Indian Res. J. Genet. & Biotech 7(1) : 123 – 126 (2015)

Assessment of genetic variability and yield component analysis in Niger (*Guizotia Abyssinica* L.) genotypes.

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(Received: November 2014; Revised: December 2015; Accepted: January 2015)

Abstract

The present investigation was carried out from seven quantitative characters and evaluates the genetic variability, character association and path coefficient analysis was conducted taking twenty-five Niger genotypes and seven yield attributing traits in 2014. Significant population differences existed among the genotypes for all the characters studied except leaf length of plant. High value of phenotypic coefficient of variability (PCV) than genotypic coefficient of variability (GCV).High heritability and genetic advance as percent of mean values indicated scope for improvement in plant height, seed yield per plant, oil content, and days to 50% flowering. The grain yield was found positively and strongly correlated with no of primary branches at genotypic level and negative was days to 50% flowering and leaf length. Path analysis revealed that the significantly positive associations of no of primary branches per plant for seed yield per plant were due to high positive direct and indirect effect via, no. of primary branch per plant respectively. So, no. of primary branch per plant due emphasis may be given in yield improvement.

Keywords: Genetic variability: Genotypes; Phenotypes; Oil-seed; Niger.

Abbreviations: Phenotypic coefficient of variability (PCV); genotypic coefficient of variability (GCV).

Introduction

Niger (*Guizotia abyssinica* (L.f.) Cass. Asteraceae) is an oilseed crop cultivated in Indian subcontinent and East African Countries (Getinet and Sharma,1996). Niger seeds contain about 40% edible oil with fatty acid composition of 75-80% linoleic acid, 7-8% palmitic and steric acids, and 5-8% oleic acid (Dutta *et al.,* 1994). Niger is an important oil seed crop, the seed which is pale yellow with nutty taste and pleasant odour. It's keeping quality poor due to high content of unsaturated fatty acids. The oil of Niger crop is very deficient in India .It is suitable for rain fed condition. Production of oil seeds 0.96 lak tones during 2013. **(Pocket Book on Agricultural Statistics 2013)**
The Niger plant is consumed by sheep but not by cattle .Niger seed cake are valuable cattle feed particularly for milk producing cattle. It is also utilized by the perfume industry. The selection is an important criterion for crop improvement in any breeding programme. The phenotypic variability arises due to interaction of environment variability and genotypic variability. The present investigation assess the which character is directly and indirectly positively correlated to grain yield /plant. These characters that are associated with grain yield must be given top priority during selection process in breeding. The high heritability is coupled with high genetic advance could be beneficial for improvement. Niger is a completely out crossing species with self-incompatibility mechanism. Variability exists for morphological characters **(Pradhan *et al.,* 1995);** 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. An assessment of variability is, therefore, required to judge its potential as base material for genetic improvement. Further direct selection for complex traits like grain 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 seven attributes in twenty five Niger genotypes.

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Published by the Indian Society of Genetics, Biotechnology Research and Development
Biotech Bhawan 5 E Nikhil Estate, DPS Road, Shastripuram, Agra 282007
Online management by www.isgbrd.co.in

Material and Methods

Twenty five Niger genotypes grown in a Randomized Block Design (RBD) with three replications in Kharif 2014 , field experimentation center of crop science M.G.C.G.V Chitrakoot, M.P India. Each genotype was sown in ten rows of 5.4m each with the spacing of 30cm within rows and 10cm between plants. The crop was raised under recommended package of practices and prophylactic plant protection measures need based. Observations were taken on Five randomly selected plants in each entry were taken up for recording data on plot basis for days to 50% flowering plant height, number of primary branches per plant, and number of seeds yield per plant . the oil content was estimated through Soxhlet extraction method of Franz van Soxhlet (1879). Analysis of variance was performed following the standard procedures described by Singh and Chaudhury, 1998. The phenotypic and genotype coefficients of variability were computed according to the method suggested by Burton (1952). Heritability (broad sense) and genetic advance were estimated as per Johnson *et al*. (1955). The phenotypic and genotypic correlations were calculated as per the method described by Al-Jibouri *et al.* (1958). Path coefficient analysis was carried out with genotypic correlations following the method of Dewey and Lu (1959).

Results and Discussion

The analysis of variance revealed significant differences among the genotypes for all the seven Characters. The estimates of genetic variability are presented in Table 2. GCV was comparatively high for number of 1000 seed weight (12.10%), seed yield per plant (10.44%) no. of primary branches (8.60%) and plant height (7.75%). Low GCV / PCV ratio of days to 50% flowering (0.23); number of primary branches per plant (0.76), 1000 seed weight (0.87) and leaf length (0.94) indicated that these characters were highly influenced by environmental factors. High GCV / PVC ratio was recorded for plant height (0.99) and seed yield per plant (0.97). High heritability value was recorded for plant height (98.2%) followed by seed yield per plant (95.5%) and oil content (90.3%) which indicated that selection was effective for these traits. Low heritability was observed for rest of the characters. High heritability coupled with high genetic advance as per cent of mean was recorded for seed yield per plant(95.5) and plant height (98.2) revealing the influence of additive gene action for these traits. Hence the improvement of these traits can be made through direct phenotypic selection. High heritability coupled with low genetic advance as per cent of mean was recorded for number of primary branches (58.8) and days to 50% flowering indicating the effect of non-additive gene action in crop improvement like heterosis Breeding may be beneficial. The estimates of genotypic and phenotypic correlation coefficients for different characters. The genotypic correlation coefficients were similar in direction but higher in magnitude than phenotypic correlation coefficients for all the traits under study, revealing the influence of environment for expression of that character. The grain yield was found positively and strongly correlated with no of primary branches per plant (0.04) at genotypic level and negative was days to 50% flowering (-0.21) and leaf length (-0.09). Table 4. Path analysis revealed that the significantly positive associations of no of primary branches per plant (0.04) for seed yield per plant were due to high positive direct and indirect effect via, no. of primary branch per plant respectively. So, no. of primary branch per plant due emphasis may be given in yield improvement.

Table no. 1 Analysis of variance for seven quantitative characters in Niger genotypes

S. No.	Characters	Mean sum of square		
		Replications	Treatment	Error
1.	Days to 50% flowering	1.48	65.45	2.61
2.	Leaf length (cm)	0.07	1.52	0.06
3.	Plant height (cm)	0.41	137.23	0.81
4.	Number of primary branches per plant	0.28	2.87	0.54
5.	1000 seed weight (g)	0.00	0.01	0.00
6.	Seed yield per plant	0.01	3.65	0.05
7.	Oil content (%)	1.72	23.31	0.80

* Significant at 5% level of probability
** Significant at 1% level of probability

Table no. 2. Estimates of parameters of Genetic variability, heritability and genetic advance for various characters in twenty five genotypes of Niger

S. No.	Characters	PCV%	GCV%	GCV/PCV	Heritability %	Genetic advancement	Genetic advance %mean
1	Days to 50% flowering	23.56	5.45	0.23	88.9	8.88	10.59
2	Leaf length (cm)	6.46	6.08	0.94	88.6	1.35	11.80
3	Plant height(cm)	7.82	7.75	0.99	98.2	13.76	15.82
4	No of primary branches	11.22	8.60	0.76	58.8	1.39	13.60
5	1000 Seed weight(g)	13.80	12.10	0.87	76.8	0.11	21.84
6	Seed yield /plant	10.44	10.21	0.97	95.5	2.20	20.56
7	Oil content (%)	7.76	7.38	0.95	90.3	5.36	14.44

Conclusion

The present investigation is concluded that the grain yield was found positively and strongly correlated with number of primary branches per plant (0.04) at genotypic level and negative was days to 50% flowering (-0.21) and leaf length (-0.09). Path analysis revealed that the significantly positive associations of number of primary branches per plant (0.04) for seed yield per plant were due to high positive direct and indirect effect via, no. of primary branch per plant respectively. So, the traits like number of primary branch per plant should be given top priority during selection in yield improvement programme.

Table 3.Estimate of genotypic (rg) and phenotypic (rp) correlation coefficient for seven quantities characters in twenty five Niger genotypes.

Characters		Days to 50% Flowering	Leaf length (cm)	Plant height (cm)	No of primary branches /plant	1000 seed weight (g)	Oil content (%)	Seed yield /plant (g)
Days to 50% Flowering	rg rp	1.00 1.00	0.11 0.12	0.15 0.14	-0.26 -0.21	0.38 0.33	0.02 0.00	-0.21 -0.21
Leaf length (cm)	rg rp		1.00 1.00	-0.03 -0.02	-0.09 -0.03	0.23 0.27	0.02 0.00	-0.09 -0.08
Plant height (cm)	rg rp			1.00 1.00	-0.44 -0.32	-0.10 -0.08	0.19 0.19	-0.02 -0.02
No of primary branches /plant	rg rp				1.00 1.00	0.03 0.02	0.09 0.10	0.04 0.02
1000 seed weight(g)	rg rp					1.00 1.00	-0.27 -0.21	-0.06 -0.04
Oil content (%0	rg rp						1.00 1.00	-0.08 -0.07
Seed yield/plant (g)	rg rp							1.00 1.00

Table no 4. Direct (diagonal & bold) and indirect effects of Path Coefficients based on genotypic correlation with seed yield per plant in Niger genotypes.

characters		Days to 50% Flowering	Leaf length (cm)	Plant height (cm)	No of primary branches /plant	1000 seed weight(g)	Oil content (%)	Seed yield /plant (g)
Days to 50% Flowering	rg	-0.218	-0.026	-0.033	0.057	-0.084	-0.005	-0.215
	rp	-0.224	-0.027	-0.032	0.049	-0.075	-0.001	-0.213
Leaf length (cm)	rg	-0.008	-0.074	0.002	0.006	-0.017	0.001	-0.094
	rp	-0.008	-0.066	0.001	0.002	-0.018	-0.000	-0.083
Plant height (cm)	rg	0.003	-0.000	0.022	-0.010	-0.002	0.004	-0.022
	rp	0.002	-0.000	0.020	-0.006	-0.001	0.003	-0.021
No of primary branches /plant	rg	0.001	0.000	0.002	-0.005	-0.000	-0.000	0.042
	rp	0.003	0.000	0.004	-0.014	-0.000	-0.001	0.025
1000 seed weight(g)	rg	0.008	0.005	-0.002	0.000	0.022	-0.006	-0.062
	rp	0.013	0.011	-0.003	0.001	0.041	-0.008	-0.040
Oil content (%0	rg	-0.002	0.001	-0.014	-0.007	0.020	-0.075	-0.081
	rp	-0.000	-0.000	-0.011	-0.006	0.013	-0.061	-0.070

Acknowledgement

The authors are highly thankful to the authorities of Jawahar lal Nehru Krishi Vishvvidyalya JNKV Jabalpur for providing necessary genotypes and infrastructure facilities to undertake these studies.

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