

Short Communication

Reaction of some of Afghanistan's wheat varieties to yellow rust under natural conditions

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Afghanistan grows wheat at about 2.5 million ha, about 45% of which is irrigated. The country is not wheat sufficient and has been importing to meet domestic needs. Yellow rust is the most important disease of wheat in Afghanistan. Country has been able to manage wheat rusts mainly by having a survey surveillance system in place and by releasing resistant varieties. A total of 30 wheat varieties released during last two decades were screened for rust resistance under natural epiphytotic conditions. The rust reaction observed on two dates at one week interval revealed very fast increase in yellow rust infection. A large number of varieties e.g., Gul-96, Pamir-94, Ghorl-96, HD2285 etc., were found to have very high yellow rust scores warranting their removal from seed chain.

Key words: Wheat, yellow rust, seed.

INTRODUCTION

Wheat is the staple crop of Afghanistan, which has one of the highest average per capita wheat consumption levels (over 186 kg/person/year) in the world (Persaud, 2012). Afghanistan's wheat production has always been short of its domestic demand. The wheat production in Afghanistan has been erratic mainly due to recurrent droughts faced by the country. Country has faced droughts of varying degrees during 2008, 2010 and 2011 in recent past. Afghanistan's best harvest has been 5.1 million tons in 2009 (FAO, 2012). Wheat imports from neighboring countries have been required to meet local demands. Approximately, 45% of Afghanistan's wheat area in a normal year is irrigated, accounting for about 70 to 90% of total production. The remaining 55% relies on timely rainfall and at best provides the remaining 10 to 30% of domestic production. Among biotic stresses, rusts are the most important for wheat. Yellow rust (YR) caused by *Puccinia striiformis* f. sp. *tritici* is the most prevalent among the three rusts. Principally, a disease of

wheat grown in cooler climates (2 to 15°C), YR derives its name from the stripes of yellow colored uredinia. An early YR attack can lead to weak stunted poor tillering wheat plants causing severe yield losses. Afghanistan has managed to ward off yield losses from rusts mainly by releasing and deploying rust resistant varieties and by removing susceptible ones from the seed chain.

Afghanistan is strategically located in central Asia close to the natural habitat of alternate hosts for *P. striiformis* s (Jin et al., 2010) and offer ideal conditions for a YR incidence throughout the crop season. The Afghan National Research System has the primary responsibility to put in place a proactive surveillance system to detect emerging YR races. CIMMYT/ARIA has been jointly organizing a National Rust Screening Nursery (NRSN) comprising all new candidate varieties and all seed chain and check varieties. The nursery is expected to reveal any new race change immediately and will allow CIMMYT and the Afghan National Research System to respond

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Table 1. Rust score on Afghanistan's spring sown seed chain wheat varieties at Kabul for the year 2011 to 2012 season.

| S/N | Cultivar name | Yellow rust (YR) score | |
|-----|----------------|------------------------|------------------|
| | | 24 June, 2012 | 01 July, 2012 |
| 1 | Sheshambagh 08 | 20 MR | 20 MR |
| 2 | Drokhshan 08 | 5 MS | 5 MS |
| 3 | Koshan 09 | 20 M | 20 M |
| 4 | Ariana-07 | 10 MR | 20 MS |
| 5 | HUW 234 | 10-20 MS | 10 MSS |
| 6 | Lalmi-02 | TR | TR |
| 7 | Sunbird | TR | TR |
| 8 | PASTOR | TR | TR |
| 9 | CROC-1 | TR | TR |
| 10 | Herat-99 | 40 MS | 60 S |
| 11 | Mazar-99 | TR | TR |
| 12 | Roshan-96 | 20 MS | 40 S |
| 13 | Darulaman-07 | TR | TR |
| 14 | Amo-99 | 40 MS | 60 S |
| 15 | Takhar-96 | 80 S | 80 S |
| 16 | PBW-154 | 20 MR | 40 MS |
| 17 | Nangarhar-64 | 20 MS | 20 MS |
| 18 | MH-97 | 60 S | 60 S |
| 19 | Inqelab-91 | 80 S | 80 S |
| 20 | HD2285 | 60 S | 60 S |
| 21 | Ghori-96 | 10 MR | 40 MS |
| 22 | WEBLLI | 10 MR | 10 MS |
| 23 | Lalmi-03 | TMR | TMR |
| 24 | IRENAWEAVER | TR | TR |
| 25 | Bakhtawar-92 | 5 MR | 10 MS |
| 26 | Ghazna-96 | 10 MR | 10 MR |
| 27 | Rana-96 | TR | TR |
| 28 | Gul-96 | 5 MR | 40 S; 60 S (LR*) |
| 29 | Solh-02 | 10 MR | 10 MR |
| 30 | Pamir-94 | 20 MS | 40 MS |

*LR, Leaf rust.

accordingly. The 2009 to 2010 crop season witnessed YR infection on an important variety, Ariana 07. The samples analyzed revealed the race to have virulence for Yr 27. Ariana 07 variety had been resistant ever since its release in 2007 and was occupying a prominent position in the seed chain. In a study involving 28 near-isogenic lines during 2005 to 2007 (Osmanzai et al., 2008), the lines carrying Yr10, Yr26, Yr18+Yr27 and Yr9+Yr18+Yr27 showed resistance. This note reports YR scores observed on the set of wheat varieties released during last two decades in Afghanistan.

MATERIALS AND METHODS

Material comprised of 30 wheat varieties released in the country during last two decades. The experimental plot consisted of six

rows of 5 m each with a row to row spacing of 30 cm. The experiment was shown on 2nd February, 2012 at the experimental field of Agricultural Research Institute of Afghanistan, Darulaman, Kabul. The local recommended agronomic practices were adopted to raise the crop. Many of these varieties figure in Afghanistan's current seed chain also. The scoring was done following modified Cobb's scale (Peterson et al., 1948). Observations were recorded on June 24th and July 1st, 2012.

RESULTS AND DISCUSSION

Even though it was late in the season and scores were observed only at Kabul (Table 1), nevertheless it hinted at a potentially risky shift in YR virulences in the country. The scores varied from TR to 80 S on both dates; however, a week's gap increased severity as well as higher field response in respect of several varieties. For

example, variety Gul 96 had a score of 5MR on first date which increased to 40 S within a week's time. Incidentally, this was the only variety on which 60 S leaf rust was also observed. On the other hand, there were varieties like Lalmi 02, Drokshshah 08, Mazar 99 etc., for which there was no change in the disease score. Results have implications on country's seed chain as some of the varieties need to be phased out as it is just a matter of time before the race might spread to other regions and cause economic losses in farmers' fields.

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