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STUDY OF VIRULENT CHARACTERISTICS OF (Puccina striiformis f.sp. tritica) IN THE CONDITIONS OF JIZAK REGION

Abstract: *The article describes the study of the virulence of a sample of wheat yellow rust (Puccina striiformis f.sp. tritica) from Gallaorol district of Jizzakh region, which is one of the main problems in the grain industry. The disease sample was calculated by race formula 207E217 according to virulence properties. 207E217 race Yr1, Yr7, Yr6, Yr4, YrND, Yr8, YrSP, Yr2 +, Yr17, Yr9, Yr25, Yr27 genes and Yr3 + Yr 4, Yr9 + Yr2 +, Yr31 + APR gene combinations virulent and Yr6, Yr6, Yr32 is reported to be avirulent to Yr29 genes.*

Key words: *wheat, race, yellow rust, inoculation, gene, collection, spore, disease, virulent, avirulent.*

Language: *English*

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Introduction

One of the most pressing problems in wheat cultivation is the spread of yellow rust diseases. The spread of this disease causes great economic damage to farms, as well as pollution of the natural environment when chemical control is carried out against them. In this regard, by studying the development and spread of yellow rust, it is necessary to constantly study the racial composition of yellow rust, which is spreading in the grain fields of our republic.

The disease caused by yellow rust fungi is the most harmful disease found in cereal crops [1].

Puccinia striformis f.sp. tritic virulence (the ability of a pathogen to infect a plant) is the pathogen with the greatest variability [2].

New genes can occur due to accidental re-mutation, genetic variability that occurs continuously in an organism, and the restructuring of pathogenic genetic material. Such pathogenic individuals may have existed before, but they make up a very small portion of the total pathogen population, and a variety with a new resistance gene was on a much smaller scale before large-scale cultivation began. However, once these resistant plants are planted, the new resistance gene destroys or stops the movement of all other pathogenic individuals except for a very small number of pathogenic individuals that have a new virulence gene that can infect these varieties. The extinction or cessation of pathogens that do not have a new gene allows a very small number of pathogens with a new gene to multiply and replace the extinct population [3].

Today, the virulence content of rust disease is constantly monitored in many countries around the world. One of the main reasons for this is that if there is a change in the composition of the race, that is, a virulent race, the selection process requires the use of these genes and the use of other genes [4].

Determining the spread, development and composition of yellow rust disease and the widespread application of varieties resistant to these yellow rust races will contribute to the further development of grain farming.

Materials and methods.

Monitoring of wheat fields was carried out in Jizzakh region in late April and early May 2020, during the main season of yellow rust disease in wheat fields. In the field, samples of urediniospores of yellow rust disease were collected by placing the infected plant leaves in air-permeable paper bags. The diseased leaves were air-dried and stored at + 4- + 5 0C air temperature until inoculation.

Identification of virulence and disease races. The breed of wheat yellow rust (Puccina striiformis f.sp. tritica) is Johnson R., World in the style of others (9: Chinese 166, Lee, Heine's Kolben, Vilmorin 23, Moro, Strubes Dickopf, Suwon92 x Omar, Clement and Triticum spelta) and Europe (8: Hybrid 46, Reichersberg 42, Heine's Peco, Nord Desprez, Compare, Carstens V, Spalding Prolific, and Heines VII) were identified using a set of differentiator varieties. Additional for further study of the virulence properties of the isolate (Yr8 Avocet NIL, Yr17 Avocet NIL, Lal Bahodur (Yr29), Pastor (Yr31 + APR), Yr7 Avocet NIL, Fed4 / Caucasus (Yr9), TPI 1295 (Yr25), Yr27 Avoc) varieties and Morocco was used as a resistant control variety. No gene resistant to yellow rust (Puccinia striformis f.sp. tritici) has been identified in the genome of the Morocco variety. Seeds of this collection of wheat samples were sown in 7-8 cm pots in a mixture of soil, sand and humus (3: 3: 4 ratio) in 10 cm diameter pots [5].

Diseased leaves were collected to revitalize the urediniospores of yellow rust fungi and stored at + 4- + 5 0S air temperature, placed in Petri dishes filled with filter paper moistened with water and stored in a dark environment for 10-15 hours. The resuscitated urediniospores were inoculated by spraying on 10-day-old and first-leaf fully opened wheat grasses mixed with Soltrol 170 mineral oil. Inoculated specimens were left for 24 h in a dark environment at an air temperature of +9 0C and 100% humidity to carry out the incubation process. The samples were then grown in a greenhouse at + 16- + 18 0S for 12 hours a day, under 10,000 lux fluorescent lamps.

Assessment of yellow rust resistance in grasses after 14-17 days was assessed on the basis of 0-9 points, of which 0-6 points determine avirulence, and 7-9 points determine virulence.

The results obtained and their analysis.

In our experiment, a sample of yellow rust (Puccina striiformis f.sp. tritica) from Gallaorol district of Jizzakh region (coordinate: 566 m, N 40.01708, E 067.60447) was studied. Isolate differentiator varieties were inoculated and analyzed.

The racial formula of the isolate was determined by adding the above set of 17 varieties and the value of the decimal levels corresponding to the diseased specimens of the additional varieties (Table 1).

Table 1. A set of differentiator varieties used in the detection of yellow rust disease races

International collection		Genes	Decimal levels	
1	Chinese 166	**Yr1**	2^0	1
2	Lee	**Yr7**	2^1	2
3	Heine's Kolben	**Yr6**	2^2	4
4	Vilmorin 23	**Yr3+4+other**	2^3	8
5	Moro	**Yr10**	2^4	16
6	Strubes Dickopf	**Yr2+**	2^5	32
7	Suwon92 x Omar		2^6	64
8	Clement	**Yr9+Yr2+**	2^7	128
9	Triticum spelta	**Yr5**	2^8	256

European package				
10	Hybrid 46	**Yr4**	2^0	1
11	Reichersberg 42	**Yr7+**	2^1	2
12	Heine‘s Peko	**Yr6+**	2^2	4
13	Nord Desprez	**YrND**	2^3	8
14	Compare	**Yr8**	2^4	16
15	Carstens V	**Yr32**	2^5	32
16	Spalding Prolific	**YrSP**	2^6	64
17	Heines VII	**Yr2+**	2^7	128

In our study, the isolate was evaluated fourteen days after inoculation as follows (Table 2):

Table 2. Results of assessment of yellow rust isolate from Gallaorol district of Jizzakh region

International collection		**Genes**	**Morbidity rate (points)**	
			1 return	**2 return**
1	Chinese 166	**Yr1**	**8**	**7**
2	Lee	**Yr7**	**8**	**7**
3	Heine’s Kolben	**Yr6**	**7**	**7**
4	Vilmorin 23	**Yr3+4+other**	**7**	**8**
5	Moro	**Yr10**	**0**	**0**
6	Strubes Dickopf	**Yr2+**	**5**	**6**
7	Suwon92 x Omar		**8**	**7**
8	Clement	**Yr9+Yr2+**	**7**	**7**
9	Triticum spelta	**Yr5**	**0**	**0**
European package				
10	Hybrid 46	**Yr4**	**7**	**8**
11	Reichersberg 42	**Yr7+**	**6**	**6**
12	Heine‘s Peko	**Yr6+**	**5**	**6**
13	Nord Desprez	**YrND**	**8**	**7**
14	Compare	**Yr8**	**8**	**7**
15	Carstens V	**Yr32**	**6**	**6**
16	Spalding Prolific	**YrSP**	**7**	**7**
17	Heines VII	**Yr2+**	**7**	**7**
Additional varieties				
1	Yr8 Avocet NIL	**Yr8**	**8**	**8**
2	Yr17 Avocet NIL	**Yr17**	**7**	**7**
3	Lal Bahodur (Yr29)	**Yr29**	**6**	**6**
4	Pastor (Yr31+APR)	**Yr31+APR**	**8**	**7**
5	Yr7 Avocet NIL	**Yr7**	**8**	**8**
6	Fed4/Kavkaz (Yr9)	**Yr9**	**9**	**8**
7	TPI 1295 (Yr25)	**Yr25**	**7**	**7**
8	Yr27 Avocet NIL	**Yr27**	**8**	**9**
9	Morocco		**9**	**9**

According to the results of the assessment, the isolate infected Chinese 166, Lee, Heine’s Kolben, Vilmorin 23, Suwon92 x Omar, Clement varieties from the international collection, and Hybrid 46, Nord Desprez, Compair, Spalding Prolific, Heines VII varieties from the European collection (Table 1). The Strubes Dickopf variety from the international collection scored 5-6 points, the Reichersberg 42 variety from the European collection scored 6-6 points, the Heine’s Peko variety scored 5-6 points, and the Carstens V variety scored 5-6 points. Immune status was observed in Moro and Triticum spelta varieties from the international collection.

The 207E217 race formula was calculated by adding the decimal degree values in Table 1 of the varieties infected with this isolate.

In addition, additional varieties Yr8 Avocet NIL, Yr17 Avocet NIL, Pastor (Yr31 + APR), Yr7 Avocet NIL, Fed4 / Caucasus (Yr9), TPI 1295 (Yr25), Yr27 Avocet NIL, control Morocco varieties were infected.

Lal Bahodur (Yr29) was infested with a 6-point scale. No immune status was observed in the additional varieties.

Conclusion

In summary, the 207E217 race formula was detected in a yellow rust disease sample of wheat imported from Gallaorol district of Jizzakh region.

Wheat rust (Puccina striiformis f.sp. tritica) disease sample from Gallaorol district Yr1, Yr7, Yr6, Yr4, YrND, Yr8, YrSP, Yr2 +, Yr17, Yr9, Yr25, Yr27 genes and Yr3 + Yr4 +, Yr3 + Yr4 + + APR gene combinations were found to be virulent for existing wheat plants, while Yr10, Yr5, Yr7 +, Yr6 +, Yr32, Yr29 genes were found to be virulent for existing wheat plants. This indicates the need to make extensive use of existing donors with genes Yr10, Yr5, Yr7 +, Yr6 +, Yr32, Yr29 in the future to create varieties of wheat resistant to yellow rust for Jizzakh region.

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