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# Evaluation of different genotypes of sponge gourd (*Luffa cylindrica* L.) under foothill condition of Nagaland

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## ABSTRACT

*A field experiment was conducted during Kharif season of 2022 at the Experimental Farm of Department of Horticulture, School of Agricultural Sciences, Medziphema Campus, Nagaland University to evaluate different genotypes of sponge gourd for their growth, yield and quality under foothill condition of Nagaland. Twenty three (23) genotypes of sponge gourd were evaluated in randomized block design with three replications. The experimental material comprised 23 genotypes i.e., NUSG-21-1, NUSG-21-2, NUSG-21-3, NUSG-21-4, NUSG-21-8, NUSG-21-10, NUSG-21-11, NUSG-21-13, NUSG-21-15, NUSG-21-16, NUSG-21-18, NUSG-21-19, NUSG-21-20, NUSG-21-21, NUSG-21-22, NUSG-21-23, NUSG-21-24, NUSG-21-25, NUSG-21-26, NUSG-21-27, NUSG-21-29, NUSG-21-31 and Kashi Divya. Studies showed that among all the genotypes, genotype NUSG-21-18 exhibited maximum vine length (4.67 m), average fruit weight (334.67 g) and yield (185.67 q ha$^{-1}$). Genotype NUSG-21-4 taken shortest time to produce 1$^{st}$ male flower (39.33 days) and genotype NUSG-21-21 taken shortest time to produce 1$^{st}$ female flower (43 days). Ascorbic acid content in fruit was found to be highest (5.16 mg 100g$^{-1}$) in genotype NUSG-21-19. Whereas, maximum TSS (4.13ºB) was found in genotype NUSG-21-20. Based on the experimental findings, it can be concluded that genotype NUSG-21-18 was proved to be potential yielder over other genotypes under foothill condition of Nagaland.*

**Keywords:** Sponge gourd, genotypes, growth, quality, yield

## INTRODUCTION

Sponge gourd (*Luffa cylindrica* L.) is a cross-pollinated crop and a diploid plant with chromosomes (2n = 26) belonging to family cucurbitaceous. Sponge gourd is annual summer vegetable. Fruits of sponge gourd are botanically known as many seeded pepo. Sponge gourd contain gelatinous compound called luffein. Immature fruits are used as vegetable. It is a very popular vegetable in the Tropical and Subtropical regions. Some local names of sponge gourd are chikni turai (Hindi), bhol (Assamese), jhinga (Bengali), pirkanga (Tamil) and gisoda (Gujarati) Sponge gourd is an insect pollinated crop due to monoecious and required pollinaters for better fruit production (Joshi *et al.*, 2005). Sponge gourd importance has increased due to its medicinal, food and industrial value like cleaning utensils, shock absorbers, washroom sponge, used in factories as a filter, crafting, bio diesel and chemical extractions (Oboh and Aluyor, 2009). Sponge gourd is grown on a commercial scale as well as in kitchen gardens in North Indian conditions throughout the summer and rainy seasons (Kanaujia *et al.*, 2020). Sponge gourd is low in calories and rich in dietary fiber, vitamins and minerals. Sponge gourd contain 93.2 g of moisture, 1.2 g of protein, 0.20 g of fat, 0.06 g of riboflavin, 0.4 g of niacin, 120 g of carotene and minerals (calcium 36 mg, phosphorous 19 mg and ferrous 1.1 mg) per 100 g of edible portion (Gopalan *et al.*, 1999). In North East India, sponge gourd is widely grown and consumed as a vegetable. It is particularly popular in states like Assam, Manipur, Tripura, and Mizoram. The warm and humid climate of the region provides favorable conditions for the production of sponge gourd. In North East Indian sponge gourd is used in a variety of dishes. It is cooked as a stir-fry, added to curries, or stuffed with spices and cooked. The tender shoots and leaves of the plant are also used in some traditional recipes. The potential of sponge gourd as fresh vegetables is not fully exploited, this may be due to the lack of proper knowledge about the genotypes best suited under the prevailing agro-climatic condition of Nagaland. Before recommendation of any cultivars suited for this region, it is pertinent to evaluate genotypes giving emphasis on the aspects of genotypic suitability and yield. The performance of the sponge gourd genotypes varies from place to

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place due to varied agro-climatic conditions of the regions and thus the growth and yield of a genotype does not remain same for all the regions. Considering all the above mentioned facts, a pertinent need was felt to undertake an experiment on the evaluation of sponge gourd genotypes under foothill condition of Nagaland so as to identify, the best genotype suited for the agro-climatic condition of foothill of Nagaland.

## MATERIALS AND METHODS

The present investigation was carried out at experimental form of Horticulture, School of Agricultural Sciences Nagaland University Medziphema campus Nagaland during *Kharif* season of 2022. The site of proposed experiment is situated between 20°45'43" N latitude and 93°53'04" E latitude at an elevation of 305 m above mean sea level bearing sub-tropical climate. The experimental material comprised 23 genotypes i.e., NUSG-21-1, NUSG-21-2, NUSG-21-3, NUSG-21-4, NUSG-21-8, NUSG-21-10, NUSG-21-11, NUSG-21-13, NUSG-21-15, NUSG-21-16, NUSG-21-18, NUSG-21-19, NUSG-21-20, NUSG-21-21, NUSG-21-22, NUSG-21-23, NUSG-21-24, NUSG-21-25, NUSG-21-26, NUSG-21-27, NUSG-21-29, NUSG-21-31 and Kashi Divya. All 23 genotypes are evaluated in a randomized block design (RBD) with three replications. Seed are sown in field at 30$^{th}$ June, 2022 in a plot of 3m x 3m with a spacing of 1.5 m between row to row and 1.0 m between plant to plant. Recommended package practices and plant protection measure were adopted during the cropping periods. Observations were recorded for days to first male flowering, days to first female flowering, number of primary branches plant$^{-1}$, leaf length (cm), leaf breadth (cm), vine length (m), fruit length (cm), fruit breadth (cm), number of fruits plant$^{-1}$, average weight of fruit (g), fruit yield (q ha$^{-1}$), number of seed fruit$^{-1}$, total soluble solids (˚Brix) and ascorbic acid content. Ascorbic acid content was determined by using 2, 6 dichlorophenol indophenol visual titration method as given by A.O.A.C. (1984) and expressed in mg 100g$^{-1}$. Experimental data were statistically analysed as suggested by Panse and Sukhatme (2000).

## RESULT AND DISCUSSION

### Growth parameters

Improvement of growth parameters is considered to be a pre-requisite to increase the yield. The data obtained from present investigation on growth attributes exhibited significant differences by all the genotypes (Table 1). There was a significant difference in first male flower appearance among different genotypes. First male flower appearance ranged between 39.33 to 52.67 days. Genotype NUSG-21-4 had taken shortest time to reach first male flowering (39.33 days) followed by NUSG-21-23 (40.0 days). Conversely, genotype NUSG-21-31 taken longest time (52.67 days) to reach first male flowering. Similar findings were previously reported by Narayan *et al.* (2013). Similarly, days to first female flower also showed significant difference between all the genotypes ranged from 43.00 to 57.33 days. Genotypes NUSG-21-21 was taken minimum time (43.00 days) to reach first female flowering while genotype NUSG-21-25 was taken the longest time (57.33 days). Similar findings were also reported by Varalakshmi *et al.* (2016). Number of primary branches was found non significant. All the genotypes showed significant variation in regard to leaf length. The leaf length was ranged between 13.50 to 20.17 cm. Genotype NUSG-21-23 recorded maximum leaf length while, lowest was recorded in genotype NUSG-21-11 (13.50 cm). Leaf breadth also showed significant variation among the genotypes ranged from 17.50 (genotype NUSG-21-11) to 23.07 cm (genotype NUSG-21-23). Significantly difference was also observed among the genotypes with respect to vine length during full maturity. It varied from 2.39 to 4.67 m. Highest vine length (4.67 m) was recorded by the genotype NUSG-21-18 followed by NUSG-21-16 (4.51 m). Shortest vine length (2.39 m) was recorded in genotype NUSG-21-25. The results are conformity with the findings of Gaonkar *et al.* (2023). The wide variation in growth parameters of all the genotypes might be due to inherent character and genetic makeup of the genotypes. Since, all the genotypes were grown in same climatic condition.

Table 1: Performance of sponge gourd genotypes for growth parameters

| Genotypes | Days to first male flowering | Days to first female flowering | Number of primary branches | Leaf length (cm) | Leaf breadth (cm) | Vine length (m) |
|---|---|---|---|---|---|---|
| NUSG-21-1 | 42.00 | 45.00 | 4.33 | 15.83 | 19.43 | 3.00 |
| NUSG-21-2 | 41.33 | 44.33 | 4.00 | 15.33 | 19.17 | 3.33 |
| NUSG-21-3 | 40.33 | 45.00 | 4.67 | 14.67 | 17.67 | 3.37 |
| NUSG-21-4 | 39.33 | 43.33 | 4.00 | 14.83 | 18.83 | 3.03 |
| NUSG-21-8 | 52.33 | 55.67 | 4.00 | 16.00 | 20.50 | 2.77 |
| NUSG-21-10 | 48.33 | 51.67 | 4.00 | 15.67 | 21.83 | 3.03 |
| NUSG-21-11 | 52.33 | 55.00 | 5.00 | 13.50 | 17.50 | 3.07 |
| NUSG-21-13 | 46.33 | 52.00 | 4.33 | 16.00 | 21.77 | 3.66 |
| NUSG-21-15 | 43.67 | 48.00 | 4.00 | 15.67 | 21.83 | 2.81 |
| NUSG-21-16 | 45.33 | 51.00 | 4.67 | 15.67 | 19.33 | 4.51 |
| NUSG-21-18 | 49.67 | 52.00 | 4.33 | 15.33 | 19.17 | 4.67 |
| NUSG-21-19 | 46.00 | 48.33 | 4.33 | 14.33 | 18.33 | 3.05 |
| NUSG-21-20 | 40.67 | 44.33 | 4.00 | 15.83 | 20.50 | 3.82 |
| NUSG-21-21 | 40.00 | 43.00 | 4.33 | 18.33 | 21.00 | 3.42 |
| NUSG-21-22 | 47.67 | 50.33 | 5.00 | 14.77 | 19.17 | 4.20 |
| NUSG-21-23 | 40.00 | 49.33 | 4.00 | 20.17 | 23.07 | 3.15 |
| NUSG-21-24 | 48.00 | 52.67 | 4.67 | 18.17 | 21.67 | 3.07 |
| NUSG-21-25 | 52.00 | 57.33 | 4.67 | 16.17 | 19.83 | 2.39 |
| NUSG-21-26 | 41.67 | 44.00 | 3.67 | 16.50 | 20.17 | 2.93 |
| NUSG-21-27 | 50.33 | 52.67 | 4.67 | 16.17 | 20.60 | 2.94 |
| NUSG-21-29 | 41.33 | 45.33 | 4.33 | 14.93 | 17.67 | 2.98 |
| NUSG-21-31 | 52.67 | 55.67 | 4.00 | 18.47 | 21.50 | 2.91 |
| Kashi Divya | 42.00 | 46.00 | 4.33 | 15.93 | 21.83 | 3.76 |
| SEm± | 0.97 | 1.72 | 0.43 | 0.52 | 0.66 | 0.27 |
| CD (P=0.05) | 2.76 | 4.89 | NS | 1.47 | 1.89 | 0.77 |

**Yield and yield attributes**

It is evident from the Table 2 that there is significant difference in yield and yield attributing characters among various genotypes. The recorded data for number of fruits plant$^{-1}$ showed significant variation which ranged from 3.33 to 6.33. The maximum number of fruits plant$^{-1}$ (6.33) was exhibited by genotype NUSG-21-11 while the minimum number of fruits plant$^{-1}$ (3.33) was recorded in NUSG-21-26. It is due to genetic behavior of the genotype to have number of fruits plant$^{-1}$ and having suitable environmental conditions. Similar findings were reported by Kannan *et al.* (2019). All the genotypes showed significant effect on average fruit weight of sponge gourd. Average fruit weight varied from 97.67 to 334.67 g. The maximum average fruit weight (334.67 g) was recorded in genotype NUSG-21-18 while the minimum (97.67 g) was recorded by genotype NUSG-21-25. The average fruit weight was extremely important character for improvement of sponge gourd yield. Similar findings were previously reported by Ara *et al.* (2015). The significant variation in regard to fruit length ranged from 15.50 cm to 32.10 cm. Maximum fruit length (32.10 cm) was exhibited by genotype NUSG-21-19 and the minimum fruit length (15.50 cm) was recorded in genotype NUSG-21-27. It was due to the genetic behavior of the genotype to have higher fruit length and the environmental conditions. Similar findings were previously reported by Dubey *et al.* (2013). Fruit breadth was also showed a significant variation ranged from 4.10 to 6.40 cm. Among the genotypes, the maximum fruit breadth (6.40 cm) was recorded in NUSG-21-31 and the least (4.10 cm) was recorded in genotype NUSG-21-11 is due to genetic behavior of the genotype to have higher fruit diameter and having suitable environmental conditions. Similar findings were previously reported by Hanumegowda *et al.* (2012). There was significant difference among the genotypes in term of fruit yield. The yield obtained from genotypes was ranged between 39.07 to 185.67 q ha$^{-1}$. Genotype NUSG-21-18 recorded maximum yield (185.67 q ha$^{-1}$) followed by genotype NUSG-21-31 (170.37 q ha$^{-1}$). NUSG-21-26 recorded the minimum yield of

Table 2: Performance of sponge gourd genotypes for yield and quality parameters

| Genotypes | Number of fruits plant$^{-1}$ | Average fruit weight (g) | Fruit length (cm) | Fruit breadth (cm) | Yield (q ha$^{-1}$) | Number of seeds fruit$^{-1}$ | Total soluble solid (˚Brix) | Ascorbic acid (mg 100g$^{-1}$) |
|---|---|---|---|---|---|---|---|---|
| NUSG-21-1 | 4.00 | 210.00 | 19.67 | 6.23 | 93.33 | 287.33 | 3.13 | 2.87 |
| NUSG-21-2 | 4.00 | 169.00 | 20.93 | 4.53 | 75.11 | 239.33 | 3.67 | 2.29 |
| NUSG-21-3 | 4.00 | 193.33 | 16.07 | 5.53 | 85.85 | 283.33 | 3.67 | 3.44 |
| NUSG-21-4 | 4.33 | 101.33 | 17.40 | 4.63 | 48.70 | 196.33 | 3.40 | 2.87 |
| NUSG-21-8 | 4.00 | 141.67 | 16.27 | 5.00 | 62.89 | 252.00 | 3.13 | 2.87 |
| NUSG-21-10 | 4.33 | 184.00 | 22.57 | 4.17 | 88.59 | 262.67 | 3.13 | 2.87 |
| NUSG-21-11 | 6.33 | 143.33 | 21.93 | 4.10 | 100.77 | 202.33 | 3.93 | 2.29 |
| NUSG-21-13 | 5.00 | 202.67 | 26.07 | 4.43 | 112.52 | 285.33 | 4.07 | 2.87 |
| NUSG-21-15 | 6.00 | 204.00 | 22.13 | 5.97 | 136.00 | 296.00 | 4.00 | 2.87 |
| NUSG-21-16 | 4.33 | 234.00 | 28.47 | 4.73 | 112.67 | 295.67 | 3.73 | 1.72 |
| NUSG-21-18 | 5.00 | 334.67 | 23.90 | 5.97 | 185.67 | 296.33 | 3.73 | 3.44 |
| NUSG-21-19 | 3.67 | 301.33 | 32.10 | 4.83 | 122.81 | 287.00 | 4.07 | 5.16 |
| NUSG-21-20 | 5.33 | 182.33 | 21.20 | 4.70 | 107.96 | 173.33 | 4.13 | 2.87 |
| NUSG-21-21 | 6.00 | 209.33 | 26.43 | 4.53 | 139.48 | 166.33 | 4.00 | 4.01 |
| NUSG-21-22 | 6.00 | 200.33 | 17.40 | 5.20 | 133.48 | 189.67 | 4.07 | 2.29 |
| NUSG-21-23 | 5.33 | 140.33 | 21.57 | 4.37 | 83.11 | 165.67 | 3.73 | 2.87 |
| NUSG-21-24 | 4.67 | 246.00 | 24.17 | 5.27 | 127.55 | 228.67 | 3.33 | 2.29 |
| NUSG-21-25 | 4.00 | 97.67 | 15.57 | 4.23 | 43.33 | 191.67 | 3.27 | 2.87 |
| NUSG-21-26 | 3.33 | 105.67 | 18.30 | 5.07 | 39.07 | 223.67 | 3.53 | 4.01 |
| NUSG-21-27 | 3.67 | 175.00 | 15.50 | 4.93 | 71.30 | 239.67 | 3.87 | 1.72 |
| NUSG-21-29 | 6.00 | 199.00 | 17.27 | 5.93 | 132.66 | 186.00 | 3.80 | 4.01 |
| NUSG-21-31 | 6.00 | 255.67 | 16.40 | 6.40 | 170.37 | 199.67 | 3.57 | 1.72 |
| Kashi Divya | 4.33 | 168.00 | 19.03 | 5.20 | 80.89 | 194.00 | 3.37 | 3.44 |
| SEm± | 0.58 | 1.16 | 0.89 | 0.33 | 0.89 | 12.45 | 0.06 | 0.47 |
| CD (P=0.05) | 1.64 | 3.32 | 2.53 | 0.93 | 2.53 | 35.48 | 0.18 | 1.33 |

39.07 q ha$^{-1}$. The genotype NUSG-21-18 is found to be significantly superior over other genotypes in respect to yield. Fruit yield per hectare was a complex character which was shaped through various yield attributing characters. Difference in yield might be due to the genetic effect and their response to environmental condition. Similar findings were previously reported by Ara *et al.* (2015). The number of seeds fruit$^{-1}$ of sponge gourd genotypes ranged from 165.67 to 296.33 which showed significant variation among the genotypes. The genotype NUSG-21-18 recorded the maximum number of seeds fruit$^{-1}$ (296.33) while the minimum (165.67) was recorded in genotype NUSG -21-23.

**Quality attributes**

Quality of sponge gourd is usually evaluated by TSS and ascorbic acid content. Data from table 2 revealed that all the genotypes showed significant difference for quality attributes. Different genotypes differed significantly in regard to TSS. Maximum TSS (4.13ºB) was recorded by genotype NUSG-21-20. Whereas, minimum (3.13ºB) was recorded by genotypes NUSG-21-1, NUSG-21-8 and NUSG-21-10. The difference may be due to the inherent character and genetic makeup of the varieties and environmental conditions. Results are conformity with the finding of Harika *et al.* (2012) and Iqbal *et al.* (2019). Ascorbic acid content in sponge gourd also varied significantly under all the genotypes. Ascorbic acid content in fruits ranged between 1.72 to 5.16 mg 100g$^{-1}$. Maximum ascorbic acid content was recorded in genotype NUSG-21-19 (5.16 mg 100g$^{-1}$) while minimum ascorbic acid content (1.72 mg/100g) was recorded in genotype NUSG-21-16 and NUSG-21-27. The variation in ascorbic acid content may be due to the inherent character and genetic makeup of the varieties and environmental conditions. Results are conformity with the finding of Harika *et al.* (2012) and Iqbal *et al.* (2019). Based on the experimental findings, it may be concluded that, genotype NUSG-21-18 was proved to be potential yielder

over other genotypes Therefore, genotype NUSG-21-18 is recommended as best genotype for commercial cultivation and further crop improvement programme under foothill conditions of Nagaland.

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