

Monitoring of disease and pests in vineyards and their levels of harmfulness

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Abstract. This article monitors the spread and damage of oidium (*Uncinula necator* Burrill), anthracnose (*Gloeosporium ampelophagum* Sacc) and mildew (*Plasmopara viticola* Berl & De Toni) diseases in the vineyards of Tashkent, Samarkand and Fergana regions of Uzbekistan. In addition, additional monitoring work was carried out on the spread of the external quarantine vine bacteriosis Pierce's disease (*Xylella fastidiosa* Wells et al) in the vineyards of Uzbekistan. According to the results of research and observation in 2022, vine oidium disease is relatively low in the vineyards of Samarkand and Fergana regions (from 5.0% to 30.0% in leaves, branches and grape bunches), and strongly in the vineyards of Tashkent region (12% in leaves, branches and grape bunches). 0% to 100.0%) have been found to be harmful. Anthracnose disease is widespread in the vineyards of Tashkent and Samarkand regions (from 10.0% to 75.0% on leaves, branches and bunches of grapes), causing severe damage to vineyards, and it is relatively rare in Fergana region (from 5.0% to 20.0% on leaves, branches and bunches of grapes) was found to be spread.

1 Introduction

In recent years, consistent measures have been taken to reform agriculture and introduce market mechanisms to the sector. Today, more than 80 types of agricultural products grown in Uzbekistan are exported to 66 countries of the world [1]. Currently, vine diseases are widespread in Uzbekistan, they not only reduce yield, but also spoil the quality of grapes, severely damage the branches, and in some cases cause the vineyards to completely dry up [2]. Diseases of oidium or powdery mildew (*Uncinula necator* Burrill) and anthracnose (*Gloeosporium ampelophagum* Sacc) are widespread in the vineyards of Uzbekistan [3]. Lately, in the years when the weather conditions are favorable, the disease of mildew (*Plasmopara viticola* Berl & De Toni) is also widespread and it is observed that it seriously damages the vineyards of Uzbekistan [4].

North America is the homeland of Oidium (flour mildew) and mildew (false mildew) diseases. It was brought to European countries, including England, in 1845 with vine seedlings. Two years later, it was found that it spread to France, in 1848 in the Caucasus,

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and in 1853 in the Crimea. Then it quickly spread to other districts engaged in viticulture [5, 6]. In Germany, oidium disease was first spread in 1851 in 3 wine-growing regions - Baden, Württemberg and Garde, and then spread everywhere [7].

Xylella fastidiosa is considered a non-quarantine pest in the EAES (Eurasian Economic Commission) region and causes plant diseases of economic importance, i.e. grape bacteriosis (Pierce's disease), variegated chlorosis of citrus fruits, false disease of peach, leaf blight of plum, olive rapid tree establishment syndrome disease, leaf blight of almond, coffee, oleander, pecan and ornamental trees. According to EFSA, the number of plants infected with *Xylella fastidiosa* in 2020 was 595 different species [8]. The economic losses associated with this disease are estimated in millions of dollars annually [6].

In accordance with the decision No. 3 and 5 of March 12, 2022 of the Agency of Plant Quarantine and Protection of the Republic of Uzbekistan and the Ministry of Health "On approval of the list of harmful organisms (A1) of quarantine significance for the Republic of Uzbekistan" is included as an external quarantine disease [9].

In this article, diseases occurring in the vineyards of Uzbekistan's Tashkent, Samarkand and Fergana regions, their spread and monitoring of the damage they cause. As a result of monitoring, it is determined which disease causes damage and the yield lost as a result of disease damage. In addition, quarantine diseases that can be encountered in the vineyards of Uzbekistan are also monitored.

2 Materials and methods

The calculation of the spread of the disease was carried out according to the methodological manuals of the State Chemical Commission of Uzbekistan [10].

Damage of grape bunches on vine bushes with oidium, anthracnose and mildew diseases is carried out simultaneously with the consideration of infected leaves. In this case, all grape bunches on the vine bush selected for the calculation are examined and, taking into account the differences in the disease symptoms of grape bunches infected with oidium, anthracnose and mildew, a separate scoring scale is applied to each of them [1-4, 9, 10].

Scale 1: determination of oidium and mildew diseases of grape bunches on vine bushes

Scores:

0 - no damage;

1 - Up to 5% of fruit in grape bunches;

2 - 5% to 10% of fruit in grape bunches;

3 - 10% to 25% of fruit in grape bunches;

4 - More than 25% of the fruits in grape bunches are damaged.

Scale 2: determination of damage of grape bunches on vines by anthracnose disease.

Points:

0 - no damage;

1 - up to 5% of the fruits in grape bunches are damaged, 1-2 deep wounds on fruit bunches, combs;

2 - up to 10% damage to the fruits of grape bunches, up to 3 wounds on fruit bunches, combs;

3 - the fruits of grape bunches are damaged up to 25%, 5 deep wounds on fruit bunches, combs;

4 - the fruits of grape bunches are more than 25% damaged, fruit bunches, more than 5 deep wounds on combs.

Scale 3: to determine the damage of green branches on vine bushes by anthracnose disease.

Points:

- 0 - no damage;
- 1 – up to 10% damage to the stem surface, 1-2 deep wounds;
- 2 - up to 25% damage to the surface of the branch, up to 5 deep wounds;
- 3 - up to 50% damage to the surface of the branch, 5-10 deep wounds;
- 4 - less than 50% damage of the stem surface, more than 10 deep wounds.

Scale 4: detection of oidium and mildew diseases on green branches of vine bushes

Points:

- 0 – no damage;
- 1 – branches are damaged up to 10%;
- 2 – branches are damaged up to 25%;
- 3 – branches are damaged up to 50%;
- 4 – more than 50% of branches are damaged;

The following formula is used to determine the incidence rate:

$$X = \frac{a \times 100}{b}, \%$$

Where, X - the %age of disease, a - the number of identified diseased plants; and, b - the total number of plants counted.

The level of plant disease is determined using the following formula:

$$U = \frac{E \times (a \times b) \times 100}{B \times C}, \%$$

Where, U – incidence rate, %; $E (a \cdot b)$ - the sum of the number of diseased plant members (leaf, stem, fruit) in each variant multiplied by (a) their characteristic score (b); B - the number of plant parts (leaf, stem, fruit) taken for control; and, C - the highest morbidity score received in the experiment.

Bacteria are isolated from the affected plant organ by serial dilution method [3] on RPA (fish-peptonny agar, for growing bacteria) and its antagonistic activity is determined. The type of bacteria is determined by the molecular genetic method of the nucleotide sequence of the genomic DNA part of the strains. Genomic DNA samples from strains are isolated by [9]. Nucleotide sequence is determined using BLAST (Basic local alignment search tool) program and National Biotechnology Information Center GenBank database.

3 Results and discussion

In 2022, studies were conducted on the spread and damage caused by oidium (*Uncinula necator* Burrill), anthracnose (*Gloeosporium ampelophagum* Sacc) and mildew (*Plasmopara viticola* Berl & De Toni) diseases found in the vineyards of Tashkent, Samarkand and Fergana regions of Uzbekistan. Observations were made in the vineyards of Parkent, Qibray and Bostonliq districts in order to study the spread and damage of vine diseases in Tashkent region.

No signs of oidium disease were observed in the Pink Toyfi variety in the vineyards of the "Baynalminal plus" farm belonging to the Boykazon agrofirma of Parkent district. Black currant variety of this farm is infected with oidium disease in leaves up to 20.0%, branches up to 12.0%, grape bunches up to 15.0%, disease development in leaves up to 10.1%, branches up to 2.2% and grapes made 5.1% in bunches. Black Kishmish and Pink Toyfi varieties have anthracnose disease in leaves from 23.3% to 36.5%, in branches from 12.2% to 22.0%, in grape bunches from 18.6% to 31.3%, and disease development in leaves It was from 7.6% to 12.1%, from 4.6% to 7.1% in branches and from 5.6% to 11.0% in grape bunches. These cultivars had 28.0% to 43.0% of leaf blight, 13.2% to 19.5% of branches,

18.6% to 26.0% of grape bunches, and 12.4% of leaf blight. to 16.1%, in branches from 4.5% to 11.1% and in grape bunches from 9.7% to 17.2%.

It was found that 10.0% of the leaves of the Black Kishmish variety planted in the vineyards of "Shavkat plus Ravshan" farms were affected by oidium, and the development of the disease was up to 2.6%, while the branches and bunches of grapes were not affected by this disease. On the farm "Toychiev Mirghairat" there were no signs of oidium disease. Black Kishmish varieties in the vineyards of Khazifa Madad farm, Qibray district, with oidium disease up to 30.0%, branches up to 21.0% and grape bunches up to 25.5%, disease development in leaves up to 13.5%, branches up to 12.6 It was found that up to % and grape bunches were infected up to 11.6%. With anthracnose disease, vine leaves up to 30.0%, branches up to 15.0% and grape bunches up to 24.0%, disease development in leaves up to 12.8%, branches up to 5.2% and grape bunches up to 9.1% observed. It was found that mildew affected the leaves of this variety up to 45.2%, branches up to 13.4% and grape bunches up to 27.8% (Table 1).

Table 1. Monitoring and damage of diseases occurring in vineyards under different soil and climate conditions in Uzbekistan (Tashkent region, Uzbekistan - 2022).

Name of district and farms	Varieties	Area, ha	Diseased plant body	Prevalence of diseases, %							
				<i>Uncinula necator</i> Burrill		<i>Gloeosporium ampelophagu</i> in Sacc.		<i>Plasmopara viticola</i> Berl. & De Toni		<i>Xylella fastidiosa</i> Wells	
				Diseased	Development	Diseased	Development	Diseased	Development	Diseased	Development
Parkent district, Boykazon agrofirma, "Baynalminal plus" farm	Pink Toyfi	2.0	Leaves	0	0	23.3	7.6	28.0	12.4	0	0
			Branch	0	0	12.2	4.6	13.2	4.5	0	0
			Grape bunch	0	0	18.6	5.6	18.6	9.7	0	0
Black Kishmish		3.0	Leaves	20.0	10.1	36.5	12.1	43.0	16.1	0	0

Kibrai district, "Khazifa madad" farm		Parkent district, Navbahor agricultural company, "Shavkat plus Ravshan" farm			Parkent district, Navbahor agricultural company, "Toychiev Murgairat" farm			
Black Kishmish		Black Kishmish			Black Kishmish			
2.0		2.0			1.5			
Branch	Leaves	Grape bunch	Branch	Leaves	Grape bunch	Branch	Grape bunch	Leaves
21.0	30.0	0	0	10.0	0	0	15.0	0
12.6	13.5	0	0	2.6	0	0	5.1	0
15.0	30.0	0	0	15.0	0	0	31.3	10.0
5.2	12.8	0	0	3.8	0	0	11.0	2.3
13.4	45.2	31.0	15.0	47.0	10.1	4.0	26.0	19.5
6.6	17.1	21.0	7.2	18.4	2.7	1.0	17.2	6.6
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0

Bostonliq Scientific Experimental Station of the Research Institute of Horticulture, Viticulture and Winery, Bostonliq District									
Katta-kurgon			Ichkimar			Black Guzal			
0.5									
Grape bunch	Branch	Leaves	Grape bunch	Branch	Leaves	Grape bunch	Branch	Leaves	Grape bunch
95.0	80.0	100.0	0	0	0	83.0	60.0	90.0	25.5
46.1	36.5	55.3	0	0	0	41.1	28.8	42.5	11.6
0	0	0	55.3	42.0	65.0	0	0	0	24.0
0	0	0	24.4	21.1	31.5	0	0	0	9.1
25.0	9.9	27.6	22.6	11.2	29.0	0	0	0	27.8
8.4	3.2	13.3	10.5	3.7	12.3	0	0	0	18.8
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0

Disease development was up to 17.1% in leaves, up to 6.6% in branches, and up to 18.8% in grape bunches. In the vineyards belonging to the Bostonliq Research Station of the Horticulture, Viticulture and Winery Scientific Research Institute of Bostonliq District, the leaves of the Black Guzal and Katta-kurgon varieties of grapes are affected by oidium disease from 90.0% to 100.0%, and the branches from 60.0% to 80.0%. , grape bunches were found to be infected from 83.0% to 95.0%. Disease development ranged from 42.5% to 55.3% in leaves, 28.8% to 36.5% in branches, and 41.1% to 46.1% in grape bunches. It was found that 30.0% of leaves, 12.0% of branches, and 21.0% of grape bunches were affected by oidium. According to the results of research and monitoring conducted in the vineyards of Tashkent region, signs of vine bacteriosis (*Xylella fastidiosa* Wells et al), which is considered an external quarantine, were not detected in the vineyards.

Studies on the spread and damage of vine diseases in Samarkand districts of Samarkand region were continued. In the vineyards belonging to the Samarkand Research Institute of Horticulture, Viticulture and Winemaking, Samarkand District, the leaves of the Black Kishmish, Black Janjal and Pink Toyfi varieties of grapes are affected by oidium from 15.0% to 30.0%, in the branches from 10.0% to 18.0%, grape bunches were observed to be infected from 5.0% to 23.0%. Disease development was from 3.3% to 8.5% in leaves, from 3.8% to 6.8% in branches, and from 1.6% to 8.1% in grape bunches. It was found that the leaves of these vine varieties were affected by anthracnose disease from 28.5% to 75.0%, branches from 17.6% to 45.0%, grape bunches from 22.5% to 62.5%. Disease development ranged from 10.2% to 23.5% in leaves, 9.3% to 21.0% in branches, and 9.1% to 28.3% in grape bunches. Mildew disease symptoms were not observed in the varieties studied above (Table 2).

Table 2. Monitoring and damage of diseases occurring in vineyards under different soil and climate conditions in Uzbekistan (Samarkand region, Uzbekistan - 2022).

Name of district and farms	Varieties	Area, ha	Diseased plant body	Prevalence of diseases, %							
				<i>Uncinula necator</i> Burrill		<i>Gloeosporium ampelophagum</i>		<i>Plasmopara viticola</i> Berl. &		<i>Xylella fastidiosa</i> Wells	
				Diseased	Development	Diseased	Development	Diseased	Development	Diseased	Development
Research Institute of Horticulture, Viticulture and Winemaking, Samarkand Research	Black Kishmish	1.0	Leaves	15.0	3.3	56.0	22.5	0	0	0	0
			Branch	0	0	27.6	12.4	0	0	0	0
			Grape bunch	5.0	1.6	42.6	16.2	0	0	0	0
	Black Janjal	1.0	Leaves	20.0	8.2	28.5	10.2	0	0	0	0
			Branch	10.0	3.8	17.6	9.3	0	0	0	0
			Grape bunch	16.0	7.2	22.5	9.1	0	0	0	0
	Pink Toyfi	0.3	Leaves	30.0	8.5	75.0	23.5	0	0	0	0
			Branch	18.0	6.8	45.0	21.0	0	0	0	0
			Grape bunch	23.0	8.1	62.5	28.3	0	0	0	0
Samarkand District, Dargom Forestry	Pink Toyfi	2.0	Leaves	0	0	0	0	0	0	0	0
			Branch	0	0	0	0	0	0	0	0
			Grape bunch	0	0	0	0	0	0	0	0

According to the conducted research and observations, varieties that are resistant to oidium disease are the Kara Guzal and Katta-kurgon varieties of the vine, with disease from 90.0% to 100.0% of leaves, branches from 60.0% to 80.0%, grape bunches from 82.0% to 95.0% damage was found. Disease development ranged from 42.5% to 55.3% in leaves, 28.8% to 36.5% in branches, and 36.6% to 46.1% in grape bunches (Table 3).

Table 3. Damage of grape varieties by oidium disease, % (Bostonliq scientific-experimental station of the Research Institute of Horticulture, Viticulture and Winery, Bostonliq district, Tashkent region, 2022).

Varieties	Leaves		Branches		Grape bunches	
	Diseased	Development	Diseased	Development	Diseased	Development
Black Guzal	90.0	42.5	60.0	28.8	83.0	41.1
Ichkimar	0	0	0	0	0	0
Katta-kurgon	100.0	55.3	80.0	36.5	95.0	46.1
Muscat orzu	0	0	0	0	0	0
Red Husaini	30.0	15.5	12.0	5.8	21.0	11.8

The variety of red grape was moderately affected by oidium disease, and the disease was found to be up to 30.0% in leaves, up to 12.0% in branches and up to 21.0% in grape bunches. The development of the disease was 15.5%, 5.8% and 11.8%, respectively. Ichkimar and Muscat varieties are resistant to oidium disease, and no symptoms of the disease were observed in these varieties (Figure 1).



Fig. 1. Damage of oidium (powdery mildew) disease on vines and leaves.

The reason for this is the result of repeated application of fungicides Ridomil Gold, Topaz, Strobi, OOK, and sulfur powder against vine diseases during the growing season.

4 Conclusions

According to the results of research and observation in 2022, vine oidium disease is relatively low in the vineyards of Samarkand and Fergana regions (from 5.0% to 30.0% in leaves, branches and grape bunches), and strongly in the vineyards of Tashkent region (12-

100% in leaves, branches and grape bunches) was found to cause damage. Anthracnose disease is widespread in the vineyards of Tashkent and Samarkand regions (from 10.0% to 75.0% on leaves, branches and bunches of grapes), causing severe damage to vineyards, while in Fergana region it is relatively rare (5.0-20.0% on leaves, branches and bunches of grapes) was found to be spread. Mildew disease was found to be widespread in the vineyards of Tashkent, Samarkand and Fergana regions (from 4.0% to 51.0% in leaves, branches and grape bunches) and severely damaged the vineyards. Also, no symptoms of vine bacteriosis Pierce disease, which is considered an external quarantine, were detected in the vineyards of Uzbekistan.

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