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DAMAGE OF WHEAT VARIETIES BY FUNGI PROVOKING YELLOW AND BROWN RUST DISEASES

Tukhtamishev S.S.*, Gulmurodov R.A.**
*Gulistan State University, Gulistan-120100, 4th microdistrict, Uzbekistan
**Tashkent State Agrarian University, 2, University street, Tashkent, Uzbekistan, 100140

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Abstract:
Wheat occupies one of the main places among the agricultural crops grown in our republic. The yield from it is also higher than 50 centners in recent years. But nevertheless, a part of the crop, sometimes the main part, was lost in the influence of diseases in which various fungi reproduce. In our conditions, rust diseases cause the greatest damage to the harvest of wheat. The spread and damage of rust diseases in the soil are different in different varieties of wheat; the resistances of varieties, as well as their attachment to the races of fungi that provoke these diseases are proved in science. In this article, the effect of some breeds of fungi that provoke yellow and brown rust diseases on several varieties of wheat has been studied.

Keywords: wheat, fungi, variety, race, rust, disease, modification, aerogen, artificial damage, urediniospora

INTRODUCTION

Currently, the following 10 countries produce the most amount of wheat: China, India, Russia, USA, France, Canada, Pakistan, Ukraine, Australia and Germany. In Uzbekistan, from the last five-year hectare, a grain crop of more than 55 c/ha is obtained, the gross yield is 6.5-7.8 mln. tons. It will be possible to further increase productivity by using intensive methods in grain fields. One of these methods is the fight against harmful organisms in the grain. Especially in plantations, effective measures against diseases caused by a variety of microorganisms, starting with the sowing of seeds in the period from the moment of harvesting to the harvest, can lead to the loss of a large part of the crop, if not used. Rust diseases cause great damage to the crop in all wheat producing countries.

There is wheat pathogen *Puccinia striiformis f. sr. tritici*, yellow rust disease, which is a fungus, is one of the most dangerous diseases in the world on cereal crops. This infection damages more than 320 cereal crops (natural or artificial) belonging to 50 generations [1]. One of the most harmful diseases of the oesophagus is *Puccinia striiformis* West. it is considered a yellow rust disease that provokes fungi. If the wheat suffers from an infection in the fall and winters well, it can lead to the loss of up to 100 percent of his fruit [2].

Yellow rust destroys the harvest from 5-10% to 30-35%, even if it is found in the grain filling phase. If the rate of development of yellow rust in the flag leaf extraction phase reaches an average of 50-60%, then there may be no 33,5-39,4% of grain yield. In 1999, most varieties cultivated in the regions of Surkhandarya, Jizzakh, Samarkand and Kashkadarya were found to be resistant to yellow rust [3].

Depending on the tolerability or intolerance of the wheat variety, it can also lose the yield from 10% to 70% according to the development of the disease. If the fall plant damage is strong, and the infection develops rapidly in the spring after a good wintering in the winter season, it leads to the death of the crop by up to 100% [4].

The most favorable temperatures for the development of fungi are 15-17^{0}C, urediniorores grow within 4 hours at a temperature of 14-15 °C, at a temperature of 7-10°C for 8-9 hours and at a temperature of 18-21°C and higher, their growth slows down, and also stops growing at a temperature of 25°C and higher [5].

Brown rust disease-causing fungus develops at a temperature from +6°C to +35°C, with a relative humidity of 63-77% air. When the temperature is 21°C, it gives one generation in 6 days, at 16°C in 10 days. Urediniooras maintains its viability at a temperature of 30-38°C for up to 3 months. At the end of the season, wires are formed on the leaves of the wheat, they are resistant to low temperatures. In the leaves of some varieties, chlorotic or necrotic spots are formed around the uredins. 10-20 days after the opening of the urethra, wires are formed on both (most often under) sides of the leaves [6, 7, 8, 9].

Brown rust disease in grain crops leads to the death of the crop from 11-21%, up to 71% in strongly distributed years [10]. In some years, the yield can be lost up to 30-70% [11]. The populations of different races of fungi that cause fungal rust disease in beetles are confirmed to occur in different places, that is, in 1998-1999 the fungi that spread in the North Caucasus, in 1995-1996 it was determined that they are similar to races that spread in the south of Ukraine [12].

Brown rust is moderate in almost all regions of Uzbekistan and strongly spreads in some regions. If during the flowering period 40-80% wheat is infected with rust,up to 10-26, 5% of the harvest, in the spike extraction phase, the disease can destroy the harvest up to 40-50%. The main part of the cultivated varieties in the republic is considered to be resistant to rust diseases [13, 14].

I. MATERIALS AND METOHODS

Taking into account the prevalence and development of yellow and brown rust, flour-dew, yellow spotting and septoriosis diseases of the wheat, the following cuff is found in the manuals [15, 16, 17]. G.Manners [18] scale, R.F.Peterson and B. Cobb scale modified by [19] and V.G. James scales were applied.

In order to artificially damage the plant with yellow and brown rust diseases, uredinioras were used, which were harvested from the plantations in field conditions or in artificial climate laboratory conditions, which were multiplied in the fields.

Experiments were carried out in laboratory and field conditions. The scale of Tsadoks and others, which was used to determine the stages of development of wheat, which were infected with rust disease pathogens.

Control experience options were returned to the 4th times. Necessary environmental factors were created for the occurrence and development of the disease. As the Latent period passed, the degree of development of the disease on the leaves was determined on the basis of the modified Cobb scale for brown rust disease, and for yellow rust-on the scale of the Manners.

The reaction type of wheat infection was determined on the basis of reduced scale of Meinns and Jackson to brown rust disease and scale of Mak Nile and others to yellow rust disease.

II. RESULTS AND AND DISCUSSION

The most effective preventive measure against aerogen diseases is the creation and planting of resistant varieties. But, the weather conditions for the development of fungi (there should be a lot of rainy days, the air temperature should be low, dew should fall a lot, and so on.) resistant varieties also suffer from the disease as a result of increased pressure of infection in the years of convenient arrival. In addition, every year as a result of the emergence of new aggressive physiological races of fungi, any resistant varieties can also be damaged. For this reason, in our studies, we tested some varieties of wheat, which are very cultivated in the conditions of the region, in laboratory and field conditions of their resistance to rust diseases.

In our laboratory studies, we took 3 fungi from each of the yellow and brown rust diseases and tested them in special rooms for their pathogenicity in relation to the varieties of wheat Babur, Grom, Krasnodar-99 and Tanya, which are being cultivated in a wide area in the conditions of the region these days, as well as the varieties of Marocco, which are most resistant. The experiments were conducted in the laboratory of the Institute of genetics and plant experimental Biology, in cooperation with scientists of the same institute, using three fungi of each of the yellow and brown rust diseases.

Wheat cultivated in the rooms, the environment necessary for the development of fungi that provoke yellow and brown rust diseases (HNN 60-70%, air temperature 9°C for yellow rust and 18-23°C for brown rust) was created. Spores of yellow and brown rust disease, stored in special containers (ampoules), were taken and mixed in water and sprinkled with plant leaves, adding a small amount of thiamine to it so that they adhere well to the leaves. In the experiment of wheat varieties were artificially damaged by a mixture of urediniosporas of certain races. Universal resistant Morocco grade was obtained for control. The end of the latent period of diseases and the development of them on the leaves were taken into account on the scales of Manners for Cobb and yellow rust for brown rust. The results of the experiment are presented in Tables 1 - and 2 -. As can be seen from the table, the first signs of the disease in different varieties of wheat were observed after artificial damage with yellow and brown rust on the grass, after eight days in the Moroccan variety in yellow rust disease, and in other varieties after 10 days in wheat and Krasnodar-99 varieties in brown rust disease and after 12-13 days.

The development of yellow rust disease on the leaves of the plant was controlled from 15-th day, and on 30-th day the results of the final calculation showed that the lesions of various varieties of wheat were different, and the effects of the three races of yellow rust were also different (Table 1).

In the experiment, the strongest damage of wheat grass with yellow rust was 10-90% in Moroccan varieties, which showed the third race (15-90%) the strongest damage rate by race. In this variety, the average plant infestation by all races was 51,7%. If less damage with yellow rust than in the tested varieties was observed in the average Krasnodar-99 (18,3%) and Tanya (19,4%) varieties compared to the total number of plants, then more damage to them was recorded in the varieties of Grom (20,6%), Bobur (22,8%) and Chillaki (27,2%). Among the races tested in each variety, the strongest pest is in the third race (21,7%, 23,3%, 26,7%, 31,7%, 55,0%) observed (Table 1).

Also, depending on the varieties of the first and second races, it has manifested its neutralizing properties to a different extent. Damage to the leaves in plants was 0-15% gach on the 1st leaves, 0-60% on the 2nd leaves and 40-90% on the 3rd leaves.

In our experiments against brown rust disease of the whet, it was also noted that the varieties are damaged to a different extent by the disease. The first signs of the disease on the leaves appeared 10 days after inoculation. Later, the appearance of uredinia was controlled every 7-10 days, and when we take into account that 30 days later,

more damage with brown rust were noted in the Krasnodar-99 variety (0-20%). If the total number of plants in the Grom and Moroccan varieties of damage amounted to 4.4%, then this indicator was in the Bobur variety (6.1%), in the Chillaki variety (6.7%), and in the Tanya variety (7.2%). It was noted that the development of the disease in plant lawns occurs at 0-5% in the first leaves, at 5-20% in the second leaves, and at 5-20% in the third leaves. While the strongest level of damage among the three races being tested was demonstrated by the third race for all varieties, relatively low damage was observed in the second race (Table 2).

When the pathogenic properties of yellow and brown rust disease-causing fungi were studied in relation to some varieties of wheat in laboratory conditions, the tested yellow rust disease-causing fungal races showed high pathogenicity compared to the races provoking brown rust disease.

III. CONCLUSIONS

In the experiment, the symptoms of the disease appeared a little later than on it in the first and other varieties of the Moroccan variety of yellow rust disease after artificial infestation with infection of wheat mites, brown rust disease appeared after ten days in the Chillaki and Krasnodar-99 varieties and after 12-13 days in other varieties. The disease was observed to be at different levels in both the spread and damage of pathogenic fungi of wheat varieties. It was found that the damage to the yellow rust causative races of it was 51,7% in the strongest Moroccan variety, and the minimum was 18,3% in the Krasnodar-99 variety, while the damage to the brown rust causative races was the strongest was 10,0% in the Krasnodar-99 variety, and the minimum damage was 4,4% in the Also, the strongest level of damage among the three races being tested was observed in the second race, while the third race was demonstrated for all varieties, relatively low damage was observed in the second race.

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Table 1
Resistance of different varieties of wheat to yellow rust disease
(artificially damaged with fungi)

Wheat varieties	Number of races	Day of damage	Day of appearance of first signs of disease	Development of the disease, in % (30.03.2019)			Damaged plants, in relevance to amount of general plants in %	
				1-leave	2-leave	3-leave	On races	Average
Chillaki	1	01.03.2019	10.03.2019	0	30	50	26,7	27,2
	2	01.03.2019	10.03.2019	5	25	40	23,3	
	3	01.03.2019	10.03.2019	5	30	60	31,7	
Bobur	1	01.03.2019	10.03.2019	0	20	50	23,3	22,8
	2	01.03.2019	10.03.2019	5	10	40	18,3	
	3	01.03.2019	10.03.2019	10	10	60	26,7	
Marocco	1	01.03.2019	08.03.2019	10	70	80	53,3	51,7
	2	01.03.2019	08.03.2019	10	60	70	46,7	
	3	01.03.2019	09.03.2019	15	60	90	55,0	
Grom	1	01.03.2019	11.03.2019	0	20	40	20,0	20,6
	2	01.03.2019	11.03.2019	0	15	45	20,0	
	3	01.03.2019	11.03.2019	0	25	40	21,7	
Krasnodar-99	1	01.03.2019	11.03.2019	5	15	40	20,0	18,3
	2	01.03.2019	11.03.2019	0	0	40	13,3	
	3	01.03.2019	11.03.2019	5	10	50	21,7	
Tanya	1	01.03.2019	11.03.2019	0	10	40	16,7	19,4
	2	01.03.2019	11.03.2019	0	10	45	18,3	
	3	01.03.2019	11.03.2019	0	25	45	23,3	

Table 2
Resistance of different varieties of wheat to brown rust disease
(artificially damaged with fungi)

Wheat varieties	Number of races	Day of damage	Day of appearance of first signs of disease	Development of the disease, in % (30.03.2019)			Damaged plants, in relevance to amount of general plants in %	
				1-leave	2-leave	3-leave	On races	Average
Chillaki	1	01.03.2019	11.03.2019	0	5	15	6,7	6,7
	2	01.03.2019	11.03.2019	0	5	10	5,0	
	3	01.03.2019	10.03.2019	0	10	15	8,3	
Bobur	1	01.03.2019	11.03.2019	0	5	10	5,0	6,1
	2	01.03.2019	11.03.2019	0	5	15	6,7	
	3	01.03.2019	10.03.2019	0	5	15	6,7	
Marocco	1	01.03.2019	12.03.2019	0	5	5	3,3	4,4
	2	01.03.2019	11.03.2019	0	5	10	5,0	
	3	01.03.2019	10.03.2019	0	5	10	5,0	
Grom	1	01.03.2019	12.03.2019	0	0	10	3,3	4,4
	2	01.03.2019	11.03.2019	0	0	10	3,3	
	3	01.03.2019	11.03.2019	0	5	15	6,7	
Krasnodar-99	1	01.03.2019	10.03.2019	0	10	10	6,7	10,0
	2	01.03.2019	10.03.2019	0	10	20	10,0	
	3	01.03.2019	10.03.2019	0	20	20	13,3	
Tanya	1	01.03.2019	11.03.2019	0	5	15	6,7	7,2
	2	01.03.2019	12.03.2019	0	5	15	6,7	
	3	01.03.2019	11.03.2019	5	10	10	8,3	