

# Fruit Length Mutant SKBH 2756 in Okra [*Abelmoschus esculentus* (L.) Moench] – A Guinness Record

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**Abstract:-** Okra [*Abelmoschus esculentus* (L.) Moench], is the most important vegetable crop . It is used to cure goiter, leucorrhoea, diabetes, constipation, catarrhal jaundice etc. With the objective of increasing yield and resistance to yellow vein mosaic disease six doses of gamma irradiations were attempted in okra. The effect of gamma radiations on fruit length and other yield attributing traits were studied in M<sub>1</sub>,M<sub>2</sub> and M<sub>3</sub> generations.Among these,400Gy irradiation was found to increase fruit length and other yield attributing traits compared to the control plants.The selected mutant in M<sub>3</sub> generation produced fruits upto 57cm (22.3inch) long and it is identified as fruit length mutant SKBH 2756 ,reported for the first time in this study.

**Keywords:-** *Abelmoschus esculentus*, gamma rays,fruit length mutant SKBH 2756

## I. INTRODUCTION

Okra [*Abelmoschus esculentus* (L.) Moench], belongs to Malvaceae is one of the most important vegetable crops grown in tropical conditions. It is a crop valued for its tender green fruits. It is extensively grown all over India due to its wide range of adaptability and ease of cultivation. India is the largest producer of bhindi and it is used to cure goiter, leucorrhoea, functional impotency, diabetes, constipation, catarrhal jaundice and burning in the eyes and all over the body. However, the widespread incidence of yellow vein mosaic disease in this crop has affected its successful cultivation. It is a virus disease transmitted by the white fly (*Bemisia tabaci*). In bhindi, previous authors have also attempted mutation breeding by using various doses of gamma irradiations [1,2,3,4,5]. With the objective of increasing yield and resistance to yellow vein mosaic disease six doses of gamma irradiations were done in okra . The effect of gamma radiation on fruit length and other yield attributing traits were studied.

## II. MATERIALS AND METHODS

Based on the comparative studies on yield attributing characters of 25 accessions collected from different localities of Kerala a superior variety namely Anakomban was selected. This variety was used for irradiation for further improvement of characters. The seeds were irradiated at six different dose levels such as 100Gy,150Gy, 200Gy, 300Gy, 400Gy and 500Gy. These doses were delivered from a 3500 curie CO<sup>60</sup> gamma cell installed at

Kerala Agriculture University, Vellanikkara. The gamma source was stationary and its irradiations were done at a dose rate of 3200 Rads/min by moving down a cylindrical gasket carrying the seeds.

Experiment was laid out in Randomised Block Design, with seven treatments and four replications. The 140 seeds of each of the seven treatments were sown on the third day of treatment at the rate of 20 progeny rows/ treatment with proper randomization. The seeds were soaked overnight to facilitate uniform pre- soaking. Data on qualitative and quantitative characters of M<sub>1</sub> generation were gathered from 25 plants/treatment. The seeds of M<sub>1</sub> generation were collected and M<sub>2</sub> and M<sub>3</sub> generations were raised for further selection.

For scoring of Yellow Vein Mosaic disease intensity in the irradiated populations (M<sub>1</sub> , M<sub>2</sub> and M<sub>3</sub> generations), a rating scale was used [6].Screening for resistance in M<sub>3</sub> generation was done by growing selected mutants along with *Bemisia tabaci* in glass house. Methodology for noting germinability of the seeds was already published[7].

## III. RESULTS AND DISCUSSION

Among the six doses of gamma irradiations used(100Gy,150Gy,200Gy,300Gy,400Gy and 500Gy), 400Gy exposure was found to increase plant height, internode length, number of leaves/plant, pollen sterility, number of fruits/plant and fruit characters such as length, girth, weight, number of seeds/fruit and weight of 100 seeds in M<sub>1</sub> , M<sub>2</sub> and M<sub>3</sub> generations compared to the control.The results of M<sub>1</sub> and M<sub>2</sub> generations were already published[7,8].The details of various characters of M<sub>3</sub> are presented in Table 1 .

It is seen that percentage of germination varied from 45 per cent in 500Gy to 95 per cent in 400Gy exposure and it exceeded to that of control with 90 per cent [7]. The progressive decrease in percentage of germination with increase in gamma ray doses was also reported in sesame [9,10] .

In order to study the effects of the mutagen in M<sub>2</sub> generation, 300Gy and 400Gy irradiated plants were raised and data on YVM disease and other yield attributing characters were recorded.

It is seen that all the characters of tallest plants of 400Gy M<sub>2</sub> generation exceeded to that of 400Gy M<sub>1</sub> plants. Among these based on the rating of YVM disease 16 plants were selected as resistant plants and their fruits were collected separately after selfing. The plants attained a maximum height of 152cm with strikingly larger fruits, upto 46cm long. The fruit contained upto 127 seeds . The plants showed the abnormalities like two leaves from a single node , bulging of three ovaries with 11 stigmata , ovary with six stigmata and extra ovary with elongated stigma , flower with six petals or seven petals , two fruits from a single node , fruits with ten locules etc. But the plants showed moderate resistance to the disease.

In the case of 300Gy M<sub>2</sub> plants, the values of all the characters were lower than that of 300Gy and 400Gy M<sub>1</sub> plants as well as 400Gy M<sub>2</sub> plants. The plants showed the abnormalities such as lethality at young stage, stunted growth, flowers with crumbled corolla , flower without stigma and flowers with four petals. The plants were moderately resistant to the disease.

M<sub>3</sub> generation was raised by germinating 400Gy irradiated M<sub>2</sub> seeds for selection of desired mutants. The details of the yield attributing characters namely fruit length, fruit girth, fruit weight, number of seeds per fruit, 100 seed weight and number of fruits per plant of five selected mutants were recorded( Table 1). It is seen that height at the time of flowering in the control was 104.27±1.16 cm. Increase in height was noted in the selected mutants of 400Gy irradiated population in M<sub>3</sub> generation upto 153.14±1.68 cm.

Among the five selected 400 Gy irradiated progenies maximum number of fruits was developed in mutant 1(16.24± 0.53) while lowest number was observed in mutant 5(12.45±0.52). Mutant 1, SKBH2756 (fig.1) produced fruits with 45.28± 2.46cm length and the longest fruit(fig.2) attained a maximum length of 57cm(22.3inch) having 124.26± 3.21seeds(fig. 3) compared to the mutant 5 [40.78± 1.27cm) and control(34.96± 2.45cm). Similarly girth of fruit, fruit weight , number of seeds/fruit and 100 seed weight were also higher in mutant 1 and lowest in mutant 5. Thus it is evident that length of fruit and other yield attributing traits were higher in the selected mutants of M<sub>3</sub> generation compared to the control plants.

Previous authors have reported increase in fruit length following gamma irradiation or chemical mutagens . Thus 4.6 cm increase in fruit length was reported in the mutant obtained after 45 KR gamma irradiation in Parbhani Kranti variety of okra [11]. Later 3.08 cm increase in fruit length was reported in the mutants of Arka Anamika variety of okra in M<sub>2</sub> (20.32cm) followed by 5KR to 20KR gamma irradiation [12]. Subsequently increase in fruit length from 11.8 cm (control) to 13.1 cm was reported in the mutant obtained by 0.5 per cent ethyl methane sulphonate treatment in okra [13] . Recently fruit length increment of 1.1 cm by 0.1 per cent ethyl methane sulphonate treatment was reported in Pehuji variety of okra[14] in M<sub>2</sub> generation (11.7 cm) compared to control(10.6 cm). In the present study 10

cm increment in fruit length was observed in mutants of M<sub>3</sub> generation followed by 400Gy gamma irradiation. The effect of 400Gy irradiation may be due to the fact that mutagens stimulate activity of enzymes and growth regulators responsible for increasing yield .

From the five selected mutants, grown along with *Bemisia tabaci* in the glass house, three mutants (SKBH 2756, SKBH 2757 and SKBH 2758) were selected based on their resistance. They didn't show the symptoms of the disease. The mutants were taller and produced exceptionally longest fruits with a maximum length of 57cm(22.3 inch), the longest fruit so far reported in okra. The mutant with longest fruits was identified as 'fruit length mutant SKBH 2756'. Thus the most remarkable achievement of the study is the development of longest fruits with 10 cm increment in length and resistance to YVM disease by 400 Gy gamma irradiation in addition to the increment in other yield attributing traits. Further trials on the high yielding resistant types will generate high yielding varieties.

#### IV. CONCLUSIONS

Among the six doses of gamma irradiations used(100Gy,150Gy,200Gy,300Gy,400Gy and 500Gy), 400Gy exposure was found to increase fruit length and other yield attributing traits compared to the control plants. The selected mutant produced fruits upto 57cm (22.3 inch) long and is identified as fruit length mutant SKBH 2756 ,reported for the first time in this study.

#### ACKNOWLEDGEMENT

The authors are grateful to Dr.M.R.Lovely,Principal,Prof.K.Raveendranath and Prof.D.Jayaprasad(former Principals), Dr.P.S.Udayan, HOD,Prof.P.Balachandran and Dr.G.Jayakrishnan(former HODs) Dept. of Botany, Sree Krishna College, Guruvayur for providing facilities and encouragement. The authors are also thankful to the UGC, New Delhi for financial assistance as UGC MRP.

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| Treatment | Germination (%) | Survival (%) | Internode length (cm) | Plant height (cm) | Total number of leaves | Pollen sterility (%) | No. of fruit/plant | Effective flowering period | Fruit length (cm) | Fruit girth (cm) | Fruit Weight (gm) | No. of locules in the fruit | No. of seeds/fruit | 100 Seed weight (gm) | Mean disease rating of YVM |
|-----------|-----------------|--------------|-----------------------|-------------------|------------------------|----------------------|--------------------|----------------------------|-------------------|------------------|-------------------|-----------------------------|--------------------|----------------------|----------------------------|
| Control   | 82.00           | 88.00        | 5.34±0.37             | 104.27±1.16       | 31.24±0.39             | 1.38                 | 12.18±0.41         | 55-90                      | 34.96±2.45        | 9.08±0.29        | 45.28±1.04        | 6,7                         | 72.47±3.85         | 7.281                | 3.2                        |
| Mutant 1  | 80.00           | 74.00        | 9.37±0.26             | 153.14±1.68       | 41.34±0.41             | 12.68                | 16.24±0.53         | 58-92                      | 45.28±2.46        | 10.68±0.21       | 72.01±1.18        | 5,6,7                       | 124.26±3.21        | 8.134                | 2.0                        |
| Mutant 2  | 76.00           | 71.00        | 8.32±0.30             | 151.26±1.53       | 37.22±0.37             | 16.21                | 14.42±0.48         | 65-88                      | 43.31±1.29        | 9.54±0.33        | 69.41±1.37        | 5,6,7                       | 120.14±2.87        | 7.775                | 2.2                        |
| Mutant 3  | 73.00           | 69.00        | 7.63±0.38             | 148.11±1.07       | 36.20±0.32             | 19.48                | 13.28±0.50         | 63-90                      | 41.45±1.18        | 9.37±0.26        | 68.55±1.28        | 5,6,7                       | 118.76±2.47        | 7.388                | 2.4                        |
| Mutant 4  | 72.00           | 63.00        | 6.25±0.41             | 142.73±1.38       | 32.57±0.29             | 22.36                | 12.53±0.44         | 62-91                      | 41.36±1.23        | 9.29±0.28        | 63.63±1.09        | 5,6,7                       | 106.94±2.62        | 7.349                | 2.3                        |
| Mutant 5  | 68.00           | 62.00        | 6.17±0.23             | 140.58±1.98       | 31.68±0.40             | 22.28                | 12.45±0.52         | 65-92                      | 40.78±1.27        | 9.25±0.31        | 60.58±1.24        | 5,6,7                       | 103.87±1.97        | 7.302                | 2.4                        |

Table 1:- Effect of gamma rays(400Gy) on various traits of selected mutants of M<sub>3</sub> generation of *Abelmoschus esculentus*

Guinness records of fruit length in okra so far known

According to Limca book of records the largest okra fruit with 16.5 inches was reported from Sharjah on 12.12.2012.It was followed by the report of okra with 16 inches by Sudheesh in UAE,18 inches in George Town by Chong kah yuan and 18.5 inch by a Jamaican woman. Later largest fruit with 19.5 inch was produced by Pala woman,Kitch (India book of records) and fruit with 19.6 inch was reported by Ani Valiyaveetil (India book of records,11.2.2019).Recently James Thaikkad of Thrissur reported 22.1 inch long okra fruit on 24.7.2020.The present report of okra with 22.3 inch(57cm) is a new report .

**Fruit length mutant SKBH 2756  
in M<sub>3</sub> after 400 Gy irradiation**



**Fig1. Mutant SKBH 2756**



**Fig 2. Fruits of SKBH 2756  
up to 22.3 inch long**



**Fig 3. Seeds of SKBH 2756**