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RUST TOLERANCE IN WHEAT VARIETIES

K.S. RAGHUVANSHI, B.S.PATIL and H.S.PATIL
Agricultural Research Station
Niphad-422 303

ABSTRACT

Eight wheat varieties *viz.*, NI-5439, NI-747-19, NI-146, Sonalika, DWR-39, MACS-1967, C-306 and WH-147 were evaluated for their tolerance to both black and brown rusts. All the varieties except NI-5439 and Sonalika have shown reduction in yield due to higher rust intensity. These two varieties, despite suffering heavily form stem -and leaf rust infection under artificial epiphytotic condition of inoculation, suffered less so for as the grain yield is concerned. Thus these two varieties can be rated as tolerant.

KEY WORDS : Rust, Tolerance Mechanism, Wheat Varieties, Yield losses

Wheat is an important cereal crop of India, providing ample food calories and proteins to the Indian population. In Maharashtra State as a *rabi* cereal, it is next in importance to *rabi* jowar. The rust diseases (*Puccinia graminis tritici* Erikss and Henn and *P. recondita Reb.* ex. Desm.) is a serious problem on wheat. By observing the tolerance mechanism of wheat varieties it could be possible to search out rust tolerant varieties which will help in maximising the production of wheat. In view of this, the present investigation was carried out with eight different wheat varieties.

MATERIALS AND METHODS

The experimental material consists of eight wheat varieties *viz.*, NI-5439, NI 747-19, NI-146, Sonalika, DWR-39, MACS- 1967, C-306 and WH-147. These varieties were evaluated for rust tolerance during 1984-85 to 1987-88, in split plot design with three replications, with varieties as main treatment and protected and unprotected series of rust as sub-treatments. There were two subtreatments: (1) protected (H) with fortnightly spraying of mancozeb @ 0.3 per cent and (2) unprotected (D) which was artificially inoculated with the suspension of uredospore of black- and brown rust of wheat by adopting syringe and spraying method of inoculation. In protected plots, spraying of fungicide was undertaken on the onset of rust incidence. Besides efforts were undertaken to check the spread of rust over protected plots by sowing rust resistant varieties in between and around the protected series. Incidence of rust was recorded in unprotected series on randomly selected ten plants of each variety in each replication. The severity of both the rusts was recorded at weekly interval as per cent infection (Peterson *et al.*, 1984). At harvest, the yield data kg/net plot was recorded and the percentage loss in yield was calculated.

RESULTS AND DISCUSSION

The data on the incidence of black-and brown rust on eight wheat varieties for four years (pooled mean of protected series, Table 1) revealed that the differences in rusts incidence between varieties were significant. The variety WH-147 recorded the highest severity of balck rust (59.58%) and was on par with NI-747-19 (49.99 %), C- 306 (49.16%) and NI-5439 (47.49 %). The lowest severity of black rust was recorded by DWR-39 (25.5%). The variety NI-5439 recorded maximum severity of brown rust (28.83%). The varieties DWR-39 (13.08%) and NI-146 (14.16%) recorded minimum incidence of brown rust.

Pooled data of grain yield over four years (Table 2) revealed that the differences due to varieties and protected and unprotected series and their interaction were significant.

The protected series recorded significantly higher grain yield (27.50 q/ha) than those of unprotected one (23.73 q/ha), suggesting that the rust incidence caused significant losses in grain yield. Over protected and unprotected series, variety WH-147 recorded maximum grain yield (29.88 q/ha) and NI-146 recorded minimum grain yield (18.74 q/ha).

Varieties DWR-39 (6.37%) Sonalika (6.96 %) and NI-5439 (7.25%) suffered the minimum grain losses. However, Sonalika and NI-5439, inspite of maximum severity of rust incidence, recorded

Table 1. Intensity of black and brown rusts of wheat for four years

Varieties	Rust	1984-85	86-87	87-88	88-89	Mean
NI-5439	Black	20 S	90 S	43.33 S	36.66 S	47.49 S
		(26.56)	(71.56)	(41.15)	(37.23)	(44.12)
	Brown	11.66 S	20 S	17 S	66.66 S	28.83 S
		(20.00)	(26.96)	(24.35)	(54.76)	(31.41)
NI-747-19	Black	25 S	85 S	33.33 S	56.66 S	49.99 S
		(30.00)	(67.21)	(35.24)	(48.79)	(45.31)
	Brown	11.66 S	20 S	10 S	56.66 S	24.58 S
		(20.00)	(26.56)	(18.44)	(48.85)	(28.46)
NI-146	Black	16.66 S	60 S	23.33 S	50 S	37.49 S
		(24.04)	(50.77	(28.86)	(45.00)	(37.16)
	Brown	11.66 S	20 S	5 S	20 S	14.16 S
		(20.00)	(26.56)	(12.92)	(26.56)	(21.51)
Sonalika	Black	20.07 S	51.39 S	38.14 S	73.59 S	45.80 S
		(28.56)	(45.57)	(38.05)	(58.69)	(42.13)
	Brown	14.45 S	16.27 S	15.19 S	57.86 S	25.95 S
		(21.97)	(23.57)	(22.78)	(49.92)	(30.00)
DWR-39	Black	5 S	40 S	17 S	40 S	25 S
		(12.92)	(39.23)	(24.35)	(39.23)	(28.93)
	Brown	T S	10 S	2.33 S	40 S	13.08 S
		(5.74)	(18.44)	(8.72)	(39.23)	(18.03)
MACS-196	Black	21.66 S	55 S	20 S	56.66 S	38.33 S
		(27.69)	(47.87)	(26.96)	(48.79)	(37.72)
	Brown	11.66 S	15 S	3.66 S	23.33 S	15.66 S
		(20.00)	(12.79)	(11.09)	(28.86)	(20.68)
C-306	Black	6.66 S	90 S	26.66 S	73.33 S	49.16 S
		(14.89)	(71.56)	(31.05)	(58.89)	(44.99)
	Brown	5 S	20 S	2.33 S	80 S	26.83 S
		(12.92)	(26.56)	(8.72)	(63.44)	(27.91)
WH-147	Black	25 S	90 S	63.33 S	60 S	59.58 S
		(30.00)	(71.56)	(52.71)	(50.77)	(51.26)
	Brown	16.66 S	15 S	30 S	26.66 S	22.08 S
		(24.12)	(22.29)	(33.21)	(31.11)	(27.80)
			Black rust	Brown rust		
	SE ±		4.16	4.06		
	CD at 5%		12.24	11.95		

Figures in parantheses are arc sin transformed values.

Table 2. Grain yield (q/ha) and loss (%) in different wheat varieties

	NI 5439	NI 747-19	NI 146	Sonalika	DWR 39	MACS 1967	C-306	WH 147	Mean
Protected	29.76	29.07	20.56	29.03	29.52	25.70	22.60	33.37	27.50
Unprotected	27.60	24.55	16.93	27.01	27.64	22.83	19.91	26.39	23.73
Mean	28.68	26.81	18.74	28.02	28.58	24.26	21.25	29.88	
% loss	7.25	15.55	17.61	6.96	6.37	11.20	11.90	20.92	

	SE ±	CD at 5%
Varieties	1.49	4.42
Protected and Unprotected series	0.89	2.49
Interaction	2.03	5.64

higher grain yield, suggesting that these two varieties possess rust tolerance mechanism. Gaikwad and Bhate (1989) also reported the rust tolerance of Sonalika.

REFERENCES

GAIKWAD, A.P. and BHATE, S.B. (1989). Tolerance to stem *Puccinia graminis tritici* Erikss and Henn.) and leaf rust *Puccinia recondita* Rcb. ex. Desm.) of wheat. **J. Maharashtra agric. Univ., 14**: 98-99.

PETERSON, R.F., CAMPBELL., A.B. and HENNAH, A.R. (1984). A diagrammatic scale for estimating rust intensity on leaves and stems of cereals. **Canad. J. Res.,26**: 496-500

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ASSOCIATION AMONG YIELD COMPONENTS IN TOMATO

NARENDRA KUMAR and M.C. ARYA
Defence Agricultural Research Laboratory
Haldwani 263 139 (U.P.)

ABSTRACT

The present study was undertaken on 34 genotypes of tomato (*Lycopersicon esculentum* Mill) to furnish the information of the nature of association among different yield attributes and their direct and indirect contribution towards yield. The coefficient of variation was high for plant height, number of fruits per plant and yield per plant in 34 accessions of tomato. Number of fruits perplant showed high heritability. There was a positive and significant association between yield per plant and number of fruits per plant. Path co-efficient analysis revealed that the direct effects via number of primary branches per plant, number of fruit clusters per plant and number of fruits per plant were positive but for number of primary branches per plant was of low magnitude. Hence it would be worth laying stress on number of fruit clusters per plant and number of fruits per plant while formulating selection programme in tomato.

KEY WORDS : Tomato, Yield Components

Fruit yield is a complex trait and is the sum total of a number of components. Therefore, improvement in components may be an effective way to improve yield. The relative contribution of different characters towards yield must be estimated. Information on the genotypic and phenotypic associations among various yield attributes and their direct and indirect effect on yield in tomato (*Lycopersicon esculentum* Mill) with particular reference to hilly conditions are very few. Hence, a study was conducted to gain a better understanding of nature of association between yield and yield contributing characters in tomato using the techniques of correlation as well as path analysis.

MATERIALS AND METHODS

An experiment was conducted with 34 indigenous and exotic genotypes of tomato at the Defence Agricultural Research Laboratory field station, Pithoragarh with three replications in the *kharif* season of 1985-86. Each entry was sown in a plot of 3 rows, each 3 m long. The plant to plant and row to row distance was 50 cms. On 10 random plants, data were collected on individual plant basis for plant height, primary branches per plant, number of fruit clusters per plant, number of fruits per cluster, number of fruits per plant, number of fruits per kilogram and yield per plant. The genotypic and phenotypic correlations were calculated. Path coefficient were calculated as suggested by Dewey and Lu (1959).

RESULTS AND DISCUSSION

There was a wide range of genetic variability for various morphological and quantitative attributes (Table 1). The coefficient of variation was high at genotypic and phenotypic levels for plant height, number of fruits per plant, number of fruit clusters per plant, and yield per plant, but number of primary branches and number of fruits per cluster had low coefficient of variability at both genotypic and phenotypic levels, Heritability was high for number of fruits per plant as suggested by Singh *et al.* (1974), Johnson and Hernandez (1980) and Khalil *et al.* (1986).

Result on correlation coefficient at the phenotypic and genotypic levels, are presented in Table 2. A perusal of the data indicates that in general the estimates of genotypic correlation coefficient were slightly higher than the corresponding phenotypic level. This suggests that inspite of being strong inherent association between the character pairs their expression is reduced