

Correlation Studies of Yield and Yield Contributing Characters and Quality Parameters of Elephant Foot Yam (*Amorphophallus Paeoniifolius* Dennst.) Under The Influence of Different Organic and Inorganic Substances

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Abstract: All the yield attributing characters were found to be positively correlated with each other which consequently improved the corm yield significantly over the two years (2010-11 and 2011-12). The corm yield had negative and significant correlation with days to 50 per cent emergence ($r = -0.934$). However, it showed positive and significant correlations with plant height ($r = 0.938$), pseudo-stem girth ($r = 0.966$), number of pseudo-stem plant⁻¹ ($r = 0.932$), canopy spread ($r = 0.964$), days to maturity ($r = 0.972$), corm yield plant⁻¹ ($r = 0.969$), corm diameter ($r = 0.968$), dry matter content of corm ($r = 0.930$) and starch content of corm ($r = 0.887$).

Key words: Correlation, Elephant foot yam, yield, quality

I. Introduction

Elephant foot yam (*Amorphophallus paeoniifolius* Dennst.) is one of the important tuber crops widely cultivated in sub-tropical regions for its underground food reserves. It is gaining wide acceptability due to its better cooking quality, palatability and various uses in boiled or baked forms and pickles and flours. Even the stem and flowers are used as food (Raghu et al., 1999). In India, the elephant foot yam is commercially cultivated in Andhra Pradesh, Bihar, West Bengal, Orissa, Gujarat, Kerala and North-Eastern states (Nedunchezhiyan et al., 2006). Besides, other growing states are Maharashtra, Tamil Nadu, Jharkhand and Chhattisgarh. Gajendra variety of elephant foot yam is high yielding, free from acidity and is popularly grown all over India as well as Chhattisgarh. It requires huge quantity of seed material, non-availability of planting material and dormancy of tubers is a major constraint of this crop. Therefore, the present study was to examine the characters which associate to increase the yield of elephant foot yam.

II. Materials And Methods

The experiment was conducted at Research and Instructional Farm of Department of Horticulture, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh during Kharif season of the years 2010-11 and 2011-12. The experiments were laid out in Randomized Block Design (RBD) with fifteen treatments and three replications. The treatment consisted of different concentrations of organic and inorganic substances which were applied as pre-planting soaking of corms. Minisets of weight 100 g were planted vertically in the month of July at spacing of 60 × 60 cm in pits of size 30 × 30 × 30 cm at a depth of 10 – 15 cm after treating these minisets with fungicide (Dithane M-45 @ 2.5 g L⁻¹) followed by pre-planting soaking for one hour in different organic and inorganic substances as per treatments. The farm yard manure (FYM) was incorporated in the soil @ 200 q ha⁻¹ before planting of minisets. Recommended dose of nitrogen, phosphorus and potassium were applied @ 100:60:100 kg ha⁻¹ in the form of urea, single super phosphate and murate of potash, respectively. The entire quantity of phosphorus and one third dose of nitrogen and potassium were incorporated as basal applications. However, rest of two, one-third doses of each nitrogen and potassium were applied in two equal splits at 60 and 90 days after planting (DAP). The crop was harvested in the month of February when leaves turn yellow and start drying. Ten plants were sampled randomly from the each plot for recording data on days to 50 per cent emergence, plant height (cm), pseudo-stem girth (cm), number of pseudo-stem plant⁻¹, canopy spread (cm), days to maturity, corm yield kg plant⁻¹, corm yield (t ha⁻¹) and diameter of corm (cm), and quality parameters such as dry matter (%) and starch content (%). The first year (2010-11), second year (2011-12) and pooled data were analysed for correlation coefficient.

The correlation coefficient (r) between different characters and quality parameters was carried out according to Panse and Sukhatme (1985).

$$r = \frac{\text{covariance}(X, Y)}{\sqrt{\text{variance}(X)\text{variance}(Y)}}$$

The test of significance of correlation coefficient was tested by using t- test value and show significant correlation if the calculated t-value is greater than the tabulated t-value at 5 per cent level of significance with (n-2) degree of freedom.

III. Results And Discussion

The correlation coefficient of yield and yield contributing characters and quality parameters studied during both the years (2010-11 and 2011-12) and pooled data are presented in Table 1 to3 and Fig. 1 to 10. The correlation studies during first year (2010-11) indicated that the corm yield was negatively and significantly correlated with days to 50 per cent emergence ($r = -0.914$). However, it showed positive and significant correlation with plant height ($r = 0.961$), pseudo-stem girth ($r = 0.984$), number of pseudo-stem plant⁻¹ ($r = 0.928$), canopy spread ($r = 0.977$), days to maturity ($r = 0.947$). The corm yield plant⁻¹ ($r = 0.965$), diameter of corm ($r = 0.964$), dry matter content of corm ($r = 0.930$) and starch content of corm ($r = 0.789$) were also found to be positive correlation with this character. The study revealed that significant positive correlation between diameter and dry matter content of corm ($r = 0.963$).The yield attributing characters like plant height ($r = -0.900$), pseudo-stem girth ($r = -0.895$), number of pseudo-stem plant⁻¹ ($r = -0.878$), canopy spread ($r = -0.907$), days to maturity ($r = -0.953$), diameter of corm ($r = -0.930$), dry matter content of corm ($r = -0.828$) and starch content of corm ($r = -0.641$) were found to be negatively and significantly correlated with days to 50 per cent emergence. Significant positive correlations were found between plant height and pseudo-stem girth ($r = 0.962$), number of pseudo-stem plant⁻¹ ($r = 0.930$), canopy spread ($r = 0.973$), days to maturity ($r = 0.901$), diameter of corm ($r = 0.978$), dry matter content of corm ($r = 0.973$) and starch content of corm ($r = 0.790$).

During second year (2011-12), almost similar trend was noticed in relation to correlation studies. The corm yield had positive and significant correlations with plant height ($r = 0.868$), pseudo-stem girth ($r = 0.913$), number of pseudo-stem plant⁻¹ ($r = 0.920$), canopy spread ($r = 0.925$), days to maturity ($r = 0.953$), corm yield plant⁻¹ ($r = 0.957$), corm diameter ($r = 0.958$), dry matter content of corm ($r = 0.918$) and starch content of corm ($r = 0.752$). However, days to 50 per cent emergence showed a negative and significant correlation ($r = -0.959$) with these characters.

In case of pooled data, almost similar trend was noticed in relation to correlation studies. The corm yield had negative and significant correlation with days to 50 per cent emergence ($r = -0.934$). However, it showed positive and significant correlations with plant height ($r = 0.938$), pseudo-stem girth ($r = 0.966$), number of pseudo-stem plant⁻¹ ($r = 0.932$), canopy spread ($r = 0.964$), days to maturity ($r = 0.972$), corm yield plant⁻¹ ($r = 0.969$), corm diameter ($r = 0.968$), dry matter content of corm ($r = 0.930$) and starch content of corm ($r = 0.887$). In correlation studies, all the yield attributing characters and quality parameters were positively correlated with each other except the days to 50 per cent emergence which was negatively and significantly correlated with all the characters. Similar results were obtained by Kumar et al.(2010) who revealed that the corm yield of elephant foot yam had significant positive correlations with starch content, plant height, weight of individual corm, size of individual corm, stem girth, canopy spread and dry matter. Germchi et al. (2011) reported negative link between plant height and number of days until germination in potato and positive relationship between tuber numbers plant⁻¹ with plant height. It seems that thiourea by increasing plant height, also increased stems number and declined emergence period and which led to increase in tuber weight (Rezaee and Soltani, 1996).

IV. Conclusion

In correlation studies of yield and yield contributing characters and quality parameters of elephant foot yam, corm yield was negatively and significantly correlated with days to 50 per cent emergence. However, it showed positive and significant correlation with plant height, pseudo-stem girth, number of pseudo-stem plant⁻¹, canopy spread, days to maturity, corm yield plant⁻¹, diameter of corm, dry matter content of corm and starch content of corms.

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Table 1: Correlation coefficient of yield, yield attributing characters and quality parameters of elephant foot yam cv. Gajendra (2010-11)

	Days to 50% emergence	Plant height (cm)	Pseudo-stem girth (cm)	No. of pseudo-stem plant ⁻¹	Canopy spread (cm)	Days to maturity	Corm yield (kg plant ⁻¹)	Corm yield (t ha ⁻¹)	Diameter of corm (cm)	Dry matter of corm (%)
Plant height (cm)	-0.900**									
Pseudo-stem girth (cm)	-0.895**	0.962**								
No. of pseudo-stem plant ⁻¹	-0.878**	0.930**	0.932**							
Canopy spread (cm)	-0.907**	0.973**	0.974**	0.938**						
Days to maturity	-0.953**	0.901**	0.911**	0.886**	0.945**					
Corm yield (kg plant ⁻¹)	-0.902**	0.919**	0.944**	0.833**	0.939**	0.954**				
Corm yield (t ha ⁻¹)	-0.914**	0.961**	0.984**	0.928**	0.977**	0.949**	0.965**			
Diameter of corm (cm)	-0.930**	0.978**	0.959**	0.939**	0.980**	0.951**	0.941**	0.964**		
Dry matter of corm (%)	-0.828**	0.973**	0.938**	0.916**	0.959**	0.855**	0.884**	0.930**	0.963**	
Starch (%)	-0.641**	0.776**	0.814**	0.729**	0.775**	0.622**	0.803**	0.790**	0.699**	0.767**

Note: ** significant at 1 % level

Table 2: Correlation coefficient of yield, yield attributing characters and quality parameters of elephant foot yam cv. Gajendra (2011-12)

	Days to 50% emergence	Plant height (cm)	Pseudo-stem girth (cm)	No. of pseudo-stem plant ⁻¹	Canopy spread (cm)	Days to maturity	Corm yield (kg plant ⁻¹)	Corm yield (t ha ⁻¹)	Diameter of corm (cm)	Dry matter of corm (%)
Plant height (cm)	-0.853**									
Pseudo-stem girth (cm)	-0.941**	0.951**								
No. of pseudo-stem plant ⁻¹	-0.934**	0.857**	0.944**							
Canopy spread (cm)	-0.929**	0.964**	0.972**	0.949**						
Days to maturity	-0.941**	0.936**	0.976**	0.953**	0.972**					
Corm yield (kg plant ⁻¹)	-0.948**	0.886**	0.937**	0.881**	0.899**	0.953**				
Corm yield (t ha ⁻¹)	-0.959**	0.868**	0.913**	0.920**	0.925**	0.953**	0.957**			
Diameter of corm (cm)	-0.967**	0.914**	0.958**	0.935**	0.951**	0.951**	0.944**	0.958**		
Dry matter of corm (%)	-0.894**	0.948**	0.948**	0.938**	0.967**	0.943**	0.885**	0.918**	0.959**	
Starch (%)	-0.829**	0.768**	0.819**	0.684**	0.737**	0.754**	0.894**	0.752**	0.818**	0.725**

Note: ** significant at 1 % level

Table 3: Correlation coefficient of yield, yield contributing characters and quality parameters of elephant foot yam cv. Gajendra (pooled data)

	Days to 50% emergence	Plant height (cm)	Pseudo-stem girth (cm)	No. of pseudo-stem plant ⁻¹	Canopy spread (cm)	Days to maturity	Corn yield (kg plant ⁻¹)	Corn yield (t ha ⁻¹)	Diameter of corn (cm)	Dry matter of corn (%)
Plant height (cm)	-0.911**									
Pseudo-stem girth (cm)	-0.953**	0.973**								
No. of pseudo-stem plant ⁻¹	-0.917**	0.907**	0.950**							
Canopy spread (cm)	-0.946**	0.983**	0.986**	0.954**						
Days to maturity	-0.979**	0.939**	0.979**	0.936**	0.973**					
Corn yield (kg plant ⁻¹)	-0.927**	0.920**	0.955**	0.861**	0.933**	0.970**				
Corn yield (t ha ⁻¹)	-0.934**	0.938**	0.966**	0.932**	0.964**	0.972**	0.969**			
Diameter of corn (cm)	-0.945**	0.970**	0.976**	0.943**	0.985**	0.977**	0.949**	0.968**		
Dry matter of corn (%)	-0.871**	0.976**	0.953**	0.930**	0.969**	0.911**	0.890**	0.930**	0.970**	
Starch (%)	-0.835**	0.851**	0.876**	0.774**	0.853**	0.841**	0.914**	0.887**	0.847**	0.829**

Note: ** significant at 1 % level



