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Dıseases of Tomato Plant and Dynamıcs of Theır Spreadıng ın Azerbaıjan

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ABSTRACT

The purpose of the presented work has been dedicated to study species composition and spread degree of disease created on tomato plant cultivated in open and covered conditions in the Absheron Peninsula of the Republic of Azerbaijan. Became clear that on the tomato plants were bserved some diseases like spots, fades, flour dew and others, and in their formation were involved 15 species of fungi and fungi-like organisms. During the research was not met the epiphytotic situation created by this or that pathogens. However, it has been shown that alternarios, septoriosis, and phytophthora have a relatively high spread rate (4.5-7.5%) in open, but verticilliosis in covered conditions (1,8%). In addition, during the research were also recorded pathologies such as flour dew (0.27%), dry decay(0.22%) etc. Although the phytosanitary situation for the cultivation of tomato plant in the Absheron Peninsula is not dangerous but determined that it is necessary to carry out preventive, more accurate preliminary measures.
KEYWORDS*:* tomato, phytopathogenic fungi, diseases, spread rate.

INTRODUCTION

One of the actual problems of the modern era is the development and implementation of efficient technologies for the cultivation of agricultural crops. So that, since the second half of the last century, the world's population has begun to face with manifestations of shortages of raw materials for energy, nutrition, as well as for various production areas. Among the reasons for this is the constant increasing in number of the world population in the fixed area, and as the result of this, traditional food sources are not able to meet the current demand. The solution of these issues naturally puts important tasks in front of modern sciences, primarily in agrarian and biological sciences. The research conducted in this direction, mainly covers two aspects, namely the creation of new sources or to improve the efficiency of using existing sources. Against the background of the research carried out in both directions special attention is paid to providing the population of the world with agricultural products, first of all, with vegetable crops [16]. So, it is no secret that plant origin foods are an indispensable component of human nutrition. Therefore, in studies carried out to provide the population with fresh vegetable products have been created high-productivity plant varieties that currently obtaining targeted products from them is considered as a serious result in the direction of elimination of food shortages. Despite this, every year, a certain portion of the obtained product is losses for a variety of reasons which among of those reasons diseases caused by various living beings takes an important place[13-14]. It is no coincidence that today all over the world is being carried out extensive research to prevent this. In general, solving this issue is no longer a task of any particular country, at least because combating these diseases requires a comprehensive approach and the spread of those diseases does not recognize the boundaries. Among of diseases caused by fungi[3, 8], takes importance place, at least because the loss of product during the ephytotic of the disease caused by this or another fungus may increase up to 50%[14] and every year, the loss of yields caused by fungi diseases are measured in million tonnes. Naturally, for the prevention of diseases caused by fungi are necessary to carry comprehensive research, to study extensively the growth and development, the spread of regularity of fungi and to take effective measures against them. The first step towards solving these tasks is, of course, the identification of the species of the disease-makers.

Although the Azerbaijan Republic is among the traditional oil countries to taking an important part in its economy of agrarian sector and wide-ranging cultivation of various vegetable plants[15] allows us to note that the mentioned issues are not strange to our country. Thus, the richness of nature and the variety of natural climatic in Azerbaijan have led to the spread of fungi which cause diseases and has been conducted much considerable research on their study[6]. Most of the carried research were covered to study of pathogenic fungi that cause disease mainly on fruit plants, and on the main forest-forming tree species. Although research on the study of mycobiota of vegetable plants have been started for a long time, the results of researches done so far do not allow for

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generalization not only the mycobiota of vegetable crops grown widely in Azerbaijan, as well as the mycobiota of a specific species.

Tomato one of the plants that are in the attention of center in this aspect and belongs to the juicy, tasty and aromatic fruity vegetable group, and is a product that has enough of the essential ingredients for the nutrition of people[18]. It is one of the most produced vegetable products in most countries, as well as in our country. Thus, the annual amount of the product produced in Azerbaijan is between 450-500 thousand ton[15].In culinary it is used in the preparation of more than 100 dishes. It was determined that a person should eat 40-60 g of tomatoes per day. Its main usefulness is containing biologically active ingredients (lycopene, beta-carotene, etc.) and rich with mineral salts[18].

Taking into account the above mentioned, the presented work was dedicated to the evaluation the species of microorganisms, first of all, of the fungus species that caused this or that pathology, and the extent of the disease spread in tomatoes grown in Azerbaijan.

MATERIAL AND METHODS

The researches carried out in the Absheron Peninsula of Azerbaijan Republic. For this purpose, samples were taken from vegetative and generative organs of tomato grown in open and covered conditions that were supposed to be microorganism. During taking samples, we have used methods of planned route and selection of permanent areas for stationary observations which were widely used in the analogous studies. Taking of samples was also carried out on the seasons. During the research, more than 500 samples were taken from the studied plant and analyzed according to the purpose of the study.

For the purpose of the study in the analysis of collected samples, were used from the modern mycology and phytopathological methods and approaches[7, 9].

For taking pure culture of fungi located on studied plants used nutrient medium, such as malt juice agar (MJA), rice agar(RA), starchy (SA) and potato agar(PA), Chapek agar (CA), and Capek-Doks agar (CDA). Preparation, sterilization and to pour of medium to the Petri dishes were performed according to known methods[9] in microbiology. The identification of fungi was carried out by microscopic and macroscopic symptoms of strains isolated in pure culture during research which, that time were used from the determinants prepared on the based of cultural-morphological and physiological symptoms of microorganisms [10-11, 17, 20], as well as from the[12] basic information of the International Association of Mycology.

The rate of spread of diseases caused by fungi were calculated by formula P = 100 (n / N) which here, P- the random frequency of fungi on the samples(or spread rate of disease caused by pathogen-%), n - the number of plants infected by disease in the studied areas, with number, N - the total number of plant species in the studied areas.

RESULTS AND THEIR DISCUSSION

As noted, tomato -*Lycopersicum esculentum*(syn. *Solanum lycopersicum* and *Lycopersicon lycopersicum*) contains enough ingredients for the feeding of microorganisms [18] and, therefore, the presence of microorganisms on them should be regarded as an ordinary reality and the studies that we have carried out confirms this. Thus, from the research it became clear that various pathologies have been observed in tomatoes cultivated in either indoor or outdoor conditions in Azerbaijan, and in their formation participates following species:

1. ***Alternaria solani (Ellis & G. Martin) L.R. Jones, Bull. Torrey Bot. Club: 353 (1896) [MB#216613].*** **Syn.*:*** Macrosporium solani Ellis & G. Martin, the American Naturalist 16: 1003 (1882) [MB#246331]; Alternaria americana Sawada, Report of the Department of Agriculture Government Research Institute of Formosa 51: 117 (1931) [MB#256637]; Alternaria porri f.sp. solani (Ellis & G. Martin) Neerg., Danish species of Alternaria and Stemphylium: 260 (1945) [MB#351636].

These fungi, which cause alternarios or dry stain disease in tomatoes, in the course of research for the first time, were found in samples taken from the leaves (12.06.2015, Pirshakhi) of the tomato plant that cultivated in open conditions. Those fungi in the next course of the research were also found on tomatoes cultivated in covered condition. The fungi except for root also meet in other organs of the plant (trunk, leaf, flowers, and fruits).

The disease is initially observed in the lower leaves of the plant as dark brown spots, and the spots are relatively large (diameter up to 1.3 cm). Over time, a combination of spots occurs which at the end causes dry and fall of the leaf. This causes a decrease in the total surface area of the plant where occurring photosynthesis which also leads to a reduction in the overall productivity of the plant.

Studies have shown that the degree of spread of the disease caused by the fungi depends on the cultivation condition of tomato (open or closed). Thus, the spread degree of fungi in field conditions is varies 5.5-7.5% and in covered conditions – 1.1-1.6%.

One of the hazardous features of this fungi is that similar pathologies meet among the other plants widely cultivated in Azerbaijan, as well as in Absheron and it has been confirmed in a number of studies namely [6], fungi are a universal phytopathogen.

2. ***Fusarium moniliforme J. Sheld., Annual Report of the Nebraska Agricultural Experimental Station 17: 23 (1904) [MB#142842]. Syn.:*** Oospora verticillioides Sacc., Fung. Ital.: fig. 789 (1881) [MB#171298]; Alysidium verticilliodes (Sacc.) Kuntze (1898) [MB#522294]; Fusarium celosiae Abe, Mem. Coll. Agric. Kyoto Univ.: 51-64 (1928) [MB#260213]; Oospora cephalosporioides Luchetti & Favilli, Ann. Fac. Agrar. R. Univ. Pisa N.S.: 399 (1938) [MB#492231].

Spread of this fungus which is one of the creators of disease of fusariosis in the course of research first time (12.06.2015, Fatmai), was found on the sample taken from the tomato plant that cultivated in open conditions. Interestingly, in the causing of that disease also takes part 2 more species of Fusarium which in the process of occurrence of the disease they are involved with various combinations.

The species of Fusarium which causes more dangerous diseases on grains also causes disease on tomato and its spread degree in the open condition contain 3.4-4.6% and in covered conditions 0.5-1.1%. This indicator in generally reflects on itself the degree of the general spread of diseases causes by species of Fusarium in various combinations.

3. ***Fusarium oxysporium Schltdl., Flora Berolinensis, Pars secunda: Cryptogamia: 139 (1824) [MB#218372***]. Syn.: Fusarium bulbigenum Cooke & Massee, Grevillea 16 (78): 49 (1887) [MB#199976]; Fusarium vasinfectum G.F. Atk., Bulletin of the Alabama Agricultural Experiment Station: 28 (1892) [MB#225413]; Fusarium dianthi Prill. & Delacr., Compt. Rend. Acad. Sc.: 744-745 (1899) [MB#232504]; Fusarium lini Bolley, Proceedings of the Annual Meeting of the Society for the Promotion of Agricultural Science 22: 42 (1901) [MB#229618]; Fusarium orthoceras Appel & Wollenw., Arbeiten aus der Kaiserlichen Biologischen Anstalt für Land- und Forstwirtschaft 8: 152 (1910) [MB#221977]; Fusarium citrinum Wollenw., Bull. Maine Agric. Exp. Sta.: 256 (1913) [MB#194950]; Fusarium angustum Sherb., Memoirs of the Cornell University Agricultural Experimental Station 6: 203 (1915) [MB#158669]; Fusarium oxysporum var. longius Sherb., Memoirs of the Cornell University Agricultural Experimental Station 6: 223 (1915) [MB#138127]; Fusarium lutulatum Sherb., Memoirs of the Cornell University Agricultural Experimental Station 6: 209 (1915) [MB#239320]; Fusarium lutulatum var. zonatum Sherb., Memoirs of the Cornell University Agricultural Experimental Station 6: 214 (1915) [MB#139136]; Fusarium bostrycoides Wollenw. & Reinking, Phytopathology 15 (3): 166 (1925) [MB#258714]; Diplosporium vaginae Nann., Atti Reale Accad. Fisiocrit. Siena: 491 (1926) [MB#281287].

Those fungi as other species of Fusarium which cause the same named disease are found in tomato grown in both open and covered conditions. This fungus which is one of the creators of disease of fusariosis in the course of research first time (12.06.2015, Fatmai) was found on the sample taken from the tomato that cultivated in open conditions.

4. ***Fusarium solani (Mart.) Sacc., Michelia 2 (7): 296 (1881) [MB#190352].*****Syn.**: Fusisporium solani Mart., Die Kartoffel-Epidemie der letzten Jahre oder die Stockfäule und Räude der Kartoffeln: 20 (1842) [MB#194746]; Fusarium solani (Mart.) Appel & Wollenw., Arbeiten aus der Kaiserlichen Biologischen Anstalt für Land- und Forstwirtschaft 8: 64-78 (1910) [MB#515978]; Neocosmospora solani (Mart.) L. Lombard & Crous, Studies in Mycology 80: 228 (2015) [MB#810964]; Fusarium martii Appel & Wollenw., Arbeiten aus der Kaiserlichen Biologischen Anstalt für Land- und Forstwirtschaft 8: 83 (1910) [MB#249096]; Nectria cancri Rutgers, Ann. Jard. Bot. Buitenzorg, II: 59 (1913) [MB#145963]; Fusarium striatum Sherb., Memoirs of the Cornell University Agricultural Experimental Station 6: 255 (1915) [MB#240201]; Fusarium solani var. minus Wollenw., Fusaria Autographice Delineata 1: 403 (1916) [MB#185066]; Fusarium solani f. 2 W.C. Snyder, Zentralblatt für Bakteriologie und Parasitenkunde Abteilung 2 91: 174 (1934) [MB#494337]; Cylindrocarpon vaginae C. Booth, Y.M. Clayton & Usherw., Proceedings of the Indian Academy of Sciences (Plant Sciences) 94 (2-3): 436 (1985) [MB#105231].

This fungi like the other two species of Fusarium cause the same named disease and this situation is observed in the tomato plant that cultivated in both open and covered condition. This fungus in the course of research first time (12.06.2015, Zira) was found on the sample taken from the tomato that cultivated in open conditions.

5. Septoria lycopersici Speg., Anales de la Sociedad Científica Argentina 12 (3): 115 (1881) [MB#222927].

This fungus, which belongs to the anamorphs of sack fungi cause septoriosis or white stain diseases in tomato. The disease in the course of the research first time (17.05.2015, Zira) was found on the tomato cultivated in open conditions. The disease caused by fungus is also met in covered conditions.

The first observed place of this disease is the lower leaves of the plant that the observed spots are numerous and small diameter (0.1-0.2 mm) with dirty gray color. There were also slightly combination of stains. In the center of the spots are formed, black pycnidium with a smaller size which over time, here is formed conidium of fungus and namely conidium are involved at the mainly spread of the fungus.

Analysis of samples taken from the tomato plant cultivated in open and covered conditions also showed that the spread degree of the disease caused by the fungus varies depending on the cultivation conditions. In this case, has been determined that the spread degree of the disease created by the fungus in open condition contained 5.1-6.9% and in covered conditions 1,0-1,4%.

6. Phytophthora infestans (Mont.) de Bary, Journal of the Royal Agricultural Society of England 12: 240(-242) (1876) [MB#232148]. **Syn.** Botrytis infestans Mont., Bulletin de la Société Philomatique de Paris 13: 313 (1845)[MB#226630];

Peronospora infestans (Mont.) Casp. (1852) [MB#179737].

This fungus, which belongs to fungi-like organisms and creator adventitious pathology, the first time(17.07.2015, Low Guzdak) was found on the sample taken from the fruit of the tomato plant cultivated in open conditions.

Although phytophthora is one of the most dangerous diseases of tomatoes, its spread in Absheron is not so high so that its spread in open conditions contain up to 3.2%, and in covered conditions – 0.7%.

7. *Verticillium dahliae Kleb., Mycologisches Centralblatt 3: 66 (1913)[MB#196942].Syn.:* Verticillium albo-atrum var. dahliae (Kleb.) R. Nelson, Verticillium wilt of Peppermint: 110 (1950) [MB#352579]; Verticillium tracheiphilum Curzi, Nuovo Giorn. Bot. Ital.: 394 (1925) [MB#280463]; Verticillium ovatum G.H. Berk. & A.B. Jacks., Scient. Agric.: 261 (1926) [MB#273159].

This fungus, which causes disease verticellulose, the first time(12.04.2015, Zira) was found on samples taken from the tomato plant cultivated in covered condition and were identified after taken to the pure culture.

Though it is considered one of the most dangerous diseases of tomatoes, the spread degree of the disease caused by fungal in open conditions in the Absheron region is considered 4.4-5.1% and in covered conditions 1.0-1.3 %. One of the dangers of this disease that it does not have a gradual impact on the particular organ of the plant, such as the others, that is, the plant or its specific organ which cause disease in generally does not perform its functions.

During the carry out of the research was not found ephytotic of any disease caused by fungi on the tomato plant in the condition of Absheron.

It should be noted that in the course of research has also been observed other diseases on the tomato plants grown in Absheron from which can be noted diseases like as floury dew (causing by *Erysiphe communis (Wallr.) f. solani-lycopersici Jacz.*), brown stain(causing by *Cladosporium fulvum Cooke*), gray decay(causing by *Botrytis cinerea Pers.*), anthracnose(causing by *Colletotrichum lage-narium Ell. et Halst.*) and others. Due to the fact that the spread degree of these diseases is relatively small (0.02-0.27%), today, their danger may not take into consideration so seriously. Despite this, due to the fact that they are cause pathology on tomatoes grown both in open and covered condition their development dynamics should be kept in the center of attention.

As a result of studies conducted in Absheron, in generally 15 species of fungi were found on tomato plants that were cultivated in open and covered conditions, which the spread degree of disease created by them contain maximum up to 7.5% in open, and up to 1,8% in covered condition. Compared to studies carried out in other regions it should be noted that Absheron is more favorable for the cultivation of tomatoes, which is probably due to the relatively droughty condition of Absheron. Thus, for the development of phytopathogenic fungi, in addition to heat, the high humidity is considered to be one of the most favorable indicators.

It should be noted that microorganisms, including fungi, not only creates disease in vegetables like as on tomatoes, but also enrich them with their metabolites [2, 4, 19]. More precisely, although tomato one of the important plant with the nutrient is also characterized as a carrier of substances that can cause disease and food poisoning[1, 5, 21]. Therefore, it is necessary to keep always in the center of attention of plants ühich have nutritional value and hold preventive measures and the areas where we conducted research are no exception.

The tomato plant, cultivated in open and covered conditions in Absheron Peninsula of the Republic of Azerbaijan is one of the settlements of fungi. So, their activities cause to apparent different, primary diseases such as dry and white spotting, fusariosis, fading, and phytophthora. İn the appearance of these diseases involved 12 species

of fungi and fungal-like organisms. During the research was not met the epiphytotic situation created by this or that pathogens. However, it has been shown that alternarios, septoriosis, and phytophthora have a relatively high spread degree (4.5-7.5%) in open, but verticilliosis in covered conditions (1.8%). In addition, in the course of the research were also recorded pathologies such as flour dew, dry decay, and so on. Although phytosanitary conditions are not dangerous for the cultivation of tomato in the Absheron Peninsula, prophylactic, more accurate preliminary measures are essential.

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