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Assessment of existing genetic variability and yield component analysis in Niger [(*Guizotia abyssinica* (L.f.) Cass.]

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Abstract
The present investigation was carried out at the Zonal Agriculture Research Station, Igatpuri during *Rabi* 2020 to evaluate the presence of genetic variability for seed yield and yield contributing characters of niger germplasm. Analysis of variance revealed that the mean sum of square due to genotypes were highly significant for all the characters except plant height, number of branches per plant and 1000 seed weight indicating the existence of sufficient amount of variability among the genotypes The traits *viz*., seed yield per plot, diameter of cpitula, number of capitula per plant, number seeds per capitula and 1000 seed weight observed high heritability with high genetic advance reveals that these characters are governed by non additive gene effects. Hence selection procedure may be utilized in further crop improvement.

Keywords: Genetic advance, genetic variability, heritability, Niger

Introduction
Niger [*Guizotia abyssinica* (L.f.) Cass.] is. navite after the French historian Guizot. 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) [6]. The wild form has oil content 20 to 35%, while the cultivated Niger has 36 to 42% (Patil. *et al*., 2019) [10]. This crop is cultivated in sloppy/hilly areas which are unproductive, marginal or waste lands without any production management by tribal farmers of Maharashtra. 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. The quantum of genetic variability present in the population will determine the breeding strategy to be adopted for crop improvement. In addition to the genetic variability, knowledge on heritability and genetic advance helps the breeder to employ the suitable breeding strategy. Therefore, it is necessary to have knowledge on genetic variability, heritability and genetic advance present in the available genetic material.

Material and Methods
The field experiment conducted at the Zonal Agriculture Research Station, Igatpuri during *rabi*, 2020. 30 Niger germplasm obtained from Project Co-ordinator Unit, Jabalpur including two check varieties were raised in a Randomized Block Design (RBD) in two replications. Each germplasm was sown in two rows of 3 m length with spacing 30 cm between row and 10 cm within rows. The recommended fertilizer dose 20: 40: 00 NPK kg/ha applied at the time of sowing and as a top dressing 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 nine characters *viz.*, days to 50% flowering, days to maturity, plant height, number of branches per plant, diameter of capitula, number of capitula per plant, number of seeds per capitulla, 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) [9].

The genotypic coefficient (GCV) and phenotypic coefficient of variations (PCV) were estimated as per the formulae suggested by Burton (1952) [5] while, heritability in a broad sense was calculated by using the formulae suggested by Allard (1960) [2] and genetic advance expressed as per cent of mean by using the formula suggested by Johnson *et al*. (1955) [8].

Result and Discussion

The analysis of variance revealed highly significant differences among the thirty genotypes for nine characters indicating the existence of sufficient amount of variability among the genotypes except plant height, number of branches per plant and 1000 seed weight (Table.1) for the characters studied. Similar results were reported by Bhoite *et al*, (2020) [4], Baghel *et al.* (2018) [3], Suryanarayana *et al*., (2018) [11]. The seed yield per plot ranged from 9.3 g (GP-20-08) to 22.55 g (GP-20-02) with a mean value 16.82 g. Earliness in flowering and maturity was observed in GP-20-12 (48 day, 80 days, respectively) and late in GP-20-14 (59 days and 92 days, respectively). Very less variation exhibited for plant height ranged between 74 cm (GP-20-08) to 90 cm (GP-20-17) with an average value of 83.38. Similar pattern of variability manifested in case of number of branches per plant. The minimum branches found in GP-20-04 (5.20) and maximum branches depicted in GP-20-24 (10.05). The observation data of number of capitula per plant ranged between 30.45 (GP-20-18) to 85.30 (GP-20-23) with a general mean 61.48. The trait seeds per capitula ranges between 16.25 (GP-20-08) to 39.75 (GP-20-17) with average value of 24.34. The 1000 seed weight ranged between 2.30 (GP-20-08) to 4.24 g (GP-20-23) with a mean value 3.45 g.

According to Deshmukh *et al*, (1986) [6], PCV and GCV values greater than 20% are regarded as high, whereas values less than 10% are considered to be low and values between 10 and 20% to be medium. High genotypic coefficient of variation and phenotypic coefficient variation were noticed for diameter of capitula, number of capitula per plant and number seeds per capitula. The moderate GCV and PCV were recorded in seed yield per plot, 1000 seed weight and number of branches per plant. However, lowest GCV and PCV observed in days to 50% flowering, days to maturity and plant height. Similar results were reported by Suryanarayana *et al*., (2018) [11] and Ahirwar *et al*., (2017) [1] 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	Days to 50% flowering	0.27	16.51*	2.33
2	Days to Maturity	1.07	16.54*	2.34
3	Plant height (cm)	6.02	47.16	25.05
4	Number of branches/plant	0.002	3.64	1.16
5	Diameter of capitula	0.12	32.15**	2.81
6	Number of capitula per plant	17.28	531.40**	134.68
7	Number of seeds per capitula	4.99	82.44*	11.58
8	1000 seed weight (g)	0.03	0.56	0.01
9	Seed yield/plot (g)	2.52	23.73*	5.08

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	Days to 50% flowering	53.53	59	48	4.97	5.37	85.90	9.49
2	Days to Maturity	86.43	92	80	3.05	3.33	83.80	5.74
3	Plant height (cm)	93.38	90	74	3.99	5.82	46.90	5.62
4	Number of branches/plant	7.87	10.05	5.20	14.16	17.15	68.20	24.09
5	Diameter of capitula	13.09	19.48	6.16	29.25	30.62	91.30	57.56
6	Number of capitula per plant	61.48	85.30	30.45	22.91	26.51	74.70	40.77
7	Number of seeds per capitula	24.34	39.75	16.25	24.46	26.38	86.00	46.71
8	1000 seed weight (g)	3.45	4.24	2.30	15.23	15.44	97.40	30.96
9	Seed yield/plot (g)	16.82	22.55	9.30	18.16	20.48	78.60	33.17

Generally the estimates of phenotypic coefficients of variation were higher than the genotypic coefficients of variation, it indicates the variation was not only due to genotypes but also due to the influence of environment. In the present investigation all the traits except plant height showed high estimates of broad sense heritability. The moderate heritability was observed for plant height. Genetic advance a percent mean recorded high for diameter of capitula (57.56%) followed by number seeds per capitula (46.71%), number of capitula per plant (40.77%), seed yield per plot, (33.17%) and 1000 seed weight (30.96%). The moderate value depicted for the trait; number of branches per plant and lowest values observed for days to 50% flowering, days to maturity and plant height. These results are in accordance with Vinod and Rajani (2016) [12]. In the present study, high heritability coupled with high genetic advance was observed for seed yield per plot, diameter of capitula, number seeds per capitula, number of capitula per plant and 1000 seed weight suggesting that they can be improved through direct selection due to predominant additive variation. Selection may be effective in such cases.

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