

## Variability studies in wheat

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### ABSTRACT

The genetic variability heritability and genetic advance were studied in twenty seven wheat genotypes (*Triticum aestivum* L.em Thell) for important yield attributing characters viz. days to heading, days to maturity, height of the plant, number of tillers per plant, biological yield, ear length, grains per ear, 100 grain weight and grain yield per plant. High coefficient of variability was obtained for biological yield, tillers per plant, seed weight per plant, grains per ear and harvest index. All these traits exhibited high heritability coupled with high genetic advance and genetic variability indicating that lines evaluated may generate transgressive segregants, if included in hybridization programme.

**Key words :** Wheat, Genotypes, Genetic variability.

### INTRODUCTION

Wheat is the most important cereal crop in Global Agricultural Economy. Improvement of crop depends upon the magnitude of genetic variability of economic characters. Brown (1966) explained genetic diversity as the amount of genetic variability among individuals of a variety, population or species. Therefore, the measurement, evaluation and manipulation of genetic variability in desired direction becomes extremely important in any yield improvement programme.

### MATERIALS AND METHODS

Experimental material comprised of 27 wheat genotypes selected from indigenous and exotic sources. Randomised block design with three replications was utilized for growing the crop. Each line was planted in one metre single row plots with 46 cm. spacing between the rows. The plant to plant distance was maintained at 10 cm. The experiment was conducted under high fertility. (120 KgN, 60 KgP<sub>0</sub> and 40Kg K O per ha) and irrigated conditions. Observations were recorded on five randomly selected plants of genotypes per replication for ten different characters viz Days to heading, Days to maturity, Height of the plant (cm), Number of tillers per plant, Biological Yield, Ear length, Grains per ear, 100 Grain weight and Grain yield per plant. Analysis of variance was carried out. The Phenotypic and genotypic Co-efficients of variation, heritability, and genetic advance were worked out by making use of the appropriate formula (Johnson et al. 1955)

### RESULTS AND DISCUSSION

Analysis of variance indicated that genotypic means differ significantly for all the ten characters. Maximum Grains per ear was recorded for the genotype YCN35 (76.67) followed by HW2033/UP 2382 (71.88) and minimum for the genotype CPAN 3050/PBW 343 (48.90). Ear length was found maximum for HDR 134/RAJ 3765 (13.87 Cm) and minimum for WH 542 (9.98cm) Days to heading ranged from 84.33 days (HW 2033) to 94.67. Days (WH 542). Days to maturity ranged from 120 (WR180) to 128.33 for

(YCN 35). Highest plant type was observed in HDR 134 (90.84 Cm) and shortest in WH 542 (70.48 cm). Tillers per plant ranged from 12.07 (WR 180) to 20.68 (Raj 3765). Maximum Biological yield was obtained in the case of HDR 134 (115.67 gm) Hundred grain weight ranged from 3.37 gm (UP2363) to 4.52 in the case of PBW 343. Seed weight per plant ranged from 20.36 gm in the case of DL 802-3/PBW 335 to 40.02 gm in HDR 134/ Raj 3765. Highest harvest index was obtained in WR 180/PBW 343 (43.42) and lowest (27.33) in CPAN 3077. Joshi et al (1982) reported wide range of variability for plant height peduncle length, flag leaf area and grain yield per plant in 30 varieties of wheat.

High Genotypic Co-efficient of variation was observed in the case of seed weight per plant, Biological yield and Harvest index, This is in accordance with Singh et al (1970) and Jain and Aulakh. (1971).

Genetic variability, heritability and genetic advance are of great importance in improving the yield of a genotype (Verma et al 2000). With the help of GCV alone it may not be feasible to determine the amount of heritable variation and the relative degree to which a character is transmitted from parent to off spring is indicated by the estimate of heritability. Heritability estimates along with genetic advance are normally helpful in predicting the gain under selection than heritability estimate alone. Hence both heritability and genetic advance were determined to get a clear picture of the scope of improvement in various characters through selection. High heritability combined with high genetic advance is desirable for the selection based genetic improvement of a character (Johnson et al, 1955). The present results gave high estimates of heritability for biological yield, seed weight per plant and harvest index. Moderate heritability was observed for days to maturity and plant height. Low heritability was observed for 100 grain weight, tillers per plant and days to heading. The highest genetic advance was obtained for the character Biological yield (19.27%) followed by Seed weight per plant (5.27percent) Harvest index (3.89percent) Days of maturity (3.63 percent), Grains per ear (1.81 percent), Days of heading (1.26 percent)

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Table 1 : Range, Mean, Co-efficients of variation, heritability and Genetic advance of ten characters studied in Wheat

| Character                | Range          | General Mean x | Co-efficients of Genotypic | Variation (%) Phenotypic | Heritability | Genetic Advance % |
|--------------------------|----------------|----------------|----------------------------|--------------------------|--------------|-------------------|
| 1. Days of heading       | 84.33 – 94.67  | 89.23          | 1.87                       | 5.15                     | 13.31        | 1.26              |
| 2..Days of maturity      | 120 – 128.33   | 123.38         | 1.83                       | 2.35                     | 60.99        | 3.63              |
| 3. Plant Height          | 70.48 – 90.84  | 80.12          | 2.56                       | 12.25                    | 43.69        | 0.42              |
| 4. Tillers per plant     | 12.07 – 20.68  | 16.10          | 8.50                       | 25.91                    | 10.78        | 0.44              |
| 5. Biological yield      | 48.00 – 115.67 | 76.38          | 25.92                      | 26.64                    | 94.71        | 19.27             |
| 6. Ear length (cm)       | 9.98 – 13.87   | 11.73          | 6.16                       | 9.93                     | 38.53        | 0.43              |
| 7. Grains per ear        | 48.90 – 78.76  | 63.56          | 6.64                       | 15.42                    | 18.56        | 1.81              |
| 8. 100 grain weight      | 3.37 – 4.58    | 3.98           | 4.27                       | 13.35                    | 10.26        | 0.03              |
| 9. Seed weight per plant | 20.36 – 40.2   | 26.91          | 20.44                      | 21.29                    | 92.21        | 5.27              |
| 10. Harvest index        | 27.33 – 43.33  | 35.70          | 12.82                      | 15.11                    | 72.06        | 3.89              |

Table 2: Mean performance of the genotypes for yield attributing characters

| S. No. | Designation of lines | Days to Heading | Days to Maturity | Plant height (cm) | Tillers per plant | Biological yield | Ear length (cm) | Grains per ear | 100 grain weight | Seed Weight per plant | Harvest index |
|--------|----------------------|-----------------|------------------|-------------------|-------------------|------------------|-----------------|----------------|------------------|-----------------------|---------------|
| 1      | 2                    | 3               | 4                | 5                 | 6                 | 7                | 8               | 9              | 10               | 11                    | 12            |
| 1.     | UP 2338              | 91.66           | 128.00           | 74.40             | 14.40             | 78.00            | 12.50           | 72.26          | 4.02             | 27.65                 | 35.66         |
| 2.     | PBW 335              | 86.33           | 125.00           | 79.33             | 19.51             | 88.88            | 11.86           | 71.15          | 3.78             | 31.23                 | 35.00         |
| 3.     | HDR 134/Raj 3765     | 86.67           | 123.67           | 87.20             | 20.00             | 109.89           | 13.87           | 57.17          | 4.36             | 40.02                 | 36.33         |
| 4.     | UP 2405              | 93.33           | 123.67           | 76.27             | 17.67             | 98.00            | 12.61           | 68.53          | 3.66             | 27.85                 | 28.33         |
| 5.     | PBW 343              | 88.67           | 122.00           | 80.04             | 14.40             | 74.33            | 12.44           | 54.17          | 4.52             | 28.58                 | 38.00         |
| 6.     | DL802-3/PBW 335      | 86.33           | 123.67           | 86.60             | 15.70             | 73.33            | 11.13           | 65.12          | 3.83             | 20.36                 | 27.67         |
| 7.     | HW2033/UP2382        | 85.33           | 124.00           | 74.13             | 18.08             | 74.58            | 12.38           | 71.88          | 3.86             | 27.54                 | 36.67         |
| 8.     | PBW 382/WH542        | 89.00           | 124.67           | 84.47             | 17.07             | 102.00           | 11.52           | 67.87          | 4.43             | 33.56                 | 32.33         |
| 9.     | PBW 382              | 88.00           | 123.67           | 80.00             | 20.40             | 95.67            | 11.63           | 67.47          | 4.05             | 32.49                 | 33.33         |
| 10     | Raj 3765             | 93.00           | 127.67           | 88.40             | 20.68             | 113.33           | 12.91           | 57.20          | 4.36             | 36.70                 | 32.00         |
| 11     | HDR 134              | 88.67           | 127.00           | 90.84             | 20.17             | 115.67           | 11.59           | 60.07          | 4.01             | 38.92                 | 33.67         |
| 12     | CPAN 1946            | 92.00           | 126.67           | 82.80             | 18.07             | 87.33            | 10.52           | 70.07          | 3.86             | 24.73                 | 28.00         |
| 13     | YCN 35               | 94.00           | 128.00           | 75.30             | 17.13             | 82.33            | 12.94           | 76.67          | 3.73             | 28.44                 | 34.00         |
| 14     | CPAN3077/UP2338      | 93.66           | 120.67           | 76.23             | 13.70             | 59.08            | 11.23           | 61.11          | 3.99             | 24.34                 | 40.67         |
| 15     | CPAN 3050/PBW 343    | 86.33           | 120.33           | 82.18             | 13.60             | 59.00            | 12.80           | 48.90          | 4.30             | 22.80                 | 38.00         |
| 16     | WR 180               | 86.00           | 120.00           | 85.93             | 12.07             | 50.67            | 11.77           | 60.73          | 4.02             | 22.02                 | 43.00         |
| 17     | HW 2033              | 84.33           | 120.00           | 82.80             | 14.33             | 58.00            | 11.56           | 57.20          | 4.04             | 21.36                 | 36.33         |
| 18     | UP 2363              | 89.00           | 122.33           | 73.40             | 13.47             | 56.33            | 11.86           | 69.02          | 3.37             | 21.78                 | 38.33         |
| 19     | YCN35/UP2363         | 91.33           | 122.00           | 73.15             | 14.10             | 69.16            | 11.30           | 66.97          | 3.57             | 23.62                 | 33.67         |
| 20     | UP2405/WH542         | 90.33           | 121.67           | 80.67             | 14.73             | 70.00            | 11.75           | 66.87          | 4.15             | 27.84                 | 39.33         |
| 21     | CPAN 1946/Raj3765    | 86.33           | 121.00           | 84.87             | 14.60             | 86.67            | 11.75           | 53.93          | 4.12             | 25.63                 | 29.33         |
| 22     | CPAN 3050            | 88.33           | 121.00           | 80.20             | 12.87             | 50.67            | 11.00           | 62.07          | 3.66             | 21.13                 | 41.33         |
| 23     | UP 2382              | 86.00           | 121.00           | 79.47             | 12.30             | 52.47            | 10.82           | 62.65          | 4.05             | 20.95                 | 39.67         |
| 24     | WR180/PBW343         | 88.67           | 122.33           | 84.27             | 15.40             | 65.67            | 12.05           | 64.75          | 4.10             | 28.42                 | 43.42         |
| 25     | DL 802-3             | 89.67           | 124.67           | 77.33             | 14.33             | 48.00            | 10.83           | 57.20          | 3.97             | 21.11                 | 43.33         |
| 26     | WH 542               | 94.67           | 124.00           | 70.48             | 18.18             | 63.67            | 9.98            | 65.93          | 3.87             | 25.45                 | 39.67         |
| 27     | CPAN 3077            | 91.66           | 122.33           | 72.67             | 17.67             | 79.67            | 10.23           | 59.33          | 3.71             | 22.02                 | 27.33         |

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