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Studies of Genetic Variability and Correlation Coefficient in Sweet Potato (*Ipomoea batatas*)

Anuj Kumar Choudhary, Shanti Bhushan, Sanjay Kumar

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ABSTRACT

The present experiment was carried out during 2011-12. The experimental material comprised seven genotypes of sweet potato including two local check RS-47, RS-92 and one national check i.e. Sree Arun. These lines were planted in RBD with three replications. Data of the five randomly selected plants were recorded for traits viz., vine length (cm), number of tuber per plant, weight of tuber per plant, dry matter (%), harvest index (%) and marketable tuber yield (t/ha). For traits viz., Vine length (cm), HI (%), Dry matter (%) and Marketable Tuber yield/plot (kg) exhibited high h^2 coupled with high GA as per cent of mean it indicated that preponderance of additive gene action suggesting that these traits may be effective for selection in early generation. Tuber length (cm), HI (%) and Dry matter (%) exhibited positive and significant with Marketable Tuber yield/plot. These characters may be considered as an important trait during course of selection for enhancing the yield of sweet potato.

Keywords Sweet potato, Heritability, Correlation.

INTRODUCTION

Sweet potato (*Ipomoea batatas* L.) is an important source of carbohydrate. It belongs to the family convolvulaceae with chromosome number (2n = 6n =90). Sweet potato is widely grown in most parts of tropical and subtropical regions of the world (Laban *et al*. 2015) and ranked 7th among the world's major food crops (Anonymous 2018). Of the approximately 50 genera and more than 1,000 species in the family Convolvoluceae, only *Ipomoea batatas* is of economic importance as food (Edmond and Ammerman 1971). In India, sweet potato is grown in 0.116 million hectares with an annual production of 1207 million tone at productivity of 10.2 MT t/ha during 2018-19 (Agricultural Statistics at a Glance 2019). In Bihar it is mainly grown as food and fodder crops for man as well as milch animals. The objective of experiment was to find out the nature of gene action and relationship between some yield attributing traits for selection of superior lines and used as a parents in further breeding programs.

Anuj Kumar Choudhary*
Department of Plant Breeding and Genetics, Bhola Paswan Shastri Agricultural College, Purnea 854302, Bihar, India

Shanti Bhushan
Department of Plant Breeding and Genetics, VKSCOA (BAU, Sabour), Dumraon 802136, Bihar, India

Sanjay Kumar
Department of Plant Breeding and Genetics, Mandan Bharti Agricultural College, Agwanpur, Saharsa 852201, India

Email: anuj_choudhary23@yahoo.com
*Corresponding author

Table 1. Analysis of variance for nine characters in sweet potato. HI= Harvest index, *Significant at p = 0.05, **Significant at p = 0.01.

Sl. No.	Source of variation/ characters	Mean sum of square due to Replication (df=2)	Treatment (df=6)	Error (df =12)
1.	Vine length (cm)	9.48	1520.60**	6.59
2.	Petiole length (cm)	10.86	7.66**	14.45
3.	Leaf length (cm)	3.81	2.64	2.65
4.	Leaf width (cm)	14.29	1.34	1.62
5.	Tuber length (cm)	0.11	2.35	4.66
6.	Tuber girth (cm)	6.65	12.46**	7.27
7.	HI (%)	2.29	366.55**	13.62
8.	Dry matter (%)	10.33	57.59**	6.83
9.	Marketable tuber yield/ plot	15.76	11.61**	4.69

MATERIALS AND METHODS

The present experiment was carried out at the research farm Tirhut College of Agriculture, Dholi, Muzaffarpur during 2011-12. The experimental material comprised seven genotypes of sweet potato including two local check RS-47, RS-92 and one national check i.e. Sree Arun. These lines were planted in RBD with three replications. Data of the five randomly selected plants were recorded for traits viz., vine length (cm), number of tuber per plant, weight of tuber per plant, dry matter (%), harvest index (%) and marketable tuber yield (t/ha). The data was analyzed as per the method given by Panse and Sukhatme (1985) for ANOVA and correlation coefficient as well as path were analyzed by following the methods given by Wright (1921), Dewey and Lu (1959).

Table 2. Genetic parameters for nine characters of sweet potato. GCV= Genotypic coefficient of variation, PCV= Phenotypic coefficient of variation, h^2 = Heritability in broad sense, GA= Genetic advance.

Sl. No.	Characters	Genetic parameters GCV	PCV	h^2 (%)	GA	GA (%)
1.	Vine length (cm)	44.53	44.61	99.61	80.10	99.16
2.	Petiole length (cm)	5.11	12.59	16.45	1.41	12.91
3.	Leaf length (cm)	4.88	7.73	39.83	1.72	23.38
4.	Leaf width (cm)	3.30	5.74	32.99	1.06	14.41
5.	Tuber length (cm)	0.89	6.43	14.63	0.70	5.33
6.	Tuber girth (cm)	8.26	10.85	58.00	4.97	33.83
7.	HI (%)	22.53	22.95	96.37	38.48	53.95
8.	Dry matter (%)	14.73	15.61	89.00	14.45	56.66
9.	Marketable tuber yield/ plot (kg)	8.09	9.80	68.15	5.39	35.15

RESULTS AND DISCUSSION

Mean sum of squares due to genotypes were found to be highly significant for all the characters except for traits viz., leaf length (cm), leaf width (cm) and tuber length (cm) (Table 1). The high magnitude of PCV and GCV were observed for traits viz., Vine length (cm) and HI (%); expression of these characters may be due to environmental factors. Therefore, these characters can be improved through phenotypic selection similar findings corroborated by Wera *et al.* (2014), Badu *et al.* (2017) and Gurmu *et al.* (2017). Traits viz., vine length (cm), HI (%), dry matter (%) and marketable tuber yield/plot (kg) exhibited high h^2 coupled with high GA as per cent of mean it indicated that preponderance of additive gene action (Table 2) suggesting that these traits may be effective for selection in early generation. Similar findings were observed by Thiyagu *et al.* (2013), Choudhary and Singh (2013), Wera *et al.* (2014), Badu *et al.* (2017), Narasimhamurthy *et al*. (2018), Nwaigwe *et al.* (2016), Mekonnen *et al.* (2020) and Magaji *et al.* (2020).

The aim of correlation studies in primarily to know the suitability of various characters responsible for survival of other traits (Searle 1965). The indirect selection is more effective than direct selection procedure, when the attribute in question has low heritability and/or is not easily and precisely measurable. Correlation coefficients among the various root yield component characters and their effects are presented in Tables 3 and 4. The result indicated that tuber length

Table 3. Phenotypic (Upper value) and genotypic (Lower value) correlation coefficient between different characters combination among nine characters in Sweet Potato. *Significant at p = 0.05, **Significant at p = 0.01.

Characters		Characters								
		Ch-1	Ch-2	Ch-3	Ch-4	Ch-5	Ch-6	Ch-7	Ch-8	Ch-9
Ch-1	P	1.000	-0.040	-0.153	0.102	-0.146	0.004	-0.135	-0.175	-0.015
	G	1.000	-0.175	-0.195	0.134	-0.346	-0.074	-0.128	-0.208	0.015
Ch-2	P		1.000	0.007	0.081	-0.084	0.505	0.037	0.038	-0.099
	G		1.000	0.555	0.015	0.938**	-0.419	0.103	-0.185	0.157
Ch-3	P			1.000	0.173	-0.074	-0.092	0.195	0.215	0.038
	G			1.000	-0.101	0.292	0.051	0.067	0.135	0.046
Ch-4	P				1.000	0.070	0.162	0.056	0.187	-0.318
	G				1.000	-0.731*	-0.476	0.132	-0.049	0.359
Ch-5	P					1.000	0.251	-0.168	0.038	0.216
	G					1.000	0.351	-0.028	-0.024	0.820**
Ch-6	P						1.000	-0.268	0.064	0.397
	G						1.000	-0.212	0.762**	0.117
Ch-7	P							1.000	0.106	0.216
	G							1.000	0.162	0.802**
Ch-8	P								1.000	-0.099
	G								1.000	0.766**

(cm), HI (%) and dry matter (%) had shown positive and significant correlation with marketable tuber yield/plot (kg) comprising high and positive direct effect while tuber length (cm) exhibited negative effect. Indicating these characters may be considered as an important trait during course of selection for enhancing the yield of sweet potato similar findings reported by Nwaigwe *et al.* (2016), Mekonnen *et al.* (2020) and Magaji *et al.* (2020).

The result of this work indicated that wide range of genetic variability as well as direct and indirect effects were observed for traits viz., tuber length (cm), HI (%), dry matter (%) and marketable tuber yield/

Table 4. Genotypic direct (Diagonal) and indirect effect correlation nine characters on yield in sweet potato. Residual effect = 0.200.

Characters	Vine length (cm)	Petiole length (cm)	Leaf length (cm)	Leaf width (cm)	Tuber length (cm)	Tuber girth (cm)	HI (%)	Dry matter (%)	Marketable tuber yield/plot (kg)
Vine length (cm)	0.015	-0.027	-0.009	0.048	0.076	0.009	-0.039	-0.014	0.015
Petiole length (cm)	-0.003	0.157	0.025	0.005	-0.207	0.049	0.031	-0.012	0.157
Leaf length (cm)	-0.003	0.087	0.046	-0.036	-0.064	-0.006	0.020	0.009	0.046
Leaf width (cm)	0.002	0.002	-0.005	0.329	0.161	0.055	0.040	-0.003	0.359
Tuber length (cm)	-0.005	0.147	0.013	-0.263	-0.220	-0.041	-0.009	-0.002	0.820
Tuber girth (cm)	-0.001	-0.066	0.002	-0.171	-0.077	-0.117	-0.064	-0.017	0.117
HI (%)	-0.002	0.016	0.003	0.048	0.006	0.025	0.302	0.011	0.802
Dry matter (%)	-0.003	-0.029	0.006	-0.018	0.005	0.031	0.049	0.066	0.766

plot (kg) ; hence, these characters may be considered as an important trait during course of selection for enhancing the yield of sweet potato.

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