Issue: 7| July 2022|| Journal DOI: 10.36713/epra2013 || SJIF Impact Factor 2022: 8.205 || ISI Value: 1.188

## CONCLUSION

It was noted that strawberry fusarium wilt disease is widespread in all farms of Tashkent region. 4.1-9.7% strawberry yield loss was determined due to fusarium wilt disease.

Fusarium disease was found in all strawberry producing farms of Tashkent region.

The first symptoms of fusarium disease of strawberry were observed during fruit ripening period.

Strawberry plants infected with fusarium disease have light brown spots on the edges of the leaves, in vascular and cordial tissues, and the plant first wilts and then dies.

It was found that the fungus that causes fusarium disease in strawberries is preserved by forming chylomidospores in the infected plant and its residues.

## REFERENCES

1. *Andreyeva N.F. Fusarium wilt of strawberries. // Mycology and Phytopathology. 1971. V.5, No. 5. -Pp. 467-469.*
2. *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.*
3. *Grishanovich A.K. Diseases of strawberries in the conditions of the B SSR and measures to combat them // Abstract of the thesis. cand. diss. – Minsk: 1971.-P.22.*
4. *Govorova G.F. Selection of strawberries for disease resistance in the conditions of the North Caucasus: Abstract of the thesis. diss. doc.agr.sc.: 06.01.11. St. Petersburg: ARRIPG, 1992.-P.45.*
5. *Golovin S.E. Methodological guidelines for the diagnosis and registration of diseases of the roots and stems of strawberries and raspberries transmitted through the soil. – M.: VSTISP, 2001. – P.42.*
6. *Golovin S.E. Root and basal rots of berry and fruit crops, their diagnostics: monograph. - M.: VSTISP, 2010. – P. 306.*
7. *Govorova G.F., Govorov D.N. Fungal diseases of strawberry. Moscow: IN QUARTA, 2010.- P.160.*
8. *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.*
9. *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.*
10. *Natalina O.B. Diseases of berries.-M.: Publishing house of agricultural literature, magazines and posters, 1963.-P.272.*
11. *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*
12. *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*
13. *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)*
14. *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.*
15. *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.*