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Correlation and path analysis in sponge gourd (*Luffa cylindrica* L. Roem.)

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Abstract
The present investigation was carried out at Horticultural Research cum Instructional Farm, Indira Gandhi Krishi Vishwavidyalaya, Raipur (C.G.). The experiment conducted on 15 genotypes of sponge gourd was subjected to evaluate parameters of variability, correlation and path analysis for fruit yield and its attributing traits. Significant variation were observed for all the character in all the genotypes used in the experiment. Highest genotypic and phenotypic variation were observed for fruit yield q/ha followed by fruit length, fruit yield per plot, vine length, number of fruit per plant and average fruit weight. The fruit yield q/ha followed by fruit yield per plot, number of fruit per plant, average fruit weight, days to 1st fruit harvest, fruit girth and fruit length showed high heritability coupled with high genetic advance. Correlation revealed that fruit yield per plot was found to be positively and significant correlated with number of fruit per plant, duration of crop, fruit length and node number of male flower. Path coefficient analysis revealed that number of fruit per plant, fruit girth, days to female flower, duration of crop, number of branches per plant, 50% flowering, node number in male and female flower showed positive direct effects on fruit yield per plot. Hence, selection for these traits for improving fruit yield per plot in sponge gourd is suggested.

Keywords: Sponge gourd, genotypes, path analysis, heritability, traits

Introduction
Sponge gourd [*Luffa cylindrica* (L.) Roem.] is an important vegetable crop having chromosomes (2n=26). It is an annual climbing plant with cross pollinated nature. It is difficult to assign with accuracy the indigenous area of *Luffa* species. They have a long history of cultivation in tropical countries of Asia and Africa. Indo-Burma is reported to be the center of diversity for sponge gourd and is originated in subtropical Asian region particularly India (Kalloo, 1993) [2]. *Luffa* commonly called sponge gourd, loofah, vegetable sponge, bath sponge or dish cloth gourd, is a member of cucurbitaceous family. The vernacular names of sponge gourd are kali tori, ghia tori, torianemia, nenuwa, chiori, dundul, ghosaligilka, bhol or tarada and ghiraula in different parts of the world. In India the crop is widely grown in Uttar Pradesh, Bihar, West Bengal, Orissa, Assam, Andhra Pradesh and Kerala. Sponge gourd is commonly grown for its immature tender fruits as well as for sponge which is used for scrubbing purpose. Tender fruits are rich in vitamin A, vitamin C and iron. The fibrous vascular system inside the fruit often separating from the skin, flash and seeds, can be used as a bathroom sponge, as a component of shock absorbers, as a sound proof linings, as a utensils cleaning sponge, as packing materials for making crafts as a ieters factories and as a part of sole of shoes. Sponge gourds are also used as absorbent (Altinisik *et al*. 2010) [1]. Sponge gourd struts are characterized by a microcellular architecture with continuous hollow microchannels, which form vascular bundles and yield a multimodal hierarchical pore system. The cellulose content varies from 55 to 90%, the lignin content is within the range of 10 and 23%, and the hemicelluloses content is around 8 and 22% and ash 2.4%.

The tender fruit used as vegetable which is easily digestible and increases appetite when consumed. The edible fresh and tender fruit contains 94 percent moisture and large number of chemical components including 16Cal per 100g with 9.5g carbohydrates, 2g of protein, 0.25g of fat, 10ug of vitamin A, 12.5mg of vitamin C besides minerals like sodium, calcium, potassium and phosphorus (2.5g, 30g, 375g and 62.5mg respectively). Besides being a vegetable, the mature, dry fruit consist of a hard shell surrounding a stiff, dense network of cellulose fibre (sponge) which is a good source of fiber used in industries for filler and cleaning the motor car, glass wares.

Sponge gourd is an annual climber and monoecious vegetable. There is wide variability in size of fruit; ranging from a few centimeters to one meter, fruit shape and colour as traits are complex and controlled by several genes (Zalapa *et al*., 2006) [4].

It is a cross pollinated vegetable, thus, its natural population has tremendous variability for fruit shape, colour, taste etc. Evaluation of genotypes to assess the exiting variability is considered as preliminary step in any crop improvement programme. In order to pursue an effective breeding programme, the present investigation was carried out to gather information on genetic variability, heritability, correlation and path analysis for different characteristics of sponge gourd.

Material and Methods

The genotype were sown using randomized block design with three replication at Horticulture Reaserch and Instruction farm, Indira Gandhi Krishi Vishwavidyalaya, Raipur (C.G.) during summer season, 2016-2017. The present investigation comprised 15 genotypes of sponge gourd.

Observations

Observation on five randomly selected plants from each replication were recorded for days to male flower appears, days to female flower appears, 50% flowering, node number of male flower, node number of female flower, vine length (cm), number of branch per plant, days to 1st fruit harvest, number of fruit per plant, fruit length (cm), fruit girth (cm), average fruit weight (g), duration of crop (sowing to last harvest), fruit yield per plot (kg) and fruit yield (q/ha).

Results and Discussion

Correlation revealed that Fruit yield per plot had recorded significant positive correlation with number of fruit per plant and duration of crop at both genotypic and phenotypic levels and it showed positive and significant correlation with node number of male flower, vine length and fruit length at genotypic level only and indicating that any increase in these five characters would bring about an enhancement in the yield. Further, Number of fruits per plant showed significant positive correlation fruit yield per plot at both genotypic and phenotypic levels and fruit length at genotypic levels only, suggesting thereby, the increase in either of one will ensure the increase in number of fruit per plant.

The path analysis confined that direct effect of fruit yield per plot on number of fruit per plant (1.618) followed by duration of crop (1.147), fruit girth (0.823), days to female flower appears (0.641), node no. in male flower (0.527.), no. of branch per plant (0.477), node no. of female flower (0.288) and 50% flowering (0.257),whereas, vine length (-1.023), average fruit weight (-0.887), fruit length (-0.789), days to 1st fruit harvest (-0.277) days to male flower (-0.134) were found to be negatively associated with fruit yield per plot but in desirable direction because negative values of these traits are beneficial and contribute positively to the fruit yield per plot.

Table 1: Genotypic path co- efficient for fruit yield and its components in Sponge gourd

Characters	Days to first male flower appears	Days to first female flower appears	Days to 50% flowering	Node no. of male flower	Node no. of female flower	Vine length (cm)	No. of branch per plant	Days to 1st fruit harvest	No. of fruit per plant	Fruit length (cm)	Fruit girth (cm)	Average fruit weight (g)	Duration of crop
Days to first male flower appears	-0.134	0.275	0.305	-0.068	0.124	-0.228	0.047	-0.024	-0.756	-0.062	-0.039	0.005	-0.636
Days to first female flower appears	-0.057	0.641	0.070	0.108	0.047	-0.350	0.073	0.090	0.022	-0.470	0.445	-0.715	-0.313
Days to 50% flowering	-0.159	0.176	0.257	-0.007	0.079	-0.360	0.024	-0.003	-0.649	0.251	0.269	0.234	-0.322
Node no. of male flower	0.017	0.132	-0.003	0.527	0.023	-0.466	0.127	-0.090	0.488	-0.096	0.014	0.070	-0.270
Node no. of female flower	-0.058	0.104	0.071	0.043	0.288	-0.201	-0.198	-0.237	0.277	-0.038	0.086	0.032	-0.251
Vine length (cm)	0.029	0.219	0.090	0.240	0.056	-1.023	-0.052	-0.017	0.590	-0.027	-0.128	0.057	-0.046
No. of branch per plant	-0.013	0.098	0.013	0.141	-0.120	0.112	0.477	-0.165	-1.534	0.101	0.179	0.138	-0.087
Days to 1st fruit harvest	-0.011	-0.209	0.002	0.172	0.246	-0.064	0.283	-0.277	0.038	0.606	-0.779	0.536	-0.733
No. of fruit per plant	0.062	0.008	-0.103	0.159	0.049	-0.373	-0.452	0.065	1.618	-0.277	-0.137	0.022	0.126
Fruit length (cm)	-0.010	0.382	-0.082	0.064	0.013	-0.035	-0.061	0.213	0.568	-0.789	0.638	-0.960	0.439
Fruit girth (cm)	0.006	0.347	-0.084	0.009	-0.030	0.159	0.103	0.263	-0.271	-0.612	0.823	-0.95	0.047
Average fruit weight (g)	-0.008	0.517	-0.067	0.041	-0.010	0.066	-0.074	0.168	-0.040	-0.855	0.889	-0.887	0.393
Duration of crop	0.074	0.175	-0.072	-0.124	-0.063	0.041	-0.036	0.177	0.177	-0.302	0.033	-0.304	1.147

Conclusion

On the basis of this study correlation study suggested that for improvement in yield, selection for such a plant having more number of fruits, more length of fruit would be beneficial. The path analysis confined that direct effect of fruit yield per plot on number of fruit per plant, fruit girth, days to female flower, duration of crop, number of branches per plant, 50% flowering, node number in male and female flower should be considered simultaneously for amenability in fruit yield of sponge gourd will be effective and would help to select the genotypes having highest fruit yield.

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