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Research Note

Appraisal of genetic variability for different quantitative traits in *kharif* maize (*Zea mays* L.) genotypes

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Abstract

The present study was conducted at AKS University, Satna (M.P.) during *kharif* 2019-20. Altogether 25 maize genotypes were grown under RBD design with three replications. In this study various parameters of genetic variability, broad sense heritability and genetic advance estimated in inbred line of maize. Analysis of variance revealed that the mean sum of square showed significant due to genotypes for all the 17 characters studied. High GCV and PCV were recorded for seed yield per plant, seed yield per cob, cob ear weight and shelling %. Traits seed yield per plant, seed yield per cob, total seeds per cob, cob year weight and shelling % were showed high heritability accompanied with high genetic advance which indicated that most likely the heritability due to additive gene effects and selection may be effective in the early generation for these traits. Whereas high to moderate heritability along with low estimates of genetic advance which indicates that non additive gene effects. The genotypes which shows non additive gene effects will not be consider for further breeding programme.

Keywords

Maize, Heritability, Genetic advance, GCV and PCV

Maize (*Zea mays* L.) is grown throughout the year in India. It is predominantly a Kharif crop with 85% of area under cultivation in the season. Maize is the third most important cereal crop in India after rice and wheat. It is mainly produced in temperate region of the western hemisphere and China, Brazil and several countries in Europe etc. Its production is mainly dominated by top five countries viz. USA, China, Brazil, Mexico and Argentina accounts mainly 75% of the world production (Kumar *et al.* 2014). Its highest yield were obtained in industrialized countries such as France and United States (both 9.5T/ha), Canada (8.5 T/ha), Argentina (7.5 T/ha) where the production is highly mechanized and based on well developed crop cultivars, seed selection and adequate inputs along with soil conditions (FAO Stat 2012).

Maize is the only species in the genus *Zea* has its diploid chromosome number $2n=20$. The success of the crop improvement or breeding programme depends upon the selection of suitable parents, although knowledge of genetic variability, heritability and type of gene action is very essential. In addition characters upon which the

selection of parent is based should be known. Relatively higher estimates of genotype coefficient of variation for seed yield per plant, seed yield per cob, total seed per cob and cob ear weight along with high heritability suggests that selection can be effective for these traits. Keeping this in view the present study were under taken to study the genetic parameter of selected genotypes of maize the nature and magnitude of genetic variability.

The experimental materials comprising of twenty five maize inbred lines were grown in a randomized block design with three replications at the horticultural research farm of Department of Genetics and Plant Breeding, Faculty of Agriculture Science and Technology, AKS university, Satna, M.P. during *kharif* 2019. Each plot consisted of two row plot of 2m length with a spacing of 70 cm X 45 cm were 2 seed per hill were dropped manually later on plant per hill was maintained after thinning. Recommended dose of fertilizers (NPK – 120:60:40 Kg/Ha) were applied for raising healthy and uniform crops. The data was collected for some morphological traits like Days to 50% tasseling, Days to 50% silking, Plant height, Leaf per plant, Cob per

plant, Days to 50% maturity, Biological yield per plant, Cob ear weight, cob length, rows per cob, seed per rows, Total seed per cob, 100 seed weight, seed yield per cob, Seed yield per plant, Shelling % and Harvest Index were taken from five randomly selected plants from middle row of each entry in each replication were subject to analysis of variance as suggested by **Panse and Sukhatme (1967)**. The variability present in the genotypes was estimated by phenotypic and genotypic variance and coefficient of variability using the procedure suggested by **Burton and Devane (1953)**.

Analysis of variance revealed significant differences for all the 17 quantitative traits studied which was presented in Table 1. High estimates of GCV and PCV were recorded for seed yield per plant (32.29 & 32.27), seed yield per cob (32.26 & 32.34), shelling % (24.06 & 24.55), cob ear weight (23.95 & 24.22) and Biological yield per plant (23.33 & 24.00) as presented in Table 2. suggesting sufficient variability and offers selection. Similar result was reported by Tripathi *et al.* (2017), Praveen Kumar *et al.* (2014), Rajesh *et al.* (2013) and Zahid *et al.* (2004).

Heritability was found to be highest for seed yield per plant (100%) followed by seed yield per cob (99%), total seed per cob (99%), cob ear weight (98%) and shelling % (96%) presented in table 2. High value of heritability in the broad sense indicates character is less influenced by environmental effect. Similar result was reported by Rajesh *et al.* (2008), Zahid *et al.* (2004) and Chen *et al.* (1996).

Heritability and genetic advance are the important selection parameters. Heritability estimates along with genetic advance are normally more helpful in predicting the grain under selection than heritability estimates alone. Hence knowledge about genetic advance coupled with heritability is most useful. Character exhibiting high heritability may not necessarily give high genetic advance. High heritability should be accompanied with high genetic advance to arrive more reliable conclusion. Expected genetic advance as percent of mean indicates the mode of gene action in the expression of a trait, which helps in choosing an appropriate breeding method. High heritability with high estimates of genetic advance was

Table 1. Analysis of variance for 17 different quantitative traits in 25 genotypes of maize.

| S.No | Characters | Mean sum of squares | | |
|------|------------------------------------|-----------------------|-----------------------|------------------|
| | | Replications (d.f.=2) | Treatments (d.f.= 24) | Error (d.f.= 48) |
| 1 | Days to 50 % Tasseling | 14.44 | 142.47 | 40.55 |
| 2 | Days to 50 % Silking | 11.85 | 156.78 | 21.38 |
| 3 | Plant Height (c.m.) | 104.13 | 1145.76 | 66.20 |
| 4 | Leaf Per Plant | 2.36 | 2.71 | 1.03 |
| 5 | Cobs Per Plant. | 0.04 | 0.07 | 0.04 |
| 6 | Days to 50 % Maturity. | 6.24 | 216.41 | 42.03 |
| 7 | Biological Yield Per Plant. (gram) | 222.62 | 16389.61 | 313.51 |
| 8 | Cob Ear Weight. | 5.49 | 3320.98 | 25.01 |
| 9 | Cob Length (c.m.) | 3.00 | 5.01 | 2.65 |
| 10 | Rows Per Cob. | 2.10 | 3.74 | 1.13 |
| 11 | Seeds Per Row. | 6.08 | 27.45 | 10.03 |
| 12 | Total Seeds Per Cob. | 9.16 | 14848.49 | 31.01 |
| 13 | 100 Seed Weight. (gram) | 2.96 | 82.79 | 3.52 |
| 14 | Seed yield Per Cob. (g) | 2.78 | 3236.99 | 12.26 |
| 15 | Seed yield Per Plant. | 0.27 | 3242.88 | 5.413 |
| 16 | Shelling % | 0.07 | 964.74 | 13.12 |
| 17 | Harvest Index. | 3.25 | 150.30 | 6.83 |

observed for seed yield per plant, seed yield per cob, total seeds per cob. High heritability with moderate estimate of genetic advance was observed for 100 seed weight, Days to 50% tasseling, Days to 50% silking. High to moderate heritability along with low estimates of genetic advance were observed for cob length, No. of row per cob, seeds per row, leaf per plant presented in table 2.

High heritability accompanied with high to moderate GCV and genetic advance in case of seed yield per plant, seed yield per cob, shelling%, total seeds per cob, cob ear

weight indicates that most likely the heritability is due to an additive gene effect and selection may be effective in the early generation for these characters. Whereas no. of rows per cob, cob length, leaf per plant and seed per row exhibited moderate to low heritability along with low GCV and PCV. Cob length, row per cob, seed per row, leaf per plant exhibited moderate to low heritability along with low genetic advance which indicates that non additive gene action and provides limited scope for improvement and through breeding programme. Similar results were reported by Praveen Kumar *et al.* (2014), Zahid (2004), Thanga Hemavathy *et al.* (2008) Ansuman *et al.* (2013).

Table 2. Genetic parameters for 17 biometrical characters of 25 maize genotypes

| S.No | Characters | Genotypic Coefficient of variation (GCV) | Phenotypic coefficient of variation (PCV) | Heritability (%) (broad sense) (h^2) | Genetic advance (GA) | Genetic advance as % of mean |
|------|------------------------------------|--|---|--|----------------------|------------------------------|
| 1 | Days to 50 % Tasseling | 9.64 | 14.27 | 0.46 | 10.39 | 17.18 |
| 2 | Days to 50 % Silking | 10.75 | 13.05 | 0.68 | 14.61 | 23.37 |
| 3 | Plant Height (c.m.) | 9.41 | 10.24 | 0.84 | 46.02 | 22.84 |
| 4 | Leaf Per Plant | 6.17 | 10.41 | 0.35 | 1.17 | 9.65 |
| 5 | Cobs Per Plant. | 8.33 | 18.84 | 0.20 | 0.12 | 9.73 |
| 6 | Days to 50 % Maturity. | 7.39 | 9.70 | 0.58 | 15.33 | 14.86 |
| 7 | Biological Yield Per Plant. (gram) | 23.33 | 24.00 | 0.94 | 187.84 | 59.86 |
| 8 | Cob Ear Weight. | 23.95 | 24.22 | 0.98 | 86.53 | 62.51 |
| 9 | Cob Length (c.m.) | 3.55 | 7.43 | 0.23 | 1.12 | 4.48 |
| 10 | Rows Per Cob. | 6.95 | 10.54 | 0.43 | 1.63 | 12.09 |
| 11 | Seeds Per Row. | 7.90 | 13.06 | 0.37 | 3.85 | 12.63 |
| 12 | Total Seeds Per Cob. | 19.48 | 19.54 | 0.99 | 184.96 | 51.27 |
| 13 | 100 Seed Weight. (gram) | 18.34 | 19.52 | 0.88 | 12.75 | 45.48 |
| 14 | Seed Yield Per Cob. (g) | 32.16 | 32.34 | 0.99 | 86.07 | 84.42 |
| 15 | Seed Yield Per Plant. | 32.29 | 32.37 | 1.00 | 86.51 | 85.04 |
| 16 | Shelling % | 24.06 | 24.55 | 0.96 | 46.08 | 62.25 |
| 17 | Harvest Index. | 21.24 | 22.70 | 0.87 | 17.08 | 52.44 |

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