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Genetic studies of yield and its component of Niger [(*Guizotia abyssinica* (L.f.) Cass.] in Western Ghat Zone of Maharashtra

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Abstract
A field experiment was carried out on Niger germplasm lines at the Zonal Agriculture Research Station, Igatpuri during *Kharif* 2019. Analysis of variance indicate that the mean sum of square due to genotypes were highly significant for all the characters. High genotypic coefficient of variation and phenotypic coefficient variation were observed for seed yield per plot, number of branches per plant, number of capitula per plant and number seeds per capitula. High heritability accompanied with high genetic advance a percent were observed for seed yield per plot, number of branches per plant, number of capitula per plant and number seeds per capitula indicated that these characters are governed by additive gene effects.

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). In Maharashtra, this oilseed crop is an important component of tribal agriculture and considered as lifeline for nutritional security but cultivated in poor and neglected soil under rainfed conditions.

The oil is considered good for health which is pale yellow with nutty taste and a pleasant odour and can be used as a substitute for olive oil provided it has good keeping quality and self-life. The seed itself is edible with no anti-nutritional factor but contains more crude fiber than most of the oilseed meal which is of high quality and is mainly used for culinary purpose, manufacture of cosmetics, soaps, paints, lubricating and lighting. Oilseed meal is used as cattle and poultry feed. The oil from the seed is used to treat burns and in the treatment of scabies. The press cake from oil extraction is used for livestock feed. Variability exists for morphological characters (Pradhan *et al.,* 1995) [9]; however these characters are not discrete and hence complicate the niger improvement programs. The study of amount of such genetic variability including the important economic traits in Niger can be achieved through mass selection (Panda and Sial, 2012) [6]. The information on genetic variability and character association between yield and its components are of utmost importance to initiate the breeding programme to evolve high yielding varieties. Further direct selection for complex traits like seed yield is not effective. Knowledge of association of the simply inherited traits, which are less influenced by environment, is required to have sound selection criteria. Thus the present study was aimed at gathering information on existing genetic variability, nature and magnitude of association among eight attributes in forty genotypes.

Material and Methods
The present study was carried out at the Zonal Agriculture Research Station, Igatpuri during *Kharif*, 2019. The experimental material comprised of 38 Niger germplasm lines and 2 check varieties. The experiment was sown in randomized block design with two replication in June, 2019. The experimental plot size of 3.00 x 0.60m The objectives of present study to estimate the genetic variability, heritability and genetic advance. The crop was raised under recommended package of practices and prophylactic plant protection measures need based. Observations were taken on plot basis for days to 50% flowering, days to maturity and grain

yield (q/ha). Ten randomly selected plants in each entry were taken up for recording data on plant height, number of branches per plant, number of capitula per plant and number of seeds per capitulum. Analysis of variance was performed following the standard procedures described by Panse and Sukhatme, 1985 [7]. Heritability (broad sense) and genetic advance were estimated as per Johnson *et al*. (1955) [5].

Result and Discussion

Analysis of variance indicate that the mean sum of square due to genotypes were highly significant for all the characters. Similar results have been found by Panda and Sial (2012) [6] for days to 50% flowering, plant height, number of capitula per plant. Patil *et al.,* (2013) [8] observed similar findings for number of primary branches per plant, number of secondary branches per plant, plant height, number of capitula per plant, days to maturity. Bisen *et al.,* (2015) [3] observed similar results for number of branches per plant, number of capitula per plant, plant height, oil content (%), days to 50% flowering, days to maturity.

The seed yield per plot ranged from 11.5 g (IGPN-18-13) to 84.5 g (IGPN -18-15) with a mean value 23.14 g. Days to 50% flowering was ranged from 91 (IGPN-18-38) to 109 (NSS--5440) with an average value 101.3. Variation for days to maturity ranged between 122.5 (IGPN-18-12) to 142.5 (NSS--5440) with a general mean 135.36. Variation for plant height ranged between 121.5 (KEC-12) to 175.5 cm (NSS-5390) with an average value of 152.1. The observation data of number of capitula per plant ranged between 17.5 (IGPN-18-17) to 39.4 (IGPN-18-1) with a general mean 26.77. The trait seeds per capitula ranges between 12 (KEC-15) to 26.5 (KEC-7) with average value of 17.81. The 1000 seed weight ranged between 2.05 (IGPN-18-20) to 3.26 g (IGPN-18-15) with a mean value 2.40 g. Similar results were reported by Baghel *et al.,* (2018) [2] for seed yield per plant, Ahmad *et al.,* (2016) [1] for test weight, Tiwari *et al.,* (2016) [12] for seed per capitulla.

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. Similar observation were reported by earlier by Baghel (2018) [2] for seed yield, Baghel *et al.,* (2018) [2] and Suryanarayana *et al.,* (2018) [11] for number of capitulla per plant and Pradhan *et al.,* (1995) [9] for number of 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 have been reported by Panda and Sial (2012) [6].

In the present investigation each traits showed high estimates of broad sense heritability. The high heritability was recorded for the trait days to 50% flowering (88%), days to maturity (83%) followed by plant height (cm) (82%), capitula per plant and test weight(80%), seed yield per plot (g) and number of branches per plant (79%) and number of seeds per capitula (75%). These results are in accordance with Vinod and Rajani (2016) [13]. Genetic advance is the improvement in the mean genotypic value of selected plants over the parental population. Heritability estimates along with genetic advance are normally more helpful in predicting gain under selection than heritability estimates alone. However it is not necessary that a character showing high heritability will also exhibit high genetic advance (Johnson *et al.,* 1955) [5].

The magnitude of genetic advance as per cent of mean was categorized as high (> 20%), moderate (10% - 20%), and low (< 10%). If the value of genetic advance is high, it shows that the character is governed by additive genes and selection will be rewarding for improvement of such trait. If the value of genetic advance is low, it indicates that the character is governed by non additive genes may be useful.

In this investigation high genetic advance recorded for plant height (22.45%). This result was in accordance with Rani *et al.,* (2010) [10] for plant height. However, moderate genetic advance observed for seed yield per plot (10.72%). The rest of traits like days to 50% flowering, days to maturity, number of branches per plant, number of capitula per plant, number of seeds per capitulla and test weight showed low genetic advance.

Genetic advance a percent mean recorded high for seed yield per plot (46.34%), number seeds per capitulla (41.37%), number of branches per plant (40.32%), number of capitula per plant (37.32%) and test weight (22.73). Plant height recorded moderate and days to 50% flowering and days to maturity showed low genetic advance a percent. In the present study, seed yield per plot, number of branches per plant, number of capitula per plant and number seeds per capitula expressed high heritability accompanied with high genetic advance a percent reveals that these characters are governed by additive gene effects. Selection may be effective in such cases.

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

Source of variation	d.f	Mean sum of squares							
		Days to 50% flowering	Days to Maturity	Plant height (cm)	Number of branches/plant	Number of capitula per plant	Number of seeds per capitula	100 seed weight (g)	Seed yield per plot (g)
Replications	1	4.51	0.31	35.11	0.45	15.14	0.11	0.0001	0.11
Genotypes	39	44.08**	57.28**	324.79**	9.77**	66.06**	39.84**	0.20**	77.15**
Error	39	2.92	5.18	33.14	1.17	7.31	5.70	0.021	8.88

*,**: Significant at 5% and 1% levels respectively.

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

S. N.	Characters	Mean	Range		GCV %	PCV %	Heritability	Genetic advance as % mean
			Max.	Min.				
1	Seed yield/plot (g)	23.14	35.5	11.5	25.25	28.35	0.79	46.34
2	Days to 50% flowering	101.34	109	91	4.48	4.78	0.88	8.63
3	Days to Maturity	135.36	142.5	122.5	3.77	4.13	0.83	7.09
4	Plant height (cm)	152.09	175.5	121.5	7.94	8.80	0.82	14.77
5	Number of branches/plant	9.40	14.0	5.0	22.07	24.88	0.79	40.32

6	Number of capitula per plant	15.14	39.4	17.15	20.25	22.63	0.80	37.32
7	Number of seeds per capitula	17.81	26.5	9.0	23.19	26.79	0.75	41.37
8	100 seed weight (g)	2.40	3.26	2.05	12.33	13.78	0.80	22.73

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