Response of wheat germplasm against leaf and stripe rusts in agro -climatic area of Sindh

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Response of wheat germplasm against leaf and stripe rusts in agro -climatic area of Sindh

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ABSTRACT

Among tested 30 lines / varieties tested in rust screening nursery against striperust under natural conditions, 28 were found immune and 2 were screened as resistant. Moreover, among 16lines tested in Station trial against stripe rust in natural conditions, all genotypes showed immune response. 1 genotype showed R-type reaction, two showd MRMS type reaction against leaf rust in the same trial.

KEY WORDS: Wheat, *Puccinia titicina*, stripe, natural conditions, Sindh

INTRODUCTION

The wheat crop is attacked by many diseases, of which rusts are of great importance. Two types of rusts that causes major losses to wheat yield, include yellow and leaf rust. Wheat is mainly affected by leaf rust. Leaf rust (brown rust) is caused by *Pucciniarecondita* and strip rust by *Striiformis f. sp. Tritici*Westernd). Leaf rust is more prevalent from Tandojam towards southwest where stripe rust is predominant from Kashmore towards northeast part of the Punjab. Hence regular studies are conducted every year from monitoring these rusts and the type of virulences they possess.

The rust diseases of wheat pose a constant threat to sustainable wheat production and thus food security in Asia (Hussain et al., 1980). If susceptible wheat cultivars are grown, approximately 40 to 60 million hectares could experience periodic epidemics of leaf and stripe rust, respectively. Avoiding major rust epidemics in the region is a complex challenge, given that fewer cultivars are being cultivated over large areas, that several of those cultivars are protected by the same

resistance genes, and that there is free movement of new virulent races in most of west and south Asia. Rusts are obligate parasites that interact with resistance genes in wheat in a gene-for-gene manner. New races of rust developed by mutation and selection for virulence against rust resistance genes in wheat. In recent years, new races of leaf rust, stripe rust, and stem rust have been introduced into wheat production areas in different continents.

Leaf and stripe rusts appear periodically on wheat crop and induce heavy losses in yield. Several epidemics of leaf and stripe rusts on wheat crop have been reported in the past and these diseases continue to be major threat to future wheat production. Leaf rust appears on wheat crop during March-April in the form of orange colour pustules, scattered on leaf and leaf sheath. Early infection may even kill the plant while the late infections reduce the overall yield.

“The disease can create chronic problem due to its time of appearance and prolonged season for its development.(Khan et al., 1997). Yellow rust appears on leaves as small yellowish pustules arranged in lines parallel to veins. The damage caused depends upon the severity and time of infection resulting into yield reduction. It may appear in January and continue to develop in March depending upon the prevalence of low temperature.The best management for the control of rust diseases is to screen out the available germplasm against yellow and brown rusts, to determine their level of resistance and to estimate yield losses caused by rust disease in relation to rust intensities. The research work regarding yield losses due to rust is required, particularly in relation to different rust intensities. The amount of rust diseases and their correlation with yield can be helpful to develop a model which may be used in future to predict not only the rust diseases but also the yield losses on wheat genotypes affected by these diseases. The worst yellow rust epidemic in the recent years has wiped out almost all the commercial wheat varieties of the country. At present, country is facing critical shortage of appropriate wheat varieties having both feature of high yield and rust resistance with wider adoptability.

The main objective of the study is:

- To evaluate the resistance of different wheat varieties/lines

MATERIALS AND METHODS

Screening of wheat germplasm under natural conditions

30 and 16genotypes were grown in rust screening nursery an d micro yield trials repectively at NIA, Tandojam, Sindh, to observe their rust response and performance in agro climatic conditions of this area. Wheat lines were sown on 3rd week of December. Hand drill was used for sowing purpose. Each line was planted in one cm row. Randomized complete block design was used in the experiment. Morocco was used as a susceptible check and was sown at border of plot and was also repeated after each ten rows. All agricultural inputs were given to the crop at recommended rates.The material was left free for disease occurence..Field was visited regularly to observe disease appearance. Disease severity ratings were taken from appearance of initial symptoms up to crop maturity using the Cobb's scale.Disease Appeared, Small brown pustules develop on the leaf blades in a random scatter distribution. The pustules were circular, slightly elliptical, and smaller than those of stem rust. Usually contain masses of orange to orange-brown urediospores. Infection sites primarily were found on the upper surfaces of leaves and leaf sheath and occasionally on the neck and awns.

Disease scoring

Data in the field was recorded as severity and response. For this purpose, Modified Cobbs' scale was used which represents six degrees of rust lines viz., 5, 10, 20, 30, 65, and 100 %. The 100% severity accounts for 37% of the actual leaf area covered. Below 5% severity trace to 2% intervals are used. The response of a variety refers to the infection type and is classified according to the following letters:

Modified Cobbs' Scale used for Scoring

Letter	Infection type
O	No visible infection
R	Resistant: necrotic areas with or without small pustules.

MR	Moderately resistant: medium sized pustules; no necrosis, but some chlorosis possible.
MS	Moderately resistant: medium sized pustules; no necrosis, but some chlorosis possible.
S	Susceptible: large pustules; no necrosis or chlorosis.
X	Intermediate. pustules of variable size; some necrosis and or chlorosis

Severity and response readings are recorded together with severity first. Some examples are given below;

TR= trace severity of a resistant type infection

10MR= 10% severity of a moderately resistant type

50S= 50% range of reaction on each plant

RESULTS AND DISCUSSIONS

Results and discussions

Among tested 30 lines / varieties tested in rust screening nursery against stripe rust under natural conditions, 28 were found immune and 2 were screened as resistant. Moreover, among 16lines tested in Station trial against stripe rust in natural conditions, all genotypes showed immune response. 1 genotype showed R-type reaction, two showd MRMS type reaction against leaf rust in the same trial.The above results showed that source of resistance are present in wheat tested germplasm. If this material is tested for other agronomic traits in different agro-climatic zone of Pakistan and satisfactory results are achieved, Then these cultivars can be deployed in breeding programme to release resistant varieties. Thus this approach can greatly help to increase and stabilize agriculture productivity as well as avert epidemics if seed of resistant varieties are made

available to the farmers on a timely basis. Walker (1965) considered screening as important tool for evaluation of resistance. Many successes can be quoted of such productive programmes

Table-1.RESPONSE OF WHEAT GENOTYPES AGAINST STRIPE IN RUST SCREENING NURSARY UNDER NATURALCONDITIONS

Sr. No	Genotypes	Stripe rust Response
1	Mb-11	O
2	Mb-12	O
3	Mb-13	O
4	Mb-17	O
5	Mb-19	R
6	Mb-12	O
7	JMb-13	O
8	AMb-17	O
9	Mbs-11	**R**
10	JMb-12	O
11	KMb-13	O
12	CMb-17	O
13	CMb-11	O
14	AMb-12	R
15	DMb-13	O
16	JMb-17	O
17	AHMb-11	O
18	MMb-12	O
19	Mb-1.1	O

20	Mb-1.7	R
21	Mb-1.1	O
22	Mb-1.2	O
23	JMb-13	O
24	ZMb-17	O
25	KMb-11	**O**
26	KMb-12	O
27	TMb-13	O
28	Mbc-17	O
29	Mbn-11	O
30	Mbm-12	O

Table-2.RESPONSE OF WHEAT GENOTYPES AGAINST LEAF AND STEM RUST UNDER ARTIFICIAL CONDITIONS

Sr. No	**Genotype**	**Leaf rust**	**Yellow rust**
1	ASR-1	R	o
2	ASR-4	o	o
3	ASR-5	o	o
4	ASR-7	o	o
5	ASR-9	o	o
6	ASR-11	o	o
7	ASR-13	5MRMS	o
8	ASR-14	o	o

9	ASR-16	o	o
10	ASR-17	o	o
11	ASR-19	5MRMS	o
12	ASR-21	o	o
13	ASR-23	o	o
14	ASR-25	o	o
15	ASR-27	o	o
16	ASR-29	o	o

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