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Genetic variability on yield and quality of different Sponge gourd (*Luffacylindrica*) genotypes under Prayagraj Agro-climatic condition

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Abstract
A field experiment was carried out during Zaid season, in the year 2023 at Horticulture Research Field, Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj (U.P.) India. Under this study, total 14 new genotypes of sponge gourd were tested and compared with two local checks. Results reflects that, the different genotypes performed differently with regards to growth & yield. The genotype AVT-1,2021/ SPGVAR-4 (T4) recorded best growth which resulted into, higher fruit size (23.87 cm long), fruit diameter (5.50 cm) fruit weight (129.24 g), number of fruits (11.25), higher fruit yield (131.71 q/ha). TSS (4.63%) with attractive fruit colour (dark green) and cylindrical in shape. However, Genotype IET 2022/SPGVAR-6 was early bearer while, Genotype IET 2022/SPGVAR-8 contains more numbers of seeds/ fruit (94.81). Besides it's, Fruit yield showed highest Genotypic (24.96) as well as phenotypic (28.30) co-efficient of variation among all other yield and quality characters under study.

Keywords: Genetic variability, sponge gourd, yield, seeds/fruit and quality

Introduction
Increasing population, per capita income, health consciousness, urbanization, and working women are responsible for increasing demand for nutritionally rich foods in the country. Vegetables are an important component of nutritional security and sustainable income provider sector in agriculture due to their high productivity, use in diversification, nutritional improvement and export potential. Vegetables play an important role in the balance diet by providing not only energy but also supplying vital protective like micronutrients, vitamins, antioxidants & fibbers and induce alkaline reaction inside human body. Vegetables provide nutritional security which is a major problem in our country. Moreover, more economic growth can be achieved by producing vegetables from per unit area which will ultimately uplift the socio-economic status of the farmers. Therefore, it is important to increase the production and productivity of vegetables to fulfil the urgent need.

Sponge gourd (*Luffa cylindrica*) is an important cultivated vegetable and medicinal plant in the family Cucurbitaceae. Sponge gourd is packed with dietary fibber, which plays a crucial role in maintaining a healthy digestive system. It improved immunity, rich in essential vitamins & mineral including vitamin C, vitamin A, and zinc. The success of a systematic breeding programme depends mainly on judicious selection of promising parameter from the gene pool. The available germplasm serves as most valuable natural reservoir in providing donor parent for incorporation or improving the characteristics by genetic reconstruction of plant for developing high yielding varieties (Harlan, 1956) [1].

Thus, in order to increase the production and improvement in productivity of sponge gourd, the cultivation of improved varieties is essential. Further, Improved and high yielding variety can only be released through studies on genetic potential of the sponge gourd (*Luffa cylindrica*). Thus keeping all the facts in view, the present experiment was conducted.

Materials and Methods
The field investigation was carried out during Zaid season of year 2023 at Horticulture Research Field, Department of Horticulture, SHUATs, Prayagraj (U.P.) India.

The experiment was laid out in Randomized block design (RBD) with 16 Varieties/Genotypes, which replicated thrice. The soil of field was sandy loam in texture having sand (57.70%), silt (21.30%), clay (20.80%) with pH (6.6), Organic carbon (3.94 g/kg) with available nitrogen (195.68 kg/ha), available phosphorus (17.84 kg/ha) and available potassium (148.57 kg/ha). The experiment was laid out in Randomized Block Design (RBD) with (6) genotypes from AVT-1 2021 series *viz*. AVT-1 2021/SPGVAR-1, AVT-1 2021/SPGVAR-2, AVT-1, 2021/SPGVAR-3, AVT-1 2021/SPGVAR-4, AVT-1 2021/SPGVAR-5 & AVT-1 2021/SPGVAR-6 and (8) genotypes from initial exploratory trial of 2022 *viz*. IET, 2022/SPGVAR-1, IET, 2022/ SPGVAR-2, IET, 2022/SPGVAR-3, IET, 2022/SPGVAR-4, IET, 2022/SPGVAR-5, IET, 2022/SPGVAR-6, IET, 2022/ SPGVAR-7 and IET, 2022/SPGVAR-8 which were tested /compared with (2) local check namely Harita (check-1) and Sureeli Raje (check-2). The sponge gourd was sown during third weeks of February. Land was prepared properly to maintain uniformity in the field. The recommended dose of Nitrogen 100 kg/ha, Phosphate 50 kg/ha and Potassium 50 kg/ha were applied in the form of Urea, Single super phosphate (SSP) and Muriate of Potash (MoP). Half dose of the nitrogen and full dose of phosphorus and potassium was applied thoroughly during sowing. The balance amount of nitrogen was top dressed at the time of flowering. Top dressed fertilizer was applied in a ring at 6 to 7 cm from the base of the stem. Irrigation was applied as and when required which were six in number. Cultural as well as other Agronomical production practices like weeding, hoeing as per the recommendation. Observations were taken at proper time uniformly in all the genotypes. The data of recorded and analysed statistically (Panseand Sukhatme, 1967) [4] under slandered format of the design and presented below in tabular form for its interpretation.

Results and Discussion

Analysed data on yield attributes presented in table-1, showed that, there were much variation among different genotypes. Character wise results are presented under different sub head.

Yield attributes and yield

1. **Number of days for first picking:** Early picking started in IET 2022/SPGVAR-6 only in 51.46 days which was at par with AVT-1, 2021/SPGVAR-2, AVT-1,2021/SPGVAR-3, AVT-1, 2021/SPGVAR-6, as well as under IET 2022/SPGVAR-2, IET 2022/SPGVAR-3¸ IET 2022/SPGVAR-3, IET 2022/SPGVAR-4, IET 2022 /SPGVAR-5, while in genotype IET 2022/ SPGVAR-8 picking started delayed i.e. in 61.55 days (Table 1).
2. **Fruit length:** Genotype AVT-1, 2021/SPGVAR-4 recorded significantly longer fruit (23.87 cm), while AVT-1, 2021/SPGVAR-6 recorded shortest fruit 17.95 cm. Genotype AVT-1, 2021/SPGVAR-1, AVT-1, 2021/SPGVAR-2, AVT-1, 2021/SPGVAR-3, AVT-1, 2021/SPGVAR-5 and AVT-1,2021/SPGVAR-7 were at par to each other (Table 1).
3. **Fruit diameter:** Fruit diameter of genotype IET 2022/SPGVAR-5 was 5.92 cm thicker, which was at par to AVT-1, 2021/SPGVAR-4, AVT-1, 2021/SPGVAR-6, IET 2022/SPGVAR-3, AVT-1, 2021/SPGVAR-4, AVT-1, 2021/SPGVAR-8, and Surieeli Raje (Check-2). Lowest diameter was recorded in genotype IET 2022/SPGVAR-2 (4.03 cm).
4. **Fruit weight:** Genotype AVT-1, 2021/SPGVAR-4 recorded significantly higher fruit weight 129.24 g, than all other treatments. Except IET 2022/SPGVAR-6. Lowest fruit weight was recorded under genotype IET 2022/SPGVAR-1.
5. **Number of Fruits per plant:** Genotype AVT-1, 2021/SPGVAR-4 recorded highest number of fruits per plant 11.25 which was at par with AVT-1, 2021/ SPGVAR-2. IET 2022/SPGVAR-5. IET 2022/ SPGVAR-6. IET 2022/SPGVAR-7. IET 2022/ SPGVAR-8. In other hand Harita (Check 1) variety recorded lowest number of fruits (7.57) per plant.
6. **Fruit Yield:** Genotype AVT-1, 2021/SPGVAR-4 recorded highest fruit yield 131.71 q/ha which was significantly superior over all other genotypes. Lowest yield was recorded under genotype AVT-1, 2021/SPGVAR-1 which also lower than both the checks (Table 2).
7. Number of Seeds per fruit: Genotype IET 2022/SPGVAR-8 recorded significantly higher number of seeds per fruit (94.81), than lowest which was recorded under IET 2022/SPGVAR-2 (69.79). The rest of the genotypes showed at par number of seeds /fruit to highest one (IET 2022/SPGVAR-8). The maximum variation of 25.02 seeds per plant was recorded (Table 4.5). The yield of Sponge gourd has direct relation with their yield attributing characters as well as their genetic potential under particular climatic condition. In the present experimentation AVT-1, 2021/SPGVAR-4 has more number of fruits/plant, coupled with its weight which was also higher, resulted into more Fruit yield. Singh *et al*. (2011) [6] have also reported the same.

Quality characters

Quality of the fruits are much important characters which depends upon several factors. However, among that some important physical and chemical examination were made**.** Quality of the sponge guard includes physical colour, shape& size and several other characters like protein content, TSS content, fibber as well as cooking quality. Among that, little study has been taken and mentioned below under different sub heads.

- **Total soluble solid:** Total soluble solid percent in pulp of Sponge gourd varied minutely, i.e. non-significant. However, genotype AVT-1, 2021/SPGVAR-1 recorded highest (4.63%) and IET 2022/SPGVAR-1 recorded lowest (4.32%) among different entries.
- **Fruit colour:** There were slight differences in colour variation from light green to dark green. Genotype AVT-1, 2021/SPGVAR-4 and IET 2022/SPGVAR-3 were darkest& lightest in colour respectively. Genotypes of medium size and shape developed light green colour.
- **Fruit shape:** The shape of all the tested genotypes of sponge gourd was regular cylindrical and normal in shape. Some fruit became slight angular rather than straight longer, but that were very few.

Genotypic and Phenotypic variation

Genotypic & Phenotypic variability was studied on above mentioned yield attributing/yield and quality characters of

sponge gourd, presented at Table 3. Table showed that, Fruit yield showed highest Genotypic (24.96) as well as phenotypic variation (28.30) co-efficient of variation among all other yield and quality characters under study. Kousthubha *et al*. (2023) [3] also reported highest genotypic variation in fruit yield of sponge gourd which is close confirmatory with findings of Kannan *et al*. (2019) [2].

Conclusion

On the basis of present investigation it can be concluded that, the genotype AVT-1, 2021/SPGVAR-4 (T_4) perform best growth which resulted into, higher fruit size (23.87 cm long), fruit diameter (5.50 cm), fruit weight (129.24 g), number of fruits (11.25), fruit colour (dark green), higher fruit yield (131.71 q/ha) with TSS(4.63%). However, Genotype IET 2022/SPGVAR-6 was early bearer while, Genotype IET 2022/SPGVAR-8 contains more numbers of seeds/ fruit (94.81). Highest Genotypic as well as phenotypic variation were recorded on fruit yield.

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Table 1: Fruit yield attributing characters of different genotypes of Sponge gourd under Prayagraj agro-climatic condition.

Treatments (Genotypes)	No of days to first picking	Fruit length(cm)	Fruit diameter (cm)	Fruit weight (g)	No of fruits per plants
AVT-1, 2021/SPGVAR-1	59.04	18.22	4.82	104.34	8.04
AVT-1, 2021/SPGVAR-2	55.43	18.24	4.98	109.73	9.87
AVT-1, 2021/SPGVAR-3	53.44	18.77	5.17	115.33	8.79
AVT-1, 2021/SPGVAR-4	59.16	23.87	5.50	129.24	11.25
AVT-1, 2021/SPGVAR-5	58.24	19.95	4.86	111.77	8.74
AVT-1, 2021/SPGVAR-6	54.39	17.95	5.33	115.57	5.98
IET, 2022/SPGVAR-1	58.51	18.55	4.20	101.64	7.35
IET, 2022/SPGVAR-2	53.25	18.37	4.03	105.83	6.45
IET, 2022/SPGVAR-3	56.19	20.43	5.27	113.32	6.02
IET, 2022/SPGVAR-4	51.71	21.57	5.55	107.47	9.17
IET, 2022/SPGVAR-5	52.54	21.93	5.92	114.53	9.77
IET, 2022/SPGVAR-6	51.46	20.8	5.08	119.67	10.16
IET, 2022/SPGVAR-7	56.24	21.5	4.81	117.07	9.98
IET, 2022/SPGVAR-8	61.55	20.98	5.87	114.32	9.48
Harita (Check-1)	54.56	18.67	4.80	106.77	7.57
SureeliRaje (Check-2)	58.45	20.87	5.53	108.77	9.27
F-Test (5%)	Sig	Sig	Sig	Sig	Sig
S.E (d) (±)	2.75	0.79	0.34	5.07	0.91
CD (5%)	5.62	1.61	0.70	10.36	1.87
CV %	6.03	5.79	8.19	5.54	11.74

Table 2: Fruit yield and quality characters of different genotypes of sponge gourd under Prayagraj Agro-climatic condition

Treatments (Genotypes)	Fruit yield (q/ha)	No of seed per fruit	TSS (%)	Fruit colour	Fruit shape
AVT-1, 2021/SPGVAR-1	56.7	82.18	4.74	Light Green	cylindrical
AVT-1, 2021/SPGVAR-2	117.53	83.69	4.61	Green	cylindrical
AVT-1, 2021/SPGVAR-3	61.43	84.64	4.61	Green	cylindrical
AVT-1, 2021/SPGVAR-4	131.71	82.53	4.63	Dark green	cylindrical
AVT-1, 2021/SPGVAR-5	77.92	82.24	4.51	Green	cylindrical
AVT-1, 2021/SPGVAR-6	64.66	80.63	4.50	Green	cylindrical
IET, 2022/SPGVAR-1	72.13	82.36	4.32	Green	cylindrical
IET, 2022/SPGVAR-2	67.17	69.79	4.61	Green	cylindrical
IET, 2022/SPGVAR-3	59.59	72.87	4.52	Dark green	cylindrical
IET, 2022/SPGVAR-4	91.79	82.42	4.64	Light green	cylindrical
IET, 2022/SPGVAR-5	72.77	83.03	4.49	Light green	cylindrical
IET, 2022/SPGVAR-6	74.44	91.41	4.43	Light green	cylindrical
IET, 2022/SPGVAR-7	75.02	71.08	4.57	Green	cylindrical
IET, 2022/SPGVAR-8	72.55	94.81	4.50	Light green	cylindrical
Harita (Check-1)	74.65	78.53	4.49	Dark green	cylindrical
SureeliRaje (Check-2)	71.58	79.68	4.36	Green	cylindrical
F-Test (5%)	Sig	Sig	NS		
S.E (d) (±)	8.45	6.64	0.45		
CD (5%)	17.26	13.56	0.93		
CV %	13.34	9.99	0.14		

Table 3: Study of variability and heritability for 17 different characters in Sponge gourd under Paryagraj condition

S.N	Character	General Mean	Phenotypic variance	Genotypic variance	Phenotypic coefficient of variation	Genotypic coefficient of variation
1	No of days to first picking	55.89	16.73	5.36	7.32	4.14
2	Fruit length (cm)	20.15	4.02	3.09	9.94	8.72
3	Fruit diameter (cm)	5.11	0.39	0.22	12.30	9.18
4	Fruit weight (g)	112.20	72.70	34.07	7.60	5.20
5	No of fruits per plants	9.54	1.51	0.26	12.89	5.32
6	Fruit yield (q/ha)	77.60	482.44	375.31	28.30	24.96
7	No of seed per fruit	81.37	42.71	41.52	8.03	7.92
8	TSS (%)	4.53	0.03	0.00	3.92	0.86

Conclusion

The study concluded that among the tested genotypes of sponge gourd, AVT-12021/SPGVAR-4 exhibited superior growth and yield characteristics, including the largest fruit size, highest fruit weight, and most fruits per plant. This genotype also produced the highest fruit yield and had attractive dark green cylindrical fruits. Genotype IET 2022/SPGVAR-6 was noted for early bearing, while IET 2022/SPGVAR-8 had the highest seed count per fruit. These findings highlight the importance of selecting genotypes with desirable traits for improved yield and quality in sponge gourd cultivation under Prayagraj agro-climatic conditions.

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