

Genetic variability and association studies for seed yield and yield components in Niger [(*Guizotia abyssinica* (L. f.) Cass.)]

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ABSTRACT

The present experiment was carried out with 10 entries along with three checks during *kharif*, 2021 at Regional Agricultural Research Station, Chintapalle, Andhra Pradesh state to study variability and correlation for yield and its yield attributing traits in niger. The entries are received from PC Unit, JNKVV, Jabalpur. Each entry was sown in ten rows of 4 m length with 30 cm x 10 cm spacing in randomized block design. These entries were evaluated for seed yield and yield component characteristics *viz.*, days to 50% flowering, days to maturity, plant height, number of primary branches, number of capitula and 1000 seed weight. Analysis of variance showed significant differences among the niger genotypes. Moderate to high phenotypic and genotypic coefficient of variation was recorded for traits like plant height, days to maturity, number of primary branches, and seed yield (kg/ha). High heritability combined with high genetic advance was observed for days to maturity, plant height and number of primary branches per plant and these characters showed highly significant correlation with seed yield (kg/ha), hence selection of genotypes based on these traits will be effective.

Keywords: *Correlation, Genetic advance, Heritability and Variability.*

Niger (*Guizotia abyssinica* (L.f) Cass.) is grown mostly in hilly and tribal areas of India, particularly in the states of Andhra Pradesh, Odisha, Chhattisgarh, Madhya Pradesh, and Maharashtra. Niger is still an underutilised crop with comparatively poor production, despite its endurance in low-input environments and capacity to adapt in marginal areas. Niger seed contains 35 to 45% oil, 20% protein and 12% soluble sugars. Both seed and oil are edible and mostly consumed in tribal districts of India. It is safely consumed as it does not have any ant-nutritional factors, and the oil is rich in linoleic acid (45-70%) and oleic acid (15-40%) and stearic acid (8%). The cake, though edible is mostly utilized as organic manure. Niger has an export potential and seed is exported to many foreign countries as a bird feed. The productivity of niger crop is low because of its cultivation in unproductive lands and lack of high seed and oil yielding varieties. To improve the yield and also oil content in niger, it is very important to collect germplasm in all the parts of India and possibly from Ethiopia where it is predominantly cultivated. After collection, evaluation and finding of genotypes based on their mean performance yield and yield attributing

characters which have high variability, heritability and selection response. Keeping in view of this objective the experiment was conducted during *kharif* 2021 at one of centre of High Altitude and Tribal Zone of Andhra Pradesh i.e., at RARS, Chintapalle to evaluate 10 genotypes of niger and to study the variability, genetic advance as percent of mean and correlation for seed yield and yield contributing characters.

MATERIAL AND METHODS

The experiment was conducted at Regional Agricultural Research Station, Chintapalle, Acharya NG Ranga Agricultural University, Andhra Pradesh state, during *kharif* 2021. The experiment included evaluation of 10 genotypes of niger along with three checks laid out in Randomized Complete Block Design (RCBD). These genotypes were received from Project Coordinating Unit, AICRP on niger and sesame, JNKVV, Jabalpur. Each genotype was sown in ten rows of four-meter length with a spacing of 30 cm x 10 cm. Niger genotypes were evaluated for seed yield and other yield attributing characters *viz.*, days to 50% flowering, days to maturity, plant height (cm), number of primary branches, number of capitula

and 1000 seed weight (g). Each plot recorded with 100% germination without any scope for gap filling. Based on the percentage value PCV and GCV are categorized as low (less than 10%), moderate (10-20%) and high (more than 20%) as suggested by Sivasubramanian and Madhavamenon (1973).

RESULTS AND DISCUSSION

Completely randomized block design was used to evaluate large number of genotypes to know their performance with standard checks. In the present study, 10 entries of niger were evaluated for yield and yield related traits along with three standard checks *viz.*, JNS-9, IGPN-2004-1 and KGN-2 (local check). The results of mean performance for the trait seed yield (kg/ha) ranged between 422.00 kg (JNS- 2019-6) and 958.20 kg (ONS-184) (Table 1). The estimates of PCV and GCV components are used to measure the genetic variability present in the population. The PCV and GCV values gives an idea about the magnitude of variability present in a genetic population. The PCV values were marginally higher than the corresponding GCV values indicating some amount of environment influence on the expression of traits. In the present study high PCV and GCV were recorded for seed yield (kg/ha) and moderate values observed for days to maturity, plant height and number of primary branches per plant. Similar results

were reported by Kumar *et al.* (2022), Saraswat *et al.* (2022), Gururaja *et al.* (2021), Baghel *et al.* (2018) and Ahmad *et al.* (2016).

High heritability coupled with high genetic advance as percent of mean recorded for plant height(cm), days to maturity, number of primary branches per plant, and seed yield per plot (g) (Table 2). Similar results were obtained by Kumar *et al.* (2022), Saraswat *et al.* (2022), Gururaja *et al.* (2021), Bhoite *et al.* (2020), Suryanarayana *et al.* (2019) and Kumar and Bisen (2016). High heritability coupled with moderate genetic advance as percent of mean recorded for number of capitula per plant and 1000 seed weight. These results were in accordance with the findings of Gururaja *et al.* (2021) and Suryanarayana *et al.* (2019). Low heritability coupled with low genetic advance as percent of mean was recorded for days to 50% flowering.

In the present investigation, characters *viz.*, days to maturity ($r=0.524$), plant height (cm) ($r=0.523$) and number of primary branches per plant ($r=0.555$) showed positive significant correlation with seed yield (kg/ha)(Table 3). Days to maturity ($r=0.716$) and plant height ($r=0.725$) recorded significant positive correlation with number of primary branches per plant. Similar results were observed by Patil *et al.* (2019). High heritability coupled with high genetic advance as percent of mean was recorded for days to maturity,

Table 1: Mean performance for yield and yield attributing traits in niger (*Guizotia abyssinica* (L.f Cass.)

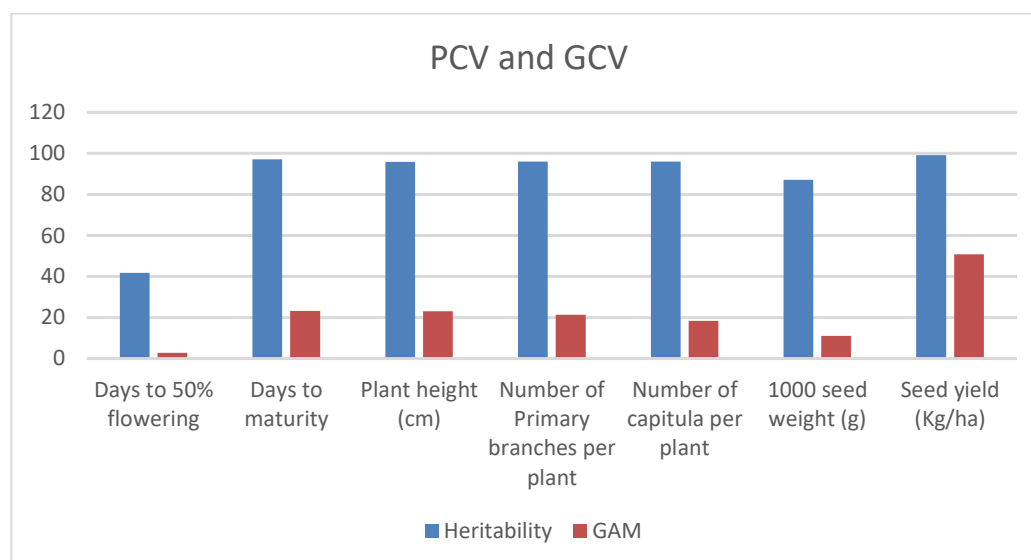
S.NO	Entry	Days to 50% flowering	Days to maturity	Plant height (cm)	Number of primary branches per plant	Number of capitula per plant	1000 seed weight (g)	Seed yield (kg/ha)
1	ONS-184	48	102	108.07	7.2	36.8	4.77	958.2
2	IGPN-18-34	49	103	86.07	5.73	38.53	4.63	529.89
3	ONS-185	47	103	109.4	6.67	36.8	4.43	537.3
4	NPR-38	49	104	80.2	6.13	35.73	4.4	690.48
5	JNS-2019-4	47	101	78.6	6.13	39.2	4.67	448.41
6	KBN-2	49	104	86.87	5.73	35.8	4.87	812.17
7	NPR-11	48	103	89.67	6.8	31.93	4.3	700.79
8	PC 2021-1	46	102	88.53	6.27	38.73	4.13	699.47
9	NPR-13	46	102	91.8	6.27	32.93	4.83	556.61
10	JNS-2019-6	50	104	79.87	5.93	35.47	4.39	421.96
11	IGPN-2004-1 (Check)	47	103	77.73	4.53	27.27	4.27	462.43
12	KGN2 (Check)	46	101	97.8	6.73	35.73	4.13	719.58
13	JNS-9(C)	47	102	94	6.2	37.4	4.5	635.71

Table 2. Variability, heritability and GAM for yield and yield attributing traits in niger (*Guizotia abyssinica* (L.f) Cass.)

S. No.	Character	Mean	Range		Coefficient of		Heritability (%)	Genetic advance as per cent of mean
			Min.	Max.	PCV (%)	GCV (%)		
1	Days to 50% flowering	48	46	50	3.21	2.07	41.71	2.75
2	Days to maturity	103	101	103	11.64	11.47	97.07	23.28
3	Plant height (cm)	90	78	90	11.7	11.45	95.88	23.09
4	Number of Primary branches per plant	6	5	6	10.83	10.61	96.03	21.42
5	Number of capitula per plant	36	27	36	9.32	9.13	96.05	18.43
7	1000 seed weight (g)	4	4	5	6.13	5.73	87.13	11.02
8	Seed yield (Kg/ha)	629	422	958	24.83	24.73	99.18	50.73

Table 3: Genotypic correlation coefficients between seed yield (kg/ha) and its component traits in niger (*Guizotia abyssinica* (L.f) Cass.)

Character	Days to 50% flowering	Days to maturity	Plant height (cm)	Number of Primary branches per plant	Number of capitula per plant	1000 seed weight (g)
Days to 50% flowering	1.000					
Days to maturity	-0.394*	1				
Plant height (cm)	-0.390*	1.009**	1.000			
Number of Primary branches per plant	-0.211 ^{NS}	0.716**	0.725**	1.000		
Number of capitula per plant	0.067 ^{NS}	0.239 ^{NS}	0.236 ^{NS}	0.476**	1.000	
1000 seed weight (g)	0.423**	0.158 ^{NS}	0.139 ^{NS}	0.049 ^{NS}	0.187 ^{NS}	1.000
Seed yield (Kg/ha)	0.078 ^{NS}	0.524**	0.523**	0.555**	0.160 ^{NS}	0.175 ^{NS}

**Fig. 1: Variability (PCV and GCV) for Yield and Yield attributing traits in Niger**

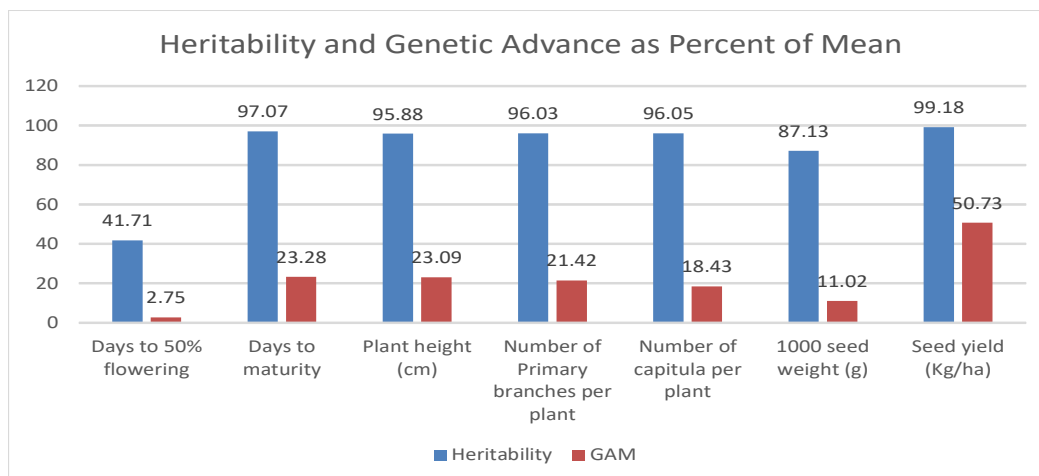


Fig. 2: Heritability and genetic advance as percent of Mean for yield and yield attributing traits in Niger.

plant height(cm), number of primary branches per plant, and seed yield (kg/ha) indicating preponderance of additive gene action and therefore simple selection would be effective for the genetic improvement of these traits. Besides, these characters also recorded positive significant correlation with seed yield (kg/ha). In the present study genotypes ONS-184 and KBN-2 recorded good *per se* performance. Hence, the genotypes which recorded high mean for seed yield and other yield component traits which were found high significant association with seed yield will be considered for further crop improvement programmes.

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