

FIELD RESISTANCE TO BROWN RUST OF WHEAT

V. P. KULSHRESTHA and D. S. RAWAT

Genetics Division, Indian Agricultural Research Institute, Delhi-12

(Accepted: 18-ii-70)

WITH the recent shift to improved agronomic practices and consequent change in micro-climate in crop stands, plant diseases are becoming increasingly important in India. These improved agronomic practices are favourable to both the host plant and obligate parasites such as the rusts. Many wheats produced in India in the past such as the wheats of the N.P. 700 and N.P. 800 series which were resistant at one time to rusts, have of late succumbed to new races of rusts (Swaminathan, Joshi, Rao and Dakshinamurthy, 1968). Under such circumstances incorporation of diverse genes for resistance into commercial varieties assumes special significance.

In this paper studies undertaken to find out diverse sources of field resistance to brown rust (*Puccinia recondita* Rob. ex. Desm.) among some of the resistant stocks being used by wheat breeders in India are reported.

MATERIALS AND METHODS

Eleven brown rust resistant exotics and two improved Indian varieties were used in the study.

F₂ seeds were dibbled at a distance of 4" in 8" wide beds in the fields of the Genetics Division, I.A.R.I. Infector rows consisting of a mixture of three highly rust susceptible varieties, Agra Local, *Motia* and *Kathia* were put around the experimental material. Field inoculations with prevalent Indian races of brown rust, 10, 11, 17, 20, 63, 77, 106, 107, 108 and 162 were made at boot-leaf stage through spraying and dusting on the lines as followed by Pal, Sikka and Rao (1956). A very high degree of infection was obtained by this method in the field. Intensity of infection and the type of reaction were recorded on the lines followed by other workers. (Pal *et al.*, 1956 and Rao, Ahire, Somayajulu and Basant Kumar, 1964). In all 13 crosses were studied.

RESULTS AND DISCUSSION

Data on the pattern of segregation for resistance and susceptibility in the F₂ of the 13 crosses are presented in Table 1. Crosses of E. 4871, E. 4717, E. 4771, E. 4894, E. 5000, and E. 5165 among themselves gave no susceptible segregates in F₂ indicating thereby that they carry identical genes for field resistance to

brown rust. The six varieties showing same genes for field resistance to brown rust, E. 4717, E. 4771, E. 4871, E. 4894, E. 5000 and E. 5165 appear to have derived their resistance from Mediterranean and Timestein.

Six exotic varieties (E. 4845, E. 4894, E. 5555, E. 5794, E. 5874 and E. 6203) when crossed with two Indian wheats showed segregation into resistant and susceptible classes in F_2 . This suggests that the varieties involved carry diverse genes for field resistance to brown rust in relation to N.P. 835 and N.P. 852.

TABLE 1

Segregation for field resistance and susceptibility in the F_2 of 13 crosses to brown rust

Cross	Resistant	Susceptible	Total
E. 5000 × E. 4871	330	—	330
E. 5000 × E. 4717	742	—	742
E. 4894 × E. 5000	289	—	289
E. 5165 × E. 5000	391	—	391
E. 4894 × E. 4871	283	—	283
E. 4771 × E. 4717	367	—	367
E. 5165 × E. 4717	296	—	296
E. 4845 × N.P. 852	62	124	186
E. 6203 × N.P. 852	158	126	284
E. 5874 × N.P. 852	193	144	337
E. 5794 × N.P. 835	82	52	134
E. 5555 × N.P. 852	106	126	232
N.P. 852 × E. 4894	244	34	278

The earlier studies conducted by Rao *et al.* (1964) using the varieties La Prevision (E. 928), Rio Negro (E. 952), Frondoso (E. 771), Frontiera (E. 957), Gabo (E. 569) and Kenya 338, A.C. 2.E.2 (E. 1951) indicated that La Prevision, Rio Negro, Frondoso and Frontiera carry identical genes for field resistance to Indian races of brown rust. Similarly Gabo and Kenya 338 A.C. 2.E.2 carry identical genes and these are different from those found in La Prevision and the other South American varieties mentioned above.

N.P. 835 which is a derivative of the cross Rio Negro × N.P. 760 evidently carries the field resistance of Rio Negro to brown rust. The work of Jain, Joshi and Rao (1962), Rao, Somayajulu and Ahire (1962) and Pokhriyal and Kohli (1962) indicated that the field resistance of Rio Negro is governed by two dominant complementary factors. N.P. 852 is a derivative of the cross Kenya 338 A.C. 2.E.2 × N.P. 761 and carries the field resistance of the former wheat to brown rust. Rao *et al.* (1962) found that the field resistance of this Kenya wheat to brown rust is governed by a single recessive gene which is also found in Gabo. From the studies reported in this paper it appear that the resistant

genes present in the varieties E. 4845, 4894, 5555, 5784, 5871 and 6203 are different from those carried by Rio Negro and Kenya 338 A.C.2.E.2.

SUMMARY

Diversity of genes for field resistance to Indian races of brown rust (*Puccinia recondita* Rob. ex Desm.) among thirteen resistant stocks was studied. Varieties Supremo-Mentana × Marquis × Renown² (E. 4717), Frontana-Maria Escobar × Gabo × Mayo 54 × Bonza (E. 4771), (Norin 10-B-17 × Y 53) Y 50), Kt 54 (E. 4871), Supremo-Mentana × Marquis-Renown² (E. 4894), II 50-17 × II 42-39 (E. 4000), and Cajeme 60 (E. 5165) were found to carry identical factors. Genes for resistance to brown rust in varieties Yaktana 54 × Norin 10-B-21 (E. 4845) and Supremo-Mentana × Marquis-Renown² (E. 5555) (E. 4894), K-340 × S/Mt-Gb × K-340-Fr-c-8038 (E. 5794), (II 50-18 × Norin 10-B-1) × -Y-54 (E. 5874) and Com-N/Mt+Fr (E. 6203) were found to be different from those carried by N.P. 852 and N.P. 835.

ACKNOWLEDGEMENTS

Authors express their gratitude to Dr. H. K. Jain, Head, Division of Genetics for providing facilities to conduct the studies and to Dr. M. V. Rao, Senior Geneticist, for kindly taking keen interest in the study and for critically going through the manuscript.

REFERENCES

- Jain, K. B. L. Joshi, A. B. and Rao, M. V. (1962). Inheritance studies in wheat XIII—Inheritance of field resistance of Rio Negro and Yaqui 53 to Brown rust of wheat. *Curr. Sci.*, **31**: 160–61.
- Pal, B. P., Sikka, S. M. and Rao, M. V. (1956). Inheritance studies in wheat. *Indian J. Genet.*, **16**: 32–46.
- Pokhriyal, S. C. and Kohli, S. P. (1962). Inheritance of field reaction to Brown rust and other characters in intervarietal crosses of *Triticum aestivum* L. *Indian J. Genet.*, **22**: 173–80.
- Rao, M. V., Ahire, S. G., Somayajulu, P. L. N. and Basant Kumar (1964). Diverse sources for field resistances to Indian races of brown rust of wheat. *Indian J. Genet.*, **24**: 51–5.
- Somayajulu, P. L. N. and Ahire, S. G. (1962). Inheritance of field resistance to some bread wheat varieties to Indian races of Brown rust. *Indian J. Genet.*, **22**: 114–17.
- Swaminathan, M. S., Joshi, L. M., Rao, M. V. and Dakshinamurthi, C. (1968). *The Rust Disease of Wheat. Res. Bull., Indian Agric. Res. Institute, Delhi-12.*