

Physiological Races of Stem and Leaf Rusts of Wheat in the Libyan Jamahiriya and Sources of Resistance to these Races

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ABSTRACT

A study of the physiological races of wheat stem and leaf rusts in Libyan Jamahiriya during 1975 revealed the existence of six races of *Puccinia graminis tritici*, namely 141, 129, 38, 40, 128, 144, 154 and 163 arranged according to their prevalence respectively.

Twenty-five promising lines and varieties of wheat were screened for their resistance to race 24 of stem rust and race 129 of leaf rust in the seedling stage. The results obtained showed that all the tested lines were resistant to stem rust and some lines originated from the cross (Nia 160 × Sidi Masri) × Sidi-Masri were resistant to leaf rust.

INTRODUCTION

Wheat production in the Libyan Jamahiriya is seriously influenced by rust diseases especially stem rust *Puccinia graminis tritici* Erikss and Henn and leaf rust (*Puccinia recondita* Rob. ex Des. f. sp. *tritici*) which are considered the most important rusts attacking wheat in this country (1,2,6,7).

Abdel-Hak and Kamel (2) reviewed the stem rust situation in the Near East Region, including Libyan Jamahiriya, with regard to rust occurrence, distribution of physiologic races, and reaction of commercial varieties to their virulence in each country.

In the Libyan Jamahiriya, they isolated races, 17, 18, 19, 14, 11, 24, 21 and 23 of stem rust in 1964. Races of 7, 117, 9, 11, 17, 19, 53, 122 and 295 of stem rust were isolated in 1965.

Abdel-Hak (1) identified leaf rust races isolated during the period of 1963–1965. In 1963, he showed that races 107, 20, 187, 93, 9 and 38 were predominant. In 1964, races 26, 184, 67, 107, 20, 86, 49, 68, 77 and 129 of leaf rust were the most abundant, whereas, in 1965, races 11, 77, 42, 26, 20, 130 and 131 of leaf rust were the most prevalent. All the above-mentioned races are listed according to their prevalence, respectively.

The commercial wheat varieties grown in the Libyan Jamahiriya had been screened at Giza, Egypt during 1963–1965 to races, 11, 14, 17, 19 and 24 of stem rust and races 20, 77 and 107 of leaf rust, and all were susceptible to all races of both diseases (2). The tested varieties were: *Vulgare* spp., which includes, Boush, Farina I, Frania II, Florence Aurora, Fritissa II, Ithkir, Khresi I, Khresi II, and Soukni. *Durum* spp. including Bbaica, Ftaiha, Homera, Mahmoudi D981, Meezka, Maghrabia, Maghrabia Be'ida, Senatore capelli and Tawaliya.

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In 1975, Mohamed H. (7) identified seven races of stem rust, namely, 14, 17, 19, 21, 24, 39 and 53. He noted that race 14 constituted the highest percentage among the other races, during the three seasons (1971–1973).

In 1975 El-Shater and Ashraf (3) isolated nine races namely 11, 14, 17, 19, 24, 34, 42 and 88 of stem rust from specimens collected in 1974 from four wheat-growing areas in the Libyan Jamahiriya. They found that race 14 was the most predominant in that period.

The main objective of the present investigation was to study the spectra of stem and leaf rust races in the Libyan Jamahiriya and to screen different wheat cultivars for possible source of genetic resistance to the prevalent races.

MATERIALS AND METHODS

The method used for identification of physiological races of wheat stem rust and testing of cultivars was the standard method adopted by Stakman and his co-workers (6) and for leaf rust was that of Johnston (4) and Johnston and Browder (5).

RESULTS AND DISCUSSION

Rust survey made during April and May 1975 showed that most of the damage caused by stem and leaf rusts occurred in the irrigated area, whereas in the rain-fed area, rust infection was negligible. Moreover, it was found that the variety Homera (*Triticum durum*) was suffering severely from stem rust wherever it was grown, especially in Zawia province. The variety Florence Aurura (*Triticum aestivum*) was moderately susceptible to stem and leaf rusts. The variety Mahmoudi (*Triticum durum*) was reported to be resistant to stem and leaf rusts (Arafa and El-Ahmar 1971–72)*. However, during 1975 stem and leaf rust infection was found on this variety at Wadi El-Hira and, as will be shown later, race 14 of stem rust was isolated from the specimens which had been collected from this variety. With regard to leaf rust, it was widespread in 1975 on the commercial varieties in the irrigated area.

1. Stem Rust Races

During the course of this study in 1975, six races of wheat stem rust, namely, 14, 11, 24, 34, 17 and 19, arranged according to their relative prevalence, were isolated from

Table 1 Number and percentage of physiologic races of wheat stem rust (*Puccinia graminis* P. sp. *tritici*) isolated from different localities of Libya in 1975.

| Physiologic races | Localities, number and percentage of isolates | | | | Total |
|-------------------|---|--------|-----------|---------|-----------|
| | Sidi Mesri | Tajura | El-Zawia | El-Hira | |
| 14 | 2(25%) | 1(30%) | 10(66.7%) | 2(10%) | 15(29.7%) |
| 11 | 4(50%) | — | — | — | 4(14.8%) |
| 24 | — | — | 3(20%) | — | 3(9.9%) |
| 34 | 2(25%) | 1(50%) | — | — | 3(9.9%) |
| 17 | — | — | 1(6.7%) | — | 1(3.3%) |
| 19 | — | — | 1(6.7%) | — | 1(3.3%) |
| Total | 8 | 2 | 15 | 2 | 27(100%) |

*Unpublished report—Agricultural Research Centre Library, Tripoli, The Libyan Jamahiriya.

Table 2 Physiologic races of wheat leaf rust (*Puccinia recondita*) isolated from Libya in 1975.

| Physiologic races | Localities, number and percentage of isolates | | |
|-------------------|---|----------|--------------------|
| | Sidi Mesri | El-Zawia | Total ¹ |
| 141 | 4(40%) | 1(25%) | 5(35.7%) |
| 129 | 2(20%) | 1(25%) | 3(21.42%) |
| 38 | 1(10%) | — | 1(7.14%) |
| 40 | — | 1(25%) | 1(7.14%) |
| 128 | 1(10%) | — | 1(7.14%) |
| 144 | 1(10%) | — | 1(7.14%) |
| 154 | — | 1(25%) | 1(7.14%) |
| 163 | 1(10%) | — | 1(7.14%) |
| Total | 10 | 4 | 14(100%) |

¹Percentage of isolates are calculated according to the total number of isolates found in each province.

Table 3 Reaction of 25 wheat cultivars to stem rust (Race 24) and Leaf rust (R. 129) in the seedling stage at Sidi Mesri, Tripoli in 1975.

| S. No. | Variety or Line | Infection types ¹ | |
|--------|--|------------------------------|-----------|
| | | Stem Rust | Leaf Rust |
| 1 | Sidi Mesri 1 | 0; | 4 |
| 2 | L (Florance aurora × Son. 64) × S.M. Fam. 15 pl. 1 | 1 | 4 |
| 3 | L (Nai. 60 × S.M.) × S.M. Fam. 231 pl. s | 0; | 2.3 |
| 4 | L (Nai. 60 × S.M.) × S.M. Fam. 234 pl. 1 | 0; | 0 |
| 5 | L (Florance aurora × Son. 64) × S.M. Fam. 15 pl. 2 | 1 | — |
| 6 | L (Nia. 60 × S.M.) × S.M. Fam. 222 pl. 1 | 0; | 4 |
| 7 | L (H722 × FA 09143) × S.M. Fam. 88 pl. 1 | 0; | 1 |
| 8 | L (Florance aurora × Son. 64) × S.M. Fam. 51 pl. 1 | 0; | — |
| 9 | Kalyansona 227 | 0; | 4 |
| 10 | L (Narino 59 × Nai. 60) × S.M. Fam. 99 pl. 1 | 0; | 4 |
| 11 | NP 852—Son. 64 × Mp 62 | 0; | — |
| 12 | Tt. 54 A(E) × Yalta (A4) | 0; | 4 |
| 13 | Giza 156 | 0; | 4 |
| 14 | FAO 25601 | 0; | — |
| 15 | L (Pitic 62 × H 722) × S.M. Fam. 120 pl. 2 | 0; | 0 |
| 16 | (Nai. 60 × S.M.) × S.M. Fam. pl. 1 | 0; | — |
| 17 | L (Florance aurora × Son. 64) × S.M. Fam. 37 pl. 1 | 0; | — |
| 18 | L (Narino 59 × Nai. 60) × S.M. Fam. 93 pl. 1 | 0; | 4 |
| 19 | L (Nai. 60 × S.M.) × S.M. Fam. 239 pl. 1 | 0; | — |
| 20 | L (Florance Aurora × Son. 64) × S.M. Fam. 21 pl. 1 | 0; | — |
| 21 | L (Nai 60 × S.M.) × S.M. Fam. 222 pl. 2 | 0; | 4 |
| 22 | L (Nai 60 × S.M.) × S.M. Fam. 221 pl. 1 | 0; | 0 |
| 23 | L (H 722 × FAO 9143) × S.M. Fam. 71 pl. 2 | 0; | 1 |
| 24 | L (Nai. 60 × S.M.) × S.M. Fam. 239 pl. 2 | 0; | 4 |
| 25 | L (Pitic 62 × H 722) × S.M. Fam. 117 pl. 1 | 0; | 4 |

¹0 = immune.

0; = nearly immune.

1 = highly resistant.

2 = moderately resistant.

3 = moderately susceptible.

4 = highly susceptible.

rust samples collected from Sidi Mesri, Tajoura, El-Zawia and Wadi El-Hira localities (Table 1). These races were previously reported along with other races in Libya by Abdel-Hak (1), El-Shater and Ashraf (3) and Mohamed (7). Race 14 seems to be the predominant race in The Libyan Jamahiriya in 1974 and 1975. Race 11, the second in prevalence in Libya was reported in 1972 by Abdel-Hak *et al.* (2) to be the most prevalent race in Egypt for several years and that race 14, the predominant race in The Libyan Jamahiriya, is also among the prevalent races in the Near East Region. Mohamed (7) also found that race 14 was the most prevalent race.

2. Leaf Rust Races

Eight physiologic races of wheat leaf rust (*Puccinia recondita*) were isolated from leaf rust specimens collected during the 1975 season from the Sidi Mesri and El-Zawia localities. These races, 141, 129, 38, 40, 128, 144, 154 and 163, are arranged according to their relative degree of virulence (Table 2). Races 38 and 129 were isolated by Abdel-Hak (1) from leaf rust specimens sent to him from Libya during 1964, whereas other races were identified for the first time in The Libyan Jamahiriya.

3. Sources of Resistance

Twenty-five lines and varieties of wheat were tested in the seedling stage for their reaction to race 24 of stem rust and race 129 of leaf rust, at Sidi Mesri during 1975 season. The results obtained showed that all these varieties and lines are highly resistant to stem rust (Table 3), whereas the reaction to leaf rust showed that some of the lines, originated from the cross (Nai, 160 × Sidi Mesri) × Sidi Mesri, are resistant to race 129 of leaf rust (Table 3). Thus, these lines are promising nuclei to be used as commercial varieties in the future.

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