

Performance Growth, Yield and Quality of Different Sponge Gourd (*Luffa cylindrica* L.) Varieties of Sponge Gourd (*Luffa cylindrica* L.) in Terms of Growth, Yield and Quality under Prayagraj Agroclimatic Condition

ABSTRACT

The present investigation was carried out at the department Department of Horticulture Horticulture, Naini Agricultural Institute Institute Sam Higginbottom University University of Agricultural Technology and Sciences, Prayagraj Uttar Pradesh during Zaid season-2023-2024 with a view to check the Performance of different varieties of sponge gourd in terms of growth, yield and quality under Prayagraj Agroclimatic conditions. The experiment was laid in Randomized Block Design (RBD) with 8 varieties and 3 replications for sponge gourd varietal evaluation. Varieties comprised of V₁ (AVT-2/2020/SPGVAR-1), V₂ (AVT-2/2020/SPGVAR-2), V₃ (AVT-2/2020/SPGVAR-3), V₄ (AVT-2/2020/SPGVAR-4), V₅ (AVT-2/2020/SPGVAR-5), V₆ (AVT-2/2020/SPGVAR-6), V₇ (AVT-2/2020/SPGVAR-7) and V₈ (PUSA CHIKNI). Among the various varieties, it was concluded that the variety AVT-2/2020/SPGVAR-5 performed best in terms of growth parameters like vine length (189.14 cm), earliness in maturity (55.33 days for first fruit picking) and yield parameters like fruit diameter (3.70 cm), fruit length (28.98 cm) and fruit yield per hectare (11.64 t/ha). AVT-2/2020/SPGVAR-5 showed the best performance for quality parameters also like TSS (3.14°Brix) and Ascorbic acid content (10.66 mg/100g).

Keywords: Sponge gourd, TSS, Ascorbic acid, fruit yield per ha, maturity, Performance of variety.

INTRODUCTION

Sponge gourd [*Luffa cylindrica* (L.) Roem.] is a very popular and nutritious vegetable in the tropical and subtropical regions. It also is an important vegetable crop having chromosomes (2n=26). It is an annual climbing plant with cross pollinated nature. gourd is an essential yield. It is difficult to assign. The sponge gourd (*Luffa cylindrica*) is referred to as Kalitori. The plant is classified under the family Cucurbitaceae and is commonly referred to, 2009). *L. cylindrica* fruits are green, and large cylindrical in shape that is crawled/crawl on other materials. According to a nutritionist, sponge 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.

Luffa commonly called sponge gourd, loofah, vegetable sponge, bath sponge or dish cloth gourd, is a member of cucurbitaceous family. The sponge gourd is now widely cultivated in Malaysia, Korea, Japan, Taiwan and China for medicinal purpose. In India the crop is widely grown in U.P., Bihar, W.B., Orissa and Kerala (Arya and Prakash, 2002). In Chhattisgarh, sponge gourd is being grown on about 2597 ha with an annual production of 23447 MT (Anon2017) particularly in Mahasamund, Kanker, Raigarh, Korba and Korba district.

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. 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 (Obah and Aluyor 2009.)

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 (Beyer et al., 2002; Zalapa et al., 2006). Evaluation of genotypes to assess the existing 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.

Water management, disease control, pest management, and soil improvement practices is crucial for successful sponge gourd cultivation in Prayagraj. Few local varieties have gained importance in Uttar Pradesh climatic conditions. There are many good performing varieties and /ha estimate different varieties of Sponge gourd are available in the market also. According to Prayagraj agro-climatic conditions Sponge gourd can be grown successfully with higher yield. In view of the above-mentioned facts, the present study on the varietal evaluation of Sponge gourd varieties under Prayagraj agroclimatic condition.

MATERIALS AND METHODS

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The present investigation entitled was done to understand the plant growth, fruit yield and different quality of sponge gourd varieties under Prayagraj agro-climatic condition. The details of the materials used, and the methods adopted in the investigation, which was carried out at Central Horticultural Research Farm (HCRF), Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences (SHUATS), Prayagraj during the Jan-Jun season of 2023. The experiment was laid in Randomized block design with 8 varieties and 3 replications. Varieties comprised of V1 (AVT-2/2020/SPGVAR-1), V2 (AVT-2/2020/SPGVAR-2), V3 (AVT-2/2020/SPGVAR-3), V4 (AVT-2/2020/SPGVAR-4), V5 (AVT-2/2020/SPGVAR-5), V6 (AVT-2/2020/SPGVAR-6), V7 (AVT-2/2020/SPGVAR-7) and V8 (PUSA CHIKNI). Observations were recorded at different stages of growth for parameters like vine length, days to flower emergence, fruit length and yield per plot and quality parameters like TSS and vitamin C content. The data were statistically analysed by the method suggested by Fisher and Yates.

1. RESULTS AND DISCUSSION

1.1 Vine Length (m) and Number of Branches Per Vine

The data pertaining to Vine length and number of branches per vine significantly varied among different varieties (Table 1). Among the different varieties maximum vine length (189.14 cm) was observed with AVT-2/2020/SPGVAR-5 and minimum vine length (120.99) was observed AVT-2/2020/SPGVAR-3. The difference in vine length among varieties can be explained by a blend of genetic elements and the surrounding environment. Varieties that are genetically suited to specific environmental conditions or have been selectively bred for longer vine length are likely to exhibit superior vine elongation performance. Similar findings were reported by Rathore et al., [2]; Pongen et al., [3]; in sponge gourd; Quamruzzaman et al., [4] in bottle gourd; Ara et al., [5] in pointed gourd; Ramya et al., [6] in Bitter gourd. Among the different varieties maximum number of nodes (40.12 nodes) was observed with AVT-2/2020/SPGVAR-5 and minimum number of nodes (29.14 nodes) was observed AVT-2/2020/SPGVAR-3. The higher number of nodes in one variety of sponge gourd, compared to other varieties, can be attributed to a combination of genetic and environmental factors. This specific variety may possess genetic traits that promote enhanced branching and internode elongation, leading to more nodes. Additionally, favorable environmental conditions, such as ample sunlight, optimal temperature, and nutrient-rich soil, may further stimulate robust growth and node development. Similar findings were reported by Haque et al.,; Sangma et al., in sponge gourd; Ara et al.,; Ramya et al., in Bitter gourd.

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1.2 Day to First Male and Female Flowering and Day to First Fruit Harvest

The data (Table 1) pertaining to day to emergence of first male flower and female flower along with first fruit harvest significantly varied among different varieties. Among the different varieties minimum day to first male flowering (30.78 days) was observed in AVT-2/2020/SPGVAR-5 and maximum day to first male flowering (39.28 days) was observed in AVT-2/2020/SPGVAR-3. Among the different varieties minimum days to emergence of first female flower (33.69 days) was observed with AVT-2/2020/SPGVAR-3 and maximum days to emergence of first female flower (49.05 days) was observed AVT-2/2020/SPGVAR-5. Among the different varieties minimum days to first fruit picking (55.33 days) was observed with AVT-2/2020/SPGVAR-5 and maximum days to first fruit picking (71.92 days) was observed AVT-2/2020/SPGVAR-3.

The better performance of one variety over another in terms of earliness in flowering and maturing can be attributed to genetic factors and environmental conditions. Varieties with genetic traits that promote early flowering, such as early maturation genes or shorter vegetative growth phases, can exhibit faster initiation of flowering and so maturing. Additionally, environmental factors such as temperature, photoperiod, and nutrient availability can influence flowering time. Varieties that are genetically predisposed to respond more favorably to the prevailing environmental conditions, or those that have been selectively bred for early flowering, may show superior performance in terms of early initiation of flowering and thus maturing too. The findings were reported similarly earlier by Reddy et al., in sponge gourd; Ramya et al. in Bitter gourd.

1.3 Number of Fruits Per Plant, Fruit Length, Fruit Diameter and Fruit Weight

Table 2 depicts the data pertaining to number of fruits per plant, fruit length, diameter and fruit weight. Among the different varieties maximum number of fruits per plant (25.3 fruits) was observed with AVT-2/2020/SPGVAR-5 and minimum number of fruits per plant (14.28 fruits) was observed AVT-2/2020/SPGVAR-3. The better performance of one variety over another in terms of producing a higher number of fruits per plant can be attributed to genetic factors and environmental conditions. Among the different varieties maximum fruit length (28.96 cm) was observed with AVT-2/2020/SPGVAR-5 and minimum fruit length (16.76 cm) was observed AVT-2/2020/SPGVAR-3. Among the different varieties

maximum fruit diameter (3.70 cm) was observed with AVT-2/ 2020/SPGVAR-5 and minimum fruit diameter (3.11 cm) was observed AVT-2/2020/SPGVAR-3. Among the different varieties maximum average fruit weight (51.45 g) was observed with AVT-2/2020/SPGVAR-6 and minimum average fruit weight (38.38 g) was observed AVT-2/2020/SPGVAR-3. The better performance of one variety over another in terms of enhanced fruit length, diameter and weight can be attributed to genetic factors and environmental conditions [16-20]. Varieties with genetic traits that promote increased cell division and elongation in fruits can result in longer and larger fruits. Environmental factors such as optimal temperature, sunlight exposure, and nutrient availability can also influence fruit growth and development. Varieties that are genetically predisposed or have been selectively bred for longer and thicker fruits may demonstrate superior performance in terms of fruit length, diameter and weight. Similar conclusions were drawn earlier by Ponggen et al., [3] in sponge gourd; Ramya et al., [6] in Bitter gourd per plant, fruit length and girth, fruit weight can be attributed to genetic factors and environmental conditions. Varieties with genetic traits that promote increased fruit set, such as higher flower-to-fruit conversion rates or enhanced reproductive capacity, can result in a greater number of fruits per plant. Additionally, environmental factors such as optimal temperature, sunlight exposure, and nutrient availability can play a significant role in determining fruit weight. Varieties that are genetically predisposed or have been selectively bred for higher fruit weight may demonstrate superior performance in terms of producing heavier fruits. The findings were in accordance with earlier reports of Haque et al. [9]; Ramya et al.

Table 1. Performance of different Varieties of sponge gourd in terms of yield and quality parameters

Varieties Notation	Varieties details	Vine length (cm)	No of Nodes	Days to first male flowering	Days to first female flowering	Days to first fruit harvest
V ₁	AVT-2/2020/SPGVAR-1	150.28	33.84	34.61	38.84	56.65
V ₂	AVT-2/2020/SPGVAR-2	128.29	35.76	33.43	35.55	60.32
V ₃	AVT-2/2020/SPGVAR-3	120.97	29.14	39.28	33.69	71.92
V ₄	AVT-2/2020/SPGVAR-4	161.60	34.38	36.76	37.57	60.06
V ₅	AVT-2/2020/SPGVAR-5	189.14	40.12	30.78	49.05	55.33
V ₆	AVT-2/2020/SPGVAR-6	140.87	35.13	32.98	36.48	58.95
V ₇	AVT-2/2020/SPGVAR-7	170.76	31.08	37.82	33.11	61.19
V ₈	Pusa Chikni	134.82	38.43	34.11	34.10	68.17
'F' Test		S	S	S	S	S
SE(d)		0.46	1.14	0.79	1.43	0.93
C.D. at 5%		0.84	2.84	3.83	3.77	4.43
C.V.		5.43	4.91	0.58	1.74	8.93

Table 2. Performance of different Varieties of sponge gourd in terms of yield and quality parameters

Varieties Notation	Varieties details	Number offruits per plant	Fruit Length (cm)	Fruit diameter (cm)	Fruit weight (g)	Fruit yield per Hectare (qt/ha)	TSS [°Brix]	Vitamin C content (mg/100g)
V ₁	AVT-2/2020/SPGVAR-1	19.5	24.01	3.61	42.01	6.86	2.00	6.00
V ₂	AVT-2/2020/SPGVAR-2	20.6	25.00	3.80	46.22	10.83	1.71	10.00
V ₃	AVT-2/2020/SPGVAR-3	14.2	16.76	3.11	38.38	6.04	1.50	7.66
V ₄	AVT-2/2020/SPGVAR-4	18.7	24.00	3.34	49.37	9.83	1.50	9.00

V ₅	AVT-2/2020/ SPGVAR-5	25.3	28.98	3.70	51.47	11.64	3.14	11.55
V ₆	AVT-2/2020/ SPGVAR-6	16.4	22.89	3.20	50.81	9.57	2.14	7.36
V ₇	AVT-2/2020/ SPGVAR-7	22.4	25.67	3.30	48.38	8.44	3.10	9.00
V ₈	PUSA CHIKNI	19.6	20.41	3.44	42.12	7.67	2.13	11.00
FTest	S	S	S	S	S	S	S	S
SE(d)	1.30	1.17	0.61	1.58	0.75	0.24	0.69	
C.D.at5%	1.08	1.08	0.45	10.02	0.30	0.40	12.30	
C.V.	0.24	1.20	0.06	0.60	1.96	7.54	2.17	

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1.4 Fruit Yield Per Hectare (qt/ha)

Among the different Varieties maximum average fruit yield per vine (11.64 qt/ha) was observed in with AVT-2/2020/SPGVAR-5 and minimum average fruit yield per hectare (6.04 qt/ha) was observed in AVT-2/2020/SPGVAR-3 (Table 2). The better performance of one Variety over another in terms of enhanced fruit yield can be attributed to genetic factors and environmental conditions. Varieties with genetic traits that promote higher flower-to-fruit conversion rates, increased branching, or enhanced reproductive capacity can result in a greater yield of fruits. Additionally, environmental factors such as pollination efficiency, availability of nutrients and water, and optimal growing conditions can significantly influence fruit production. Varieties that are genetically predisposed or have been selectively bred for higher fruit yield can demonstrate superior performance in terms of overall fruit production per plant. The findings were in accordance with earlier reports of Ramya et al.

Table 3. Cost of cultivation of sponge gourd

Sr	Particular	Unit	Quantity	Rate/Unit	Cost (Rs/ha)
A.	Land Preparations	Hrs.	5	900	4,500
1	Ploughing	Hrs.	4	800	3,200
2	levelling with cultivars	Labour	10	300	3,000
B.	Fertilizers, manures, and seed				
1	Cost of seed	Kg	1.5	3500	5,250
2	Farmyard Manure	Tones	25	800	2,0000
3	Urea	Kg	458	6.5	2,977
4	DAP	Kg	217	24.4	5,294.8
5	MOP	Kg	166	18.5	3,071
6	Labour for Seed Sowing	Mandays	10	300	3,000
7	Labour for fertilizer application	Mandays	15	300	4,500
8	Gap filling	Mandays	10	200	2,000
C.	Intercultural Operations				
1	Weeding and Hoeing	Mandays	15	300	4,500
2	Insecticides and Pesticides		8	800	6,400
3	Neem Oil		4	400	1,600
4	Spraying of Chemicals 6 times	Mandays	15	300	4,500
D.	Irrigation				
1	Irrigation	Labour	24	300	7,200
2	Tuber well Charges	Irrigation	8	500	4,000
F.	Harvesting				
1	Mandays	Labour	30	300	9,000
2	Transportation		L.S		8,000
3	Rental value of land	Months	3	2000	6,000
4	Supervision charges	Days	90	150	13,500
			Total Cost of Cultivation		1,21,493

1.5 T.S.S.[°Brix]andVitaminCContent(mg/100g)

Among the different varieties maximum Total Soluble Solid (43.14°Brix) was observed with AVT-2/2020/SPGVAR-5 and minimum Total Soluble Solid (1.50°Brix) was observed AVT-2/2020/SPGVAR-3. Among the different varieties maximum Ascorbic acid content (11.55 mg/100g) was observed with AVT-2/2020/SPGVAR-5 and minimum Ascorbic acid content (7.66 mg/100g) was observed AVT-2/2020/SPGVAR-3. The better performance of one variety over another in terms of better Ascorbic acid and TSS content can be attributed to genetic factors and environmental conditions. Varieties with genetic traits that promote higher Vitamin C synthesis and accumulation in fruits can result in increased Ascorbic acid content. Additionally, environmental factors such as sunlight exposure, temperature, and nutrient availability can influence the production of Vitamin C in fruits. Varieties that are genetically predisposed or have been selectively bred for higher Ascorbic acid content may demonstrate superior performance in terms of producing fruits with a better concentration of this essential nutrient. The findings were in accordance with earlier reports of Pongen et al., [3] in sponge gourd; Ramya et al., [6] in Bitter gourd

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CONCLUSION

From the above experimental finding it is concluded that the varieties super AVT-2/ 2020/SPGVAR-5 performed best in terms of growth parameters like vine length, earliness in flowering and maturity and yield parameters like fruit length, fruit diameter, and fruit yield per vine. It showed best performance for quality parameters also TSS and Vitamin C content.

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