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Yield component analysis in niger (*Guizotia abyssinica* Cass)

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Abstract : In thirty genotypes of niger, a substantial genetic variability was observed for seven characters. Heritability estimates was low for primary branches/plant and high for remaining all characters. High heritability along with high genetic advance was observed for capsules/plant and plant height indicating predominance of additive genetic action. The significant positive correlation of seed yield with days to maturity, seeds/capsule was observed. Genoypic correlations were observed larger in magnitude than their respective phenotypic correlations, indicating that selection for correlated characters could give better yield response to selection. A phenotypic as well as genotypic correlations among days to maturity, plant height, seeds/capsule and 1000 seed weight and their positive association with seed yield was observed indicating that these are the major yield components in niger. Days to maturity, seeds/capsules and 1000 seed weight had large and positive direct effect on seed yield. *(Key Words : Niger, Variability, Interrelationship).*

Cultivated niger (*Guizotia abyssinica* Cass) may have originated from the wild species of *Guizotia scabra*, due to selection by Ethiopian farmers several years ago. Movement of the crop to India may have occurred soon after the crop was domesticated in Ethiopia. Niger is the first ranked oil crop in Ethiopia occupying about 50 to 60 per cent of the total cropped area. However, in India it is very minor oilseed crop cultivated mainly by the poor tribal farmers. The crop is found growing under diverse conditions, where other crops may vertually fail. It can be grown on every type of soils including marginal soil and tolerate waterlogging fairly well. The niger seed contains 40 per cent oil with fatty acid composition of 75 to 80 per cent linoleic acid, 7 to 8 per cent palmitic acid and stearic acid (Getinet and Taklewold, 1995). It is wellknown that dietary fats rich in linoleic acid prevents cardiovascular disorders such as coronary heart disease and high blood pressure. Thus, it is very good and safe oil for human consumption. Now efforts for yield improvement in niger has already been started in India and within a few years, we are expecting very good encouraging results. In view of this the present investigation was undertaken.

Materials and Methods

The material consists of 27 germplasm collections with three released varieties as check. Each of the entry was grown in two replications in two rows of five meter length, with a spacing of 30 x 10 cm. Five randomly selected competitive plants were tagged in each entry and observations were recorded for seven quantitative characters. The seed yield/plant was worked out from plot yield. The heritability and variability parameters were estimated following Burton and De Vane (1953). Genotypic and phenotypic correlations were worked out following Robinson *et al.*, (1951). The path analysis was done as per the procedure outlined by Dewey and Lu (1959).

Results and Discussion

Significant differences among the genotypes of niger, suggested the presence of substantial variability for all characters studied. The variability parameters such as range, mean, genotypic coefficient of variation (GCV), phenotypic coefficient of variation (PCV), heritability percentage and genetic advance as percentage of mean (GA) are presented in Table 1. The GCV was maximum for seed yield/plant (60.70) followed by capsules/plant (28.50), seeds/capsules (20.01), plant height (14.24), primary branches/plant (10.31), 1000 seed weight (5.90) and days to maturity (4.22). The PCV revealed the same pattern of variability. The difference between GCV and PCV values of all characters were very low, was mostly due to genetic factors. The presence of high genetic variability is an important indication of good scope for the improvement. However, GCV itself would not be a correct measure to know the heritable variation present and therefore, GCV should be considered together with heritability estimates to get the best picture of the amount of advance to be expected from the selection (Burton, 1952).

Heritability estimates were high for all the characters except primary branches/plant. The highest GA was observed for capsules/plant (52.40) followed by plant height (38.30). The high heritability coupled with high GA was observed for capsules/plant, plant height and seeds/capsule indicating the preponderance of additive gene action for these traits. However, high heritability coupled with moderate GA was observed for days to maturity, 1000 seed weight and seed yield/plant, suggesting predominance of nonadditive gene action for these traits. A low heritability with low GA was observed for primary branches/plant, suggesting that environment had major role in the expression of this trait. Thus, these results are in general agreement with those of earlier workers like Sahu and Patnaik (1981), Mishra (1995), Borole and Patil (1997).

The seed yield/plant showed significant genotypic correlation in positive direction with days to maturity, seeds/capsule, 1000 seed weight and plant height. Similar was the pattern of phenotypic correlations. But the genotypic correlations were higher in magnitude than their respective phenotypic correlations, indicating that selection for correlated characters could give better yield response than would be expected on the basis of phenotypic correlations (Robinson *et al.*, 1951). Thus, these present results are in general agreement with those of Sahu and Patnaik (1981), Goyal and Kumar (1985 and 1993), chennarayappa (1987) and Borole and Patil (1997).

Twelve of the twenty-one phenotypic correlations among seven characters were significant; three of which were negative. The negative correlations were of those of seeds/capsule with primary branches/plant and capsules/plant and primary branches/plant with 1000 seed weight. Thirteen out of twenty-one genotypic correlations among seven characters were significant; of which four were in negative direction. Phenotypic as well as genotypic correlations among days to maturity, plant height, seeds/capsule and 1000 seed weight and their positive association with seed yield/plant was observed, indicating that these are the major yield contributing characters in niger, as was also reported by Goyal and Kumar (1985 and 1993) and Borole and Patil (1997). A selection for these characters would possibly be helpful in improving the yield potential of this crop.

The contribution of these characters was further analysed by computing their direct and indirect effects on seed yield based on genotypic correlations and are presented in Table 3. Days to maturity, seeds/capsule and 1000 seed weight had large and positive direct effects; whereas, primary branches/plant had moderate but negative direct effect on seed yield. The direct effect of remaining characters was very small and neglible. The large direct effect of days to maturity, which has no direct bearing on seed yield is difficult to explain. The positive correlation of plant height was due to it's positive indirect effects via capsules/plant, seeds/capsule and days to maturity. But the high positive correlation of days to maturity and seeds/capsule with seed yield/plant were owing to their large positive direct effect.

Table 1. Estimates of different variability parameters in Niger.

Character	Mean	Range	Coefficient of variation		Heritability %	Genetic advance as % of mean
			Genotypic	Phenotypic		
Days to maturity	124	111 - 137	4.22	4.30	95.10	12.70
Plant height (cm)	76.0	58.5 - 93.5	14.24	18.53	74.00	38.30
Primary branches/plant	6	3 - 9	10.31	19.52	29.80	8.90
Capsules/plant	38	25-51	28.50	25.80	87.20	52.40
Seeds/Capsule	29	14 - 44	20.01	30.06	78.20	26.60
1000 seed weight (g)	3.3	2.3 - 4.5	05.90	13.80	74.10	15.30
Seed yield/plant (g)	35	4.7 - 65.3	60.70	68.04	76.10	18.40

Table 2. Genotypic (above diagonal) and phenotypic (below diagonal) correlations in Niger

Character	Days to maturity	Plant height	Primary branches/ plant	Capsules/ plant	Seeds/ capsule	1000 seed weight	Seed yield./ plant
Days to maturity	1.00	0.38*	-0.28*	0.07	0.82**	0.39*	0.76**
Plant height	0.28*	1.00	-0.15	-0.05	0.27*	0.23	0.35*
Primary branches/plant	-0.18	-0.13	1.00	-0.04	-0.38*	-0.34*	-0.18
Capsules/plant	0.04	-0.02	-0.04	1.00	-0.29*	-0.13	-0.17
Seeds/capsule	0.74**	0.25*	-0.29*	-0.28*	1.00	0.45*	0.90**
1000 seed weight	0.34*	0.21	-0.31*	-0.12	0.43*	1.00	0.47*
Seed yield/plant	0.67*	0.32*	-0.13	-0.13	0.78**	0.44*	1.00

*, ** significant at five percent and one percent level respectively.

Table 3. Estimates of direct (diagonal) and indirect effect component traits in Niger.

Character	INDIRECT		EFFECTS		VIA		Genotypic correlation with Seed yield/plant
	Days to maturity	Plant height	Primary branches/ plant	Capsules/ plant	Seeds/ capsule	1000 seed weight	
Days to maturity	<u>0.58</u>	0.05	-0.04	-0.25	0.45	-0.03	0.76**
Plant height	0.10	<u>0.07</u>	-0.05	0.14	0.12	-0.03	0.35*
Primary branches/plant	0.10	-0.15	<u>-0.15</u>	0.06	-0.15	0.11	-0.18
Capsules/plant	0.15	-0.12	0.15	<u>-0.09</u>	-0.07	0.15	-0.17
Seeds/capsule	0.11	0.12	0.14	0.11	<u>0.52</u>	-0.10	0.90**
1000 seed weight	0.03	0.02	-0.15	0.08	0.08	<u>0.41</u>	0.47*
Residual effect =	0.29						

*, ** significant at five percent and one percent level respectively.

With considering the above discussed results, it could be concluded that days to maturity, seeds/capsule, 1000 seed weight and plant height are the major yield contributing characters in niger. Since late maturity and plant height beyond certain limit is not desirable, greater emphasis should be laid on seeds/capsule and 1000 seed weight.

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Genetic introgression from wild species into cultivated groundnut

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Abstract : The cultivated groundnut (*Arachis hypogaea L.*) suffers from many diseases and pests. The wild relatives of groundnut have been found to be number of diseases. The diploid (2n = 20) wild sp.*A.cardenasii* was hybridized with the CV. VRI 2 of *A. hypogaea* (2n=40) and the resultant triploids (2n=30) were studied. The progenies of the triploid gave rise to triploid, tetraploid and hexaploid (2n=60) progenies. The tetraploid progenies were again hybridized with the cultivated groundnut and the resultant F_1 plants were studied. The hybrids exhibited high level of resistance to rust and leafspot diseases which indicated the transfer of genes conferring resistance from *A. Cardenasii*. (*Key Words : Groundnut, A.cardenasii, Triploid, Tetraploid, Hexaploid, Foliar diseases, Resistance*).

Groundnut (*Arachis hypogaea L.*) suffers from many diseases and pests that cause serious yield losses. Wild relatives of crop species have been found to be potential sources of a number of desirable characters, especially resistance to diseases and pests (Knott and Dvorak, 1976). The genus Arachis contains number of such wild species. Gregory *et al.*, (1973) divided the genus into seven sections based on morphological affinities and cross compatibility. The section Arachis Krap. et. Greg. nom. nud. comprises the cultivated tetraploid species, *A.hypogaea*, and a number of compatible