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Genetic variability analysis of yield and its component in Niger [(*Guizotia abyssinica* (L.f.) Cass.)]

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Abstract

A field experiment was carried out on Niger germplasm at the Zonal Agriculture Research Station, Igatpuri during *Kharif* 2019. Analysis of variance revealed that the mean sum of square due to genotypes were highly significant for all the characters except days to 50% flowering indicating the existence of sufficient amount of variability among the genotypes. The traits *viz.*, seed yield per plot, number of branches per plant, number of capitula per plant and number seeds per capitula observed moderate heritability with high genetic advance reveals that these characters are governed by non additive gene effects. Hence selection may be effective in such cases.

Keywords: Genetic advance, genetic variability, heritability, Niger

Introduction

Niger [*Guizotia abyssinica* (L.f.) Cass.] is an important minor oilseed crop grown in Tropical and Subtropical countries like India, Ethiopia, East Africa, West Indies and Zimbabwe. India ranks first in area, production and export of Niger in the world. India and Ethiopia are two major producers in the world. Niger though a native of Tropical Africa, is wide spread and cultivated extensively in India since long. It is used as an oilseed crop in India where it provides about 3 per cent of the edible oil requirement of the country (Getinet and Sharma, 1996) [5]. In India, it is grown on about 2.61 lakh ha area, with production of 0.84 lakh tonnes and the productivity of 321 kg/ha. In the state of Maharashtra it is grown in an area of 12900 ha. with the production of 0.024 lakh tonnes and productivity of 185 kg/ha. (www.krishi.maharashtra.gov.in). This crop is mainly grown in hill slopes during *kharif* season by tribal farmers of Maharashtra. It is grown on unproductive, marginal or waste lands without any production management. The water holding capacity of these lands is very low and often crop suffers severe moisture stress condition during its life span. These adverse factors have rendered such morphological/anatomical adaptive mechanism in crop, which was essential for the survival and reproduction, but not for productivity. Under such situation selection pressure is given on the suitable plant type, which having good yield potential.

Material and Methods

The present study was carried out at the Zonal Agriculture Research Station, Igatpuri during *Kharif*, 2019. The experimental material comprised of 50 Niger germplasm including two check varieties was obtained from Project Co-ordinator Unit, Jabalpur, and collected from Melghat region in Amravati, Akole tahsil in Ahmednagar and Igatpuri and Trimbakeshwar tahsil of Nashik district. These genotypes of Niger were evaluated in a Randomized Block Design (RBD) with two replications. Each genotype was sown in two rows of 3 m length with spacing 30 cm between row and 10 cm within rows. The fertilizer dose is 20: 40: 00 NPK kg/ha and applied at the time of sowing in order to facilitate easy and better germination. The operations like thinning, weeding, hoeing and plant protection measures were carried out regularly to ensure satisfactory crop growth. Observations were recorded on 5 randomly selected plants in each entry for eight characters *viz.*, days to 50% flowering, days to maturity, plant height, number of branches per plant, number of capitula per plant, number of seeds per capitula, 1000 seed weight and seed yield per plot. The mean data of each character was subjected to analysis of variance to test the level of significance among the genotypes for different characters according to the method suggested by Panse and Sukhatme, (1985) [6].

The genotypic coefficient (GCV) and phenotypic coefficient of variations (PCV) were estimated as per the formulae suggested by Burton (1952) [4] while, heritability in a broad sense was calculated by using the formulae suggested by Allard (1960) [2].

Result and Discussion

Analysis of variance revealed that the mean sum of square due to genotypes were highly significant for all the characters except days to 50% flowering indicating the existence of sufficient amount of variability among the genotypes (Table.1) for the characters studied. Similar results have been found by Patil *et al.*, (2019) [7], Baghel *et al.* (2018) [3], Suryanarayana *et al.*, (2018) [8]. The seed yield per plot ranged from 12.0 g (GP-19-15) to 84.5 g (GP-19-46) with a mean value 38.83 g. Variation for plant height ranged between 79 (GP-19-37) to 166 cm (GP-19-47) with an average value of 112.95. The observation data of number of capitula per plant ranged between 17 (GP-19-15) to 96 (GP-19-46) with a general mean 63.29. The trait seeds per capitula ranges between 11 (GP-19-14) to 47 (GP-19-26) with average value of 24.93. The 1000 seed weight ranged between 3.35 (GP-19-17) to 4.90 g (GP-19-36) with a mean value 4.11 g.

High genotypic coefficient of variation and phenotypic coefficient variation were noticed for seed yield per plot, number of branches per plant, number of capitula per plant and number seeds per capitula. The moderate GCV and PCV were recorded in plant height, however, lowest GCV and PCV observed in 1000 seed weight, days to 50% flowering and days to maturity. Similar results were reported by Suryanarayana *et al.*, (2018) [8], Vinod and Bisen (2016) [9], Ahirwar *et al.*, (2017) [11] in Niger.

Table 1: Analysis of variance for seed yield and its component in Niger

S. N.	Characters	Mean sum of square		
		Replication	Genotypes	Error
1	Seed yield/plot (g)	2.25	660.83**	26.84
2	Days to 50% flowering	13.69	9.86	6.28
3	Days to Maturity	10.24	18.39**	6.16
4	Plant height (cm)	14.19	911.62**	14.97
5	Number of branches/plant	1.44	25.80**	4.63
6	Number of capitula per plant	0.25	1469.27**	37.03
7	Number of seeds per capitula	0.01	194.31**	8.23
8	100 seed weight (g)	0.001	0.32**	0.01

Table 2: Genetic parameters of variation for seed yield and its component in Niger

S. N.	Characters	Mean	Range		GCV %	PCV %	Herita-bility	Genetic advance as % mean
			Max.	Min.				
1	Seed yield/plot (g)	38.83	84.5	12.0	45.85	47.75	0.48	90.69
2	Days to 50% flowering	105.29	111	100	1.27	2.70	0.03	1.23
3	Days to Maturity	142.36	147	136	1.74	2.46	0.02	2.53
4	Plant height (cm)	112.95	166	79	18.75	19.06	0.19	37.99
5	Number of branches/plant	10.32	22	5	31.53	37.80	0.38	54.18
6	Number of capitula per plant	63.29	96	17	42.28	43.36	0.43	84.93
7	Number of seeds per capitula	24.93	47	11	38.69	40.37	0.40	76.39
8	100 seed weight (g)	4.11	4.90	3.35	9.62	9.88	0.10	19.82

In the present investigation none of the traits showed high estimates of broad sense heritability. The moderate heritability were observed for the characters seed yield per plot, number of branches per plant, number of capitula per plant and number seeds per capitula. Genetic advance a percent mean recorded high for seed yield per plot, number of branches per plant, number of capitula per plant and number seeds per capitula. These results are in accordance with Vinod and Rajani (2016) [9]. In the present study, seed yield per plot, number of branches per plant, number of capitula per plant and number seeds per capitula expressed moderate heritability accompanied with high genetic advance reveals that these characters are governed by non additive gene effects. Selection may be effective in such cases.

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