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PREVALENCE OF LEAF RUST RACES OF WHEAT IN PUNJAB

Mohammad Ashraf Randhawa, Ehsan-ul-Haq, M. Bashir Ilyas and M. Abdul Razzaq Bhatti

Department of Plant Pathology, University of Agriculture, Faisalabad

Survey of the 11 districts of the province of Punjab, Pakistan revealed the occurance of seven physiological races of leaf rust of wheat (*Puccinia recondita* Rob. Ex Desm) during the year 1981-82. The most prevalent was race 77 (72.0) followed by race 144 (11.9%), 149 (5.2%), 12 (3.7%), 57 (2.5%), 122 (2.5%) and 117 (1.2%). Race 117 prevalent only in Faisalabad division and race 122, recorded from Faisalabad and Multan divisions, are a new record in Pakistan.

INTRODUCTION

Rusts cause enormous losses to wheat crop and leaf rust is the most destructive due to its time of appearance and prolonged season for development in wheat growing tracts of Pakistan. More than 10 percent losses due to leaf rust were reported (Hassan, 1979) during the leaf rust epidemics of 1978 and 1979. The sporadic appearance of epidemics during certain years and the break down of resistance in other years is due to the fact that race situation is ever changing through hybridization and mutation of the leaf rust fungus. The introduction and cultivation of susceptible cultivars results in the build up of the population of new virulent races leading to the sporadic out-breaks of epidemics, especially when environmental conditions are favourable for such out-breaks. The success of a resistance breeding program depends upon the knowledge of the source of genetic resistance against these races. This paper reports a survey on the identification and prevalence of races during the year 1981-82.

Puccinia recondita Rob Ex Desm. is a fungus specilized into numerous physiological races (Johnston and Browder, 1966) that can be identified by their reactions on certain wheat varieties and more than 200 races of leaf rust (LR) are known (Johnston and Levine, 1955). Relatively a few races are prevalent and widely distributed in Pakistan (Hassan *et al*, 1978). The most prevalent

and widely distributed in Pakistan, is race 77 which was identified in 1961-62 (Hassan *et al.* 1967). Races 12 and 57 are being isolated regularly each year since 1961-62 (Hassan *et al.* 1967). Race 12 and 57 was first isolated from exotic variety at Sargodha in 1962. Race 144 and 149 *were reported from* Pakistan duriug 1967 and 1978 respectively (Hassan *et al.* 1978). The prevalence of race I2 and 57 during 1965-66 has fallen from 25.3 to 3.7 and 35.4 to 2.5 per cent during 1977-78 respectively (Hassan *et al*, 1978).

MATERIALS AND METHODS

Eighty two leaf rust samples were collected from various wheat varieties grown at different localities and preserved at 5°C until used. The inoculum for each sample was multiplied on susceptible Local White and C 591 varieties, planted in earthen pots, by inoculating the seedlings at single leaf stage. The urediospores were applied on both the sides of the leaves at 2-3 leaf stage with the help of a camel hair brush after rubbing the hairs of the leaves against the fingers. The inoculated seedlings were kept in a dew chamber for a period of 24 hrs, after which these were shifted to a green house at a temperature range of 17 to 35°C and humidity range of 62 to 83 per cent.

Upon the appearance of small pustules, eight wheat leaf rust differentials (Gassner, 1931) were planted in plastic pots. The differential seedling were inoculated with the individual rust samples and their reactions were recorded after 15 days of inoculations using 0 to 4 grade scale (Johnston and Browder, 1966). The races were identified according to the Fifth and Seventh Revised International Register of physiological races of leaf rust (Johnston and Browder, 1966).

RESULTS AND DISCUSSION

Rust samples tested on a set of differentials revealed the occurance of race 12, 57, 77, 177, 122, 144 and 149. Fifty eight samples exhibited a reaction of race 77 whereas nine samples reprented race 144 Race 149, 12, 57, 122 and 177 were represented by 4, 3, 2 and 1 sample, respectively. Three samples were found to consist of mixture of races. One sample contained a mixture of race 57, 144 and 149. Another contained a mixture of race 57 and 77, while the third that of race 77 and 144. A representative reaction of each of *the* seven races isolated is given in Table 1.

Race 77 was the most prevalent (72.0) and occupied all the major wheat growing region of Punjab on account of the prevailing suitable incubation tem-

perature (16-20°C) for this race (Lesovoi, 1979). It was reported from India during 1955 (Vasudeva *et al*. 1955). Later during 1961-62 it was reported from Pakistan (Hassan *et al*. 1967), when 34 samples were collected from 13 localities in West and East Pakistan (Now Bengla Desh). This is of univeral occurrence and has been reported from Poland (Ryaz-Bialota, 1980), USSR (Kulvikova and Borisenko 1968), Bulgaria (Gospodinova, 1979), Italy (Basile *et al*. 1959), Rumania (Stewart *et al*. 1967) and India (Joshi *et al*. 1971).

Table 1. *Reactions of leaf rust races on a set of differen ials.*

Differentials	Races identified and their reactions on differential						
	77	144	149	12	57	122	117
Malakoff	4	4	4	2	2	4	4
Carina	4	4	0	3	4	4	4
Brevit	4	4	4	4	4	4	4
Webster	4	2	4	1	4	4	4
Loros	4	4	4	4	4	4	4
Meditterranian	4	4	4	3	4	4	1-2
Hussar	4	4	4	4	4	2	4
Democrat	4	4	4	4	4	4	3

*New Record

The second most prevalent race was 144 which was represented by nine samples with a prevalence of 11.9%. This was recorded in Pakistan (Hassan *et al*. 1967, 1974) and USSR (Kulvikova and Borisenka 1968).

Race 149 ranked third with regard to its per cent prevalence (5.2%) and was represented by four samples. In Pakistan, it was recorded during 1978 Hussain, *et al*). It has also been seported from Bulgaria (Gospodinova and and Rzhin, 1978).

Race 12 and 57 are being isolated regularly each year scince 1962 and their population fluctuating from year to year but their prevalence increasing substantially in 1965:66 (Hussain *et al*. 1967). Of the total race population, the prevalence of race 12 (25.3%) and race 57 (35.4%) during 1965-66 has fallen to 3.7 and 2.5 per cent respectively during 1981-82 (Hassan *et al*. 1967) Race 12 was first isolated from samples of Silkirk and C 273 varieties collected at Sahiwal in March/April, 1962. Since then it has been reported from nine divisions of West Pakistan and in Khulna divisions of East Pakistan. Race 57 was first

isolated from exotic weeat variety collected at Sargodha during March, 1962 and has been recorded from ten divisions of West Pakistan and two divisions of East Pakistan during 1962 to 1966 (Hussain *et al*, 1967). Besides Pakistan, race 12 has also been reported from Italy (Basquini *et el*. 1979) and India (Singh *et al*. 1978). Race 57 has also been reported from Italy (Basile, *et al*. 1959 & 1962).

Race 117 and 122 are a new record, as these have not so far been reported from Pakistan. These races were recorded at the prevalent percentage of 1.2 and 2.5 respectively. Race 117 was recorded only on cultivar Bahawalpur 79 from one place (Faisalabad) and race 122 was recorded on Yecora wheat from Sahiwal and on Necozari cultivar from Faisalabad (Table 2). These races are quite distinct from any of the races of leaf rust reported so far from Punjab and can be distinguished from them even on the more reliable differentials (Gassner, 1931). Their monospore cultures had also repeatedly produce the same infection types under optimum and varyable temperatures and light conditions. Race 117 has also been reported to occur in USA (Tsikaridze *et al*. 1977) and race 122 in Rumania (Negulescu, 1971) and USA (Johnston, 1959 & 1960).

Table 2. *Prevalence of Leaf Rust Races During 1982.*

Race No.	Prevalence race recorded from			
	No. of samples	Percent samples	Division/s	Wheat varieties
77	58	72.9	Faisalabad Rawalpindi Sargodha Lahore Multan	C 2J1, Barani 70, C 228, Mexi Pak, Pothwar, Yecora, Chenab 70, Punjab 76, Nuri, LU, C 217, WL 711, Blue Silver, SA 42, Sonalika, Pb/Lr, Son x Tb-Pk 13421-45a, B. Sil x TD-1065, Sandal, Nacozari, RD 2009, C 591, Local White, Barani 79, PARI 73, V 1302, Lyallpur 73 Khyber 79, ZR 9.
144	9	11.4	Faisalabad Multan	SA 42, C 217, 77-20 RS-16, V 1285, V 1302, UAB 1, Sandal, Yecora.
149	4	5.2	Faisalabad Rawalpindi	Mexi-Pak, Sandal, 77-20, Blue Silver.
12	3	3.7	Faisalabad	Dirk, C 228, Barani 70.
57	2	2.5	Faisalabad	77-20, Nacozari
122	2	2.5	Multan Faisalabad	Yecora, Nacozari.
117	1	1.2	Faisalabad	Bahawalpur 79

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