*Indian J. Genet.*, 52 (2): 174–177 (1992)

# RUST RESISTANT LINES OF WHEAT DERIVED FROM DIFFERENT CROSSES INVOLVING CULTIVAR C 306

A. S. RANDHAWA, S. K. SHARMA AND H. S. DHALIWAL

*Punjab Agricultural University, Regional Research Station, Gurdaspur 143521*

(Received: January 25, 1990; accepted: October 25, 1991)

ABSTRACT

**Fifty four lines of wheat, derived from the crosses of cv. C 306 and different sources of yellow and brown rust resistance through backcross and pedigree methods, were evaluated for rust resistance, grain yield and other attributes under rainfed conditions during 1988-89. Eight promising lines were tested again during 1989-90 and 1990-91 at Gurdaspur. Four top yielding and rust resistant lines (WG 3762, WG 3771, WG 3772 and WG 3773) were identified. WG 3762 and WG 3771 also excelled the best check PBW 175 in grain yield.**

Key words: *Triticum aestivum*, wheat, rust resistant.

A large area of wheat in India is still rainfed and any improvement in the productivity of rainfed wheat will have far reaching effect on its total productivity. A wheat variety C 306, released in 1965, is the most popular variety among different wheat varieties recommended for rainfed cultivation. It has now become susceptible to brown rust (*Puccinia recondita* Rob. ex. Desm.) and in the years of epiphytotics of brown rust, it suffers heavy losses. Thus, there is a need to develop a rust resistant variety matching C 306 for drought tolerance and yield ability.

The presence of a strong necrotic gene ($Ne_1$) in C 306 restricted the gene flow from exotic rust resistance $Ne_2$ stocks [1–3]. Strenuous efforts led to the development of normal and rust resistant $F_1$ by crossing noncarrier stocks with C 306 [3, 4]. These $F_1$s were crossed with other $Ne_2$ lines and crosses, having genes for yellow and brown rust resistance. Backcross programme with C 306 was also followed in several crosses. Since brown rust appeared late in the season at Gurdaspur, therefore, crossing have to be done before selection for brown rust and a number of crosses attempted with susceptible material have to be discarded. Two or three backcrosses with C 306 were attempted, followed by selfing and selection for yellow and brown rust resistance.

During 1987-88, 54 rust resistant progenies resembling C 306 in appearance and grain characteristics, were bulked in $F_5$ and $F_6$ generations after backcrossing. These progenies were evaluated in two trials against C 306, PBW 65 and PBW 175 for grain yield and other attributes under rainfed conditions at the Punjab Agricultural University, Regional Research Station, Gurdaspur. Each experiment was laid out in a randomized block design with four replications and a net plot size of 0.92 x 5.0 $m^2$.

The progenies evaluated were derived from the simple crosses of CPAN 1946, CPAN 1962 and CPAN 1994; complex crosses of Girija x CPAN 1959, PH 100 x CPAN 1946, Kentas 54 x WG 2201, WG 357 x CPAN 1961, WG 357 x CPAN 1959, HW 658 x PBW 54, (Raj 1973 x Kentas 54) x WG 2201, CPAN 1962 x CPAN 1973, and WG 2201 x Kentas 54, and of backcrosses of CPAN 1874, CPAN 1907, CPAN 1962, HW 547, Kentas 54 x WG 2201 and (Raj 1973 x Kentas 54) x WG 2201 with C 306 (Table 1).

**Table 1. Parentage of different rust resistant derived lines of wheat**

| Derivative of C 306 | Parentage |
|---|---|
| WG 3727 | CPAN 1994 x C 306 |
| WG 3728 | CPAN 1874 x 3 C 306* |
| WG 3729 | [(Girija x C 306) x CPAN 1959] x 3 C 306* |
| WG 3730, WG 3731 | [(HW 109 x C 306) x CPAN 1959] x 3 C 306* |
| WG 3732 | [(PH 100 x C 306) x CPAN 1946] x 3 C 306* |
| WG 3734 | CPAN 1946 x C 306 |
| WG 3735, WG 3736 | CPAN 1962 x C 306 |
| WG 3737, WG 3738, WG 3739, WG 3740, WG 3741, WG 3742 | CPAN 1907 x 2 C 306* |
| WG 3744, WG 3745, WG 3746 WG 3747, WG 3748, WG 3749, WG 3750 | CPAN 1962 x 2 C 306* |
| WG 3752, WG 3753, WG 3754, WG 3755 | (Kentas 54 x WG 2201) x 2 C 306* |
| WG 3757, WG 3758, WG 3759 | (WG 357 x C 306) x CPAN 1961 |
| WG 3760 | (WG 357 x C 306) x CPAN 1959 |
| WG 3761, WG 3762 | (HW 658 xC 306) x PBW 54 |
| WG 3763, WG 3764, WG 3765 | [(PNC 306-1 x Raj 1973) x Kentas 54] x (3WG 2201 x 2 C 306)* |
| WG 3766, WG 3767, WG 3768, WG 3769, WG 3770, WG 3771, WG 3772, WG 3773 | (CPAN 1962 x C 306) x (CPAN 1973 x C 306) |
| WG 3774, WG 3775, WG 3776, WG 3777 WG 3778, WG 3779, WG 3780, WG 3782, WG 3783 | HW 547 x 2 C 306* |
| WG 3784, WG 3785 | (WG 2201 x C 306) x Kentas 54 |

*The numerals, 2, 3 indicate 2, 3 backcrosses with C 306, respectively.

Cultivar C 306 had 80S reaction to brown rust. All the progenies derived were resistant to yellow rust and only two progenies viz. WG 3730 and WG 3762 had traces of brown rust incidence (Table 2). The heading date of the new progenies ranged from –21 to +17 days

**Table 2. Reaction to yellow and brown rusts of different derived lines of wheat under field conditions at Gurdaspur**

| Variety | Yellow rust | | | Brown rust | | |
|---|---|---|---|---|---|---|
| | 1988-89 | 1989-90 | 1990-91 | 1988-89 | 1989-90 | 1990-91 |
| WG 3727 | F | F | F | F | F | F |
| WG 3762 | F | F | F | tR | F | F |
| WG 3771 | F | F | F | F | tR | tR |
| WG 3772 | F | F | F | F | F | F |
| WG 3773 | F | F | F | F | F | tR |
| WG 3774 | F | F | F | F | F | F |
| WG 3775 | F | F | F | F | F | F |
| WG 3776 | F | F | F | F | tR | F |
| PBW 175 | F | F | F | tR | F | 5S |
| C 306 | F | F | F | 80S | 80S | 80S |

from that of C 306. The average height of these progenies ranged from 99 to 145 cm. Twenty nine progenies in both the trials were significantly superior to C 306 in grain yield and sixteen among them were at par with the best check PBW 175, in grain yield. Eight progenies among them having bold and lustrous grains were retested at Gurdaspur during 1989-90 and 1990-91 for rust resistance and grain yield. It was observed that four progenies, viz. WG 3762, WG 3771, WG 3772 and WG 3773, gave good performance over the three years (Table 3). WG 3772 was consistently free from both yellow and brown rusts over three years. The other three varieties, however, showed traces reaction to brown rust either in one or the other year. These varieties should be tested in multi location trials under rainfed conditions for identifying the most suitable cultivar for such conditions.

**Table 3. Grain yield (q/ha) of promising wheat lines derived from different crosses involving cv C 306**

| Variety | Grain yield (q/ha) | | | |
|---|---|---|---|---|
| | 1988-89 | 1989-90 | 1990-91 | mean |
| WG 3727 | 36.6 | 18.5 | 21.2 | 25.4 |
| WG 3762 | 41.5 @ | 27.7 @ | 26.6 @ | 31.9 |
| WG 3771 | 43.8 @ | 26.9 @ | 27.2 @ | 32.6 |
| WG 3772 | 42.8 @ | 22.6 | 26.1 @ | 30.4 |
| WG 3773 | 40.7 @ | 17.4 | 26.6 @ | 28.2 |
| WG 3774 | 37.6 | 16.9 | 22.6 | 25.7 |
| WG 3775 | 41.7 @ | 19.0 | 22.0 | 27.6 |
| WG 3776 | 39.2 @ | 21.2 | 22.8 | 27.7 |
| PBW 175 | 46.2 @ | 15.8 | 31.5 | 31.2 |
| C 306 | 26.1 | 13.0 | 19.5 | 19.6 |
| LSD 0.05 | 7.5 | 4.1 | 5.9 | |

@Indicates varieties in the first top nonsignificant group.

## REFERENCES

1. K. S. Gill, B. S. Ghai and M. L. Gupta. 1972. Genetic and developmental analysis of hybrid necrosis in wheat. Indian J. Genet., **32**: 13–17.

2. M. Kochumadhavan, S. M. S. Tomar and P. N. N. Nambisan. 1980. Investigations on hybrid necrosis of wheat. Indian J. Genet., **40**: 496–502.

3. A. S. Randhawa. 1980. Hybrid necrosis and cross-compatibility in crosses with C 306 variety of wheat. Crop Improv., **7**: 74–76.

4. A. S. Randhawa, H. S. Dhaliwal and S. K. Sharma. 1983. Hybrid necrosis in wheat. Indian J. Genet., **43**: 370–373.