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Genetic Variability for Yield Parameters in Local Maize (*Zea mays* L.) Genotypes of Nagaland

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A B S T R A C T

Twenty local maize germplasm collected from various parts of Nagaland along with a check variety was laid in randomized block design with two replications in the research farm of School of agricultural research and rural development, Nagaland University, Medziphema during *kharif* 2019 to determine the variability present amongst the genotypes. The results showed significant differences for all characters studied except for number of ears per plant. Many genotypes showed better performance than the check variety. PCV values were higher than the GCV values for all characters. High heritability with high genetic advance was observed for 100 seed weight, ear height and plant height.

Introduction

Maize (*Zea mays L.)* is an important crop cultivated in many countries under varied environmental conditions and can be grown throughout the year. It is most commonly known as "Corn" and is also dubbed as the 'Queen of cereals' and 'Miracle crop'. Morphologically maize exhibits greater diversity of phenotypes than any other grain crop (Kuleshov, 1933).

Maize is primarily cultivated for food, poultry feed, animal feed, industrial and also brewery purposes. In India, maize serves as one of the most important cereal crops after rice and wheat. Major maize producing states that contribute to most of the country's maize production are UP, Bihar, Rajasthan, Punjab, Madhya Pradesh, Himachal Pradesh, Jammu & Kashmir.

In Nagaland, maize is the second most important cereal after rice in terms of area about 68,960 ha and total production of 1,36,540 M.T and is grown in all districts of the state (Statistical Handbook of Nagaland, 2017). Maize in Nagaland is primarily cultivated under terrace and jhum areas. As maize is widely cultivated for self consumption purpose, livestock feed or for local market, fertilizers are seldom applied in

the state. Sowing of maize in Nagaland proceed by the month of March in most areas, followed by the late sown types. Cultivation of maize in warmer region is done in late spring or early summer months. Different species of maize are found in Nagaland and each species exhibit different phenotypic traits or physical characteristics of its traits.

Materials and Methods

The work to access variability in 22 local genotypes (designated as G1,G2 ….to G22) collected from various regions of the state of Nagaland along with a check genotype RCM 75 was carried out in the institutional farm of School of Agricultural sciences and rural development, Medziphema in the kharif of 2019.

The 23 genotypes were placed in randomized block design with two replications and spacing of 60cm x 30 cm was maintained row to row and plant to plant respectively. Data on five randomly selected plants was recorded for 12 quantitative traits for recording yield parameters. The observations recorded are presented in Table 1.

Results and Discussion

Significant variability was observed for almost all characters under study except for number of ears per plant. G2 exhibited tallest plant height while G12 had the shortest stature. G7 was the earliest to mature while 100 seed weight was maximum in G14 followed by G2. Seed yield per plant ranged from 275.99 g to 61.85g with genotype G13 showing the highest yield**.** Variability studies have been reported by various workers over the years including Hosamani *et al.,* (2018), Khan *et al.,* (2018) and Patil *et al.,* (2018) who also reported substantial variability presence in genotypes of maize studied.

Genetic parameters like coefficient of variation, heritability and genetic advance is presented in table 2. The GCV values were comparatively lower than the PCV values of the characters indicating environmental effect on performance. Reddy *et al.,* (2012) also reported higher PVC than GCV for all characters under study revealing the role of experimental variance to total variance. GCV value was found highest for grain yield followed by 100 seed weight, plant height and ear height and lowest for ear width.

High heritability values for 100 seed weight, days to maturity, plant height, days to silking, days to tasselling and ear height was observed. The characters with high GCV and higher values of heritability indicated high potential for selection. Beulah *et al.,* (2018) also reported high heritability for plant height, cob height and days to maturity.

Genetic advance was seen to be high in 100 seed weight, ear height and plant height indicating additive gene action. High heritability with high genetic advance for these traits are a good selection criteria in improving the yield. Sravanthi *et al.,* (2017) also found similar result for ear height and yield per plant.

The performance of the local maize genotypes shows substantial variability present in it and many genotypes performed better than the check variety with respect to yield and yield attributing characters. High heritability values for 100 seed weight, days to maturity, plant height, days to silking, days to tasselling and ear height was observed. The characters with high GCV and higher values of heritability indicated high potential for selection. Beulah *et al.,* (2018) also reported high heritability for plant height, cob height and days to maturity.

Table.1 Mean performances of maize genotypes of Nagaland

Characters / Genotypes	Days to tasseling	Days to silking	Plant height (cm)	Ear height (cm)	No. of ears per plant	Days to 80% maturity	Ear length (cm)	Ear width (cm)	No. of kernel rows	No. of kernels per row	100 seed weight (g)	Grain yield per plant (g)
G_1	55.50	58.50	280.66	181.65	2.60	113.00	17.39	4.03	13.50	26.10	24.61	235.67
G_2	53.50	57.00	**302.49**	196.85	2.20	109.90	19.74	3.97	10.30	31.00	32.04	216.75
G_3	56.00	59.00	255.97	141.91	2.20	118.30	15.85	4.59	15.00	29.40	24.67	237.58
G_4	55.00	58.00	158.03	104.95	2.00	124.20	16.99	4.28	11.20	22.60	12.97	62.39
G_5	59.00	62.00	179.08	95.07	1.70	118.40	12.19	3.90	13.70	24.10	17.60	102.98
G_6	58.50	62.00	217.04	141.09	2.70	115.00	15.35	4.41	13.40	26.20	30.81	261.88
G_7	44.50	48.00	188.54	106.21	2.00	108.50	18.98	4.07	11.60	30.10	26.14	180.28
G_8	61.50	64.50	249.05	160.91	1.80	113.00	17.84	4.17	11.70	24.90	12.39	67.39
G_9	54.00	57.00	215.82	126.36	1.80	119.90	13.46	3.66	15.30	28.90	12.77	94.53
G_{10}	59.00	62.00	213.52	118.38	1.50	116.80	10.92	3.93	15.60	21.30	14.76	71.97
G_{11}	60.50	63.50	277.65	163.95	2.90	128.10	12.53	3.45	14.40	24.00	11.94	111.20
G_{12}	50.50	53.50	**139.55**	81.20	2.40	128.30	17.28	4.46	14.00	35.60	24.29	249.61
G_{13}	53.00	56.00	216.63	114.29	2.50	116.00	17.45	4.23	14.50	30.00	27.71	275.99
G_{14}	57.50	61.00	184.06	90.54	1.70	115.90	21.51	4.33	13.70	33.30	36.98	292.50
G_{15}	57.50	61.00	190.18	97.20	2.50	121.50	22.12	5.29	11.30	32.00	23.89	201.86
G_{16}	63.50	67.00	210.81	106.70	1.90	128.30	15.69	4.28	14.90	20.90	21.40	124.97
G_{17}	71.50	74.50	157.29	87.81	2.30	129.40	13.08	3.64	14.00	22.00	19.50	135.24
G_{18}	55.50	59.00	228.73	112.25	3.10	130.50	19.44	4.15	13.80	33.10	18.81	264.80
G_{19}	93.00	96.50	252.10	132.04	1.60	159.60	17.83	3.78	12.60	24.90	11.85	61.85
G_{20}	83.50	87.00	289.79	171.05	2.20	154.40	19.49	3.49	15.30	23.50	25.55	192.37
G_{21}	81.00	84.50	205.76	107.24	1.90	139.90	18.15	3.46	15.50	32.90	18.78	148.33
G_{22}	79.50	83.00	152.88	85.19	2.50	143.30	18.42	3.64	14.10	36.10	13.50	141.85
G_{23}	54.50	58.00	182.38	93.11	2.00	113.20	11.26	3.65	11.40	22.10	16.11	77.71
Mean	61.63	64.89	215.13	122.43	2.17	124.58	16.65	4.03	13.52	27.60	20.83	164.44
S.E	1.16	1.18	5.75	6.22	0.37	1.37	1.12	0.25	0.51	2.40	0.93	36.45
C.D (5%)	3.41	3.47	16.88	18.26	-	4.03	3.30	0.74	1.51	7.043	2.73	106.92
C.V	2.67	2.58	3.78	7.19	24.23	1.56	9.56	8.88	5.41	12.30	6.32	31.35

Table.2 Genetic parameters of 12 characters of local Maize genotypes of Nagaland

Character	Mean ± S.E	Range	Coefficient of variation			Heritability h^2 (broad sense)	Genetic advance % of mean
			GCV	PCV	ECV		
Days to tasseling	**61.63 ± 1.16**	**93 - 44.5**	**19.27**	**19.46**	**2.67**	**98.1**	**39.33**
Days to silking	**64.89 ± 1.18**	**96.5 - 48**	**18.43**	**18.61**	**2.58**	**98.1**	**37.60**
Plant height (cm)	**215.13 ± 5.75**	**302.49-139.55**	**21.26**	**21.59**	**3.78**	**96.9**	**43.12**
Ear height (cm)	**122.43 ± 6.22**	**196.85 - 81.2**	**26.62**	**27.57**	**7.19**	**93.2**	**52.94**
No. of ears per plant	**2.17 ± 0.37**	**3.1 - 1.5**	**9.46**	**26.01**	**24.23**	**13.2**	**7.10**
Days to 80% maturity	**124.58 ± 1.37**	**159.6 – 108.5**	**10.87**	**10.98**	**1.56**	**98.0**	**22.17**
Ear length (cm)	**16.65 ± 1.12**	**22.12 – 10.92**	**17.70**	**20.12**	**9.56**	**77.4**	**32.10**
Ear width (cm)	**4.03 ± 0.25**	**5.29 – 3.45**	**8.73**	**12.45**	**8.88**	**49.2**	**12.61**
No. of kernel rows	**13.51 ± 0.51**	**15.6 – 10.3**	**10.98**	**12.24**	**5.41**	**80.5**	**20.30**
No. of kernels per row	**27.60 ± 2.40**	**36.1 – 20.9**	**15.05**	**19.44**	**12.30**	**60.0**	**24.01**
100 seed weight (g)	**20.83 ± 0.93**	**36.98 – 11.85**	**34.04**	**34.62**	**6.32**	**96.7**	**68.94**
Grain yield per plant (g)	**164.44±36.45**	**275.99 – 61.85**	**40.36**	**51.11**	**31.35**	**62.4**	**65.67**

Genetic advance was seen to be high in 100 seed weight, ear height and plant height indicating additive gene action. High heritability with high genetic advance for these traits are a good selection criteria in improving the yield. Sravanthi *et al.,* (2017) also found similar result for ear height and yield per plant.

The performance of the local maize genotypes shows substantial variability present in it and many genotypes performed better than the check variety with respect to yield and yield attributing characters.

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