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# Genetic Variability and Heritability Studies in Two-Rowed Barley (*Hordeum Vulgare* L.)

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***Abstract:** The field experiment was carried out in randomized block design with three replications. Twenty eight $F_1$'s alongwith their 8 parents were evaluated at the instructional farm, AICW & BIP, College of Agriculture, Rewa (M.P.) during Rabi 2016-17. Twenty eight cross combinations obtained from 8 parental diallel were chosen for this study on the basis of their yield potential and agronomical traits. Parents and $F_1$'s were shown in two rows each, respectively in 4.0 m. row length with keeping 23 cm. The extent of phenotypic coefficient of variation (PCV) was found greater than genotypic coefficient of variation (GCV) for all the ten characters. Higher magnitude of PCV were recorded for the traits viz. spike weight (20.14), number of grain/spike (21.60), grain weight/spike (21.92) and grain yield per plant (20.29). While, lowest PCV was observed for days to 50% flowering (7.88) and biological yield/plant (7.55). In case of GCV highest value was recorded for the traits like number of grains/spike (20.93) and grain weight/spike (20.28).*

***Keywords:** Variability, heritability, GCV, PCV.*

## I. INTRODUCTION

Barley (*Hordeum vulagare* L.) is an important cereal crop grown in northern plains of India and belongs to the family Poaceae. This crop has occupied wide geographic area than any other crop species (Paulitz and Steffeson, 2011). Barely has potential to be grown under drought and saline condition. It is a key ingredient in beer and whisky production. Malting barley is usually lower protein which shows more uniform germination, needs shorter steeping, and has less protein in the extract that can make beer cloudy. The plant breeders now have recognized the importance of utilizing genetic variability and diversity in breeding programmes to meet the continuously expanding needs of hybrid and varietal improvement. In Barley observed variability is a combined estimate of genetic and environmental causes, of which only the former one is heritable. However, estimates of heritability alone do not provide an idea about the expected gain in the next generation, but have to be considered in conjuction with estimates of genetic variability, the change in mean value among successive generations ( Shukla et al., 2006). The systematic breeding programme involves the steps like creating genetic variability practicing selection and utilization of selected genotypes to evolve promising varieties. Genetic improvement of crop is largely depending on the magnitude of genetic variability and the extent to which desirable traits are heritable. A major factor limiting the rate of progress in plant breeding has low heritability of quantitative traits such as yield. The most important function of the heritability in the genetic study is the predictive role to indicate the reliability of the phenotypic values as a guide to breeding value.

## II. MATERIAL AND METHODS

The proposed study was carried out at Instructional Farm JNKVV, College of Agriculture, Rewa. The experimental material comprised with 28 F1s along with their F2 populations and parents were evaluated in a randomized block design with 3 replications during winter season of 2016-17. Each genotype was grown in paired row of 4 m. Long, along with rows and plants spacing of 23 cm and 6 cm respectively. Recommended cultural practices were adopted during crop growth period for better phenotypic expression of the characters. Ten healthy vigorous plants in the parents and $F_1$s progenies were selected randomly for recording observation on 10 characters, namely: days to 50% flowering, plant height, tillers per plant, spike weight, spike length, number of grain/spike, grain weight/spike, 1000 grain weight, biological yield/plant and grain yield/plant. Heritabilty in broad sense ($h^2b$) may be defined as the proportion of genotypic variance to phenotypic variance.

Table 1. ANOVA for grain yield and its components in two – rowed barley

| Mean sum of squares | df | Days to 50% flowering | Plant height (cm) | Number of tillers per plant | Spike weight (g) | Spike length (cm) | Number of grains per spike | Grain weight / spike (g) | 1000-grain weight (g) | Biological yield per plant (g) | Grain yield per plant(g) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Replication | 2 | 15.04 | 13.82 | 0.20 | 0.62 | 0.06 | 0.32 | 0.05 | 1.13 | 18.79 | 1.97 |
| Treatments | 35 | 76.54** | 242.45** | 7.27** | 0.50** | 6.14** | 125.88** | 0.22* | 24.03** | 146.29** | 24.23** |
| Error | 70 | 7.24 | 17.42 | 1.56 | 0.23 | 2.29 | 2.68 | 0.13 | 5.04 | 7.79 | 1.99 |

***, **** Significant at 5% and 1% level of probability, respectively.

## III. RESULT AND DISCUSSION

The analysis of variance revealed highly significant differences for all the characters under study among the genotypes, indicating that the parents included in this investigation exhibited sufficient variability for all the characters studied. The characters possessed high genotypic coefficients of variation value have better scope of improvement through selection. The influence of environment on the expression of traits could be determined on the basis of differences between phenotypic coefficient of variation and genotypic coefficient of variation.

Highest value of GCV & PCV was observed for the number of grains/spike and grain weight/spike indicating availability of sufficient variability and thus exhibited scope for genetic improvement through selection for all these traits. The results are in agreement with the finding of Singh et al. (2008), Sharma and Maloo (1994); Singh (2011) and Jalata et al. (2011) were also recorded significant variations for above characters in barley.

Maximum differences between GCV and PCV was recorded for the number of tillers per plant, spike weight and 1000- grain weight. It indicated that these traits were highly influenced by environmental fluctuation if such traits chosen as per mean performance for varietal improvement might be miss-leading. GCV and PCV alone are not helpful in determining the heritable portion of variation (Falconer 1960).

The proportion of genetic variability which is transmitted from parents to offspring is reflected by heritability (Lush 1949). In this context, the high estimates of heritability (broad sense) were recorded for days to 50% flowering, plant height, number of grains/spike and grain weight/spike. High heritability indicated that the characters were less influenced by the environment and it suggested that the selection of such traits will be more effective. According to Panse and Sukhatme (1952) such characters are governed predominantly by additive gene action and could be improved through individual plant selection. Whereas, low heritability observed for the traits viz., spike weight and 1000- grain weight. Which indicated that these characters were highly influenced by environmental effect and genetic improvement through selection will be difficult due to effect of environment.

In the present study high estimate of heritability coupled with high magnitude of genetic advance as percent of mean manifested by the Characters viz., number of grains/spike, grain weight/spike and grain yield per plant. Possessing high heritability alongwith high genetic advance will be valuable in the selection programme. Similar kinds of results also reported by Al-Tabbal and Al-Fraihat (2012) and Akanksha et al. (2012).

Table 1. Estimates of genetic parameters for grain yield and its components in two – rowed barley

| S.No | Characters | Mean | Range | | GCV | PCV | $h^2$ (bs) | GA as % of mean |
|---|---|---|---|---|---|---|---|---|
| | | | Min. | Max. | | | | |
| 1 | Days to 50% flowering | 69.89 | 59.47 | 80.97 | 6.88 | 7.88 | 76.13 | 12.36 |
| 2 | Plant height (cm) | 80.47 | 61.73 | 101.13 | 10.76 | 11.95 | 81.16 | 19.97 |
| 3 | Tillers per plant | 9.43 | 6.40 | 12.20 | 14.63 | 19.74 | 54.88 | 22.32 |
| 4 | Spike weight (g) | 2.97 | 2.10 | 4.01 | 10.66 | 20.14 | 28.03 | 11.63 |
| 5 | Spike length (cm) | 16.97 | 13.33 | 19.73 | 6.68 | 11.14 | 35.92 | 8.24 |
| 6 | Number of grain/spike | 30.62 | 14.00 | 41.67 | 20.93 | 21.60 | 93.87 | 41.77 |
| 7 | Grain weight/spike (g) | 1.39 | 0.64 | 2.36 | 20.28 | 21.92 | 85.56 | 38.64 |
| 8 | 1000- grain weight (g) | 44.68 | 40.30 | 51.27 | 7.46 | 17.26 | 18.70 | 6.65 |
| 9 | Biological yield/plant (g) | 33.50 | 24.73 | 46.70 | 5.63 | 7.55 | 55.69 | 8.66 |
| 10 | Grain yield/plant (g) | 15.11 | 10.80 | 22.33 | 18.02 | 20.29 | 78.86 | 32.96 |

Over all it is concluded that Highest value of GCV and PCV was observed for the number of grains/spike, grain weight/spike indicating availability of sufficient variability and thus, exhibited scope for genetic improvement through selection for all these traits.

GCV and PCV alone are not always helpful in determining the heritable portion of variation. The proportion of genetic variability which is transmitted from parent to offspring is reflected by heritability high. Heritability for days to 50% flowering, plant height, number of grain/spike and grain weight/spike indicated that the characters were less influenced by the environment and it suggested that the selection of such traits will be more effective. Possessing high heritability along with high genetic advance will be valuable in the selection program viz., grain weight/spike showing high heritability and number of grains/spike showing high genetic advance.

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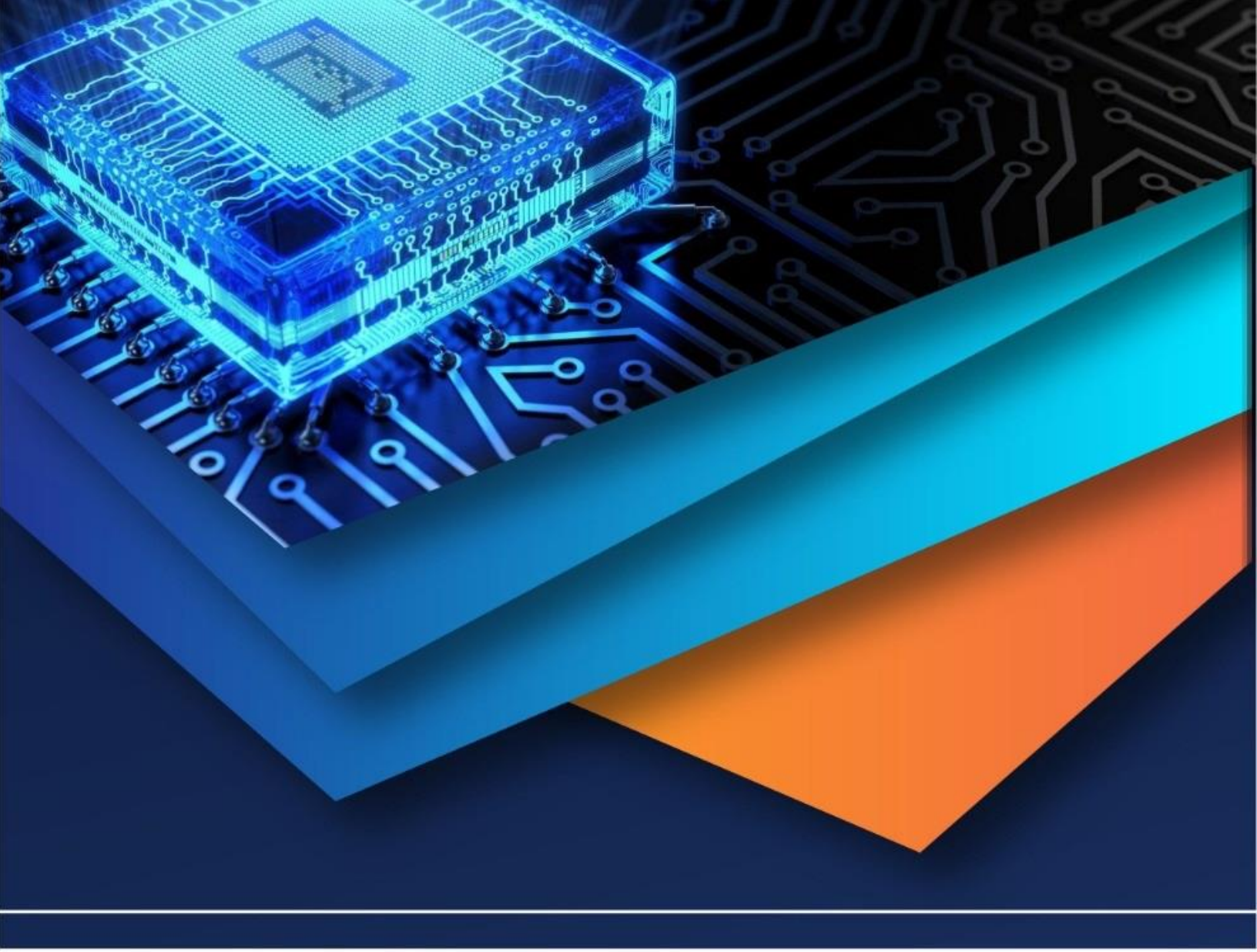

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