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Performance of tomato variety Kashi Aman under different growing containers

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Abstract

Studies conducted to evaluate the tomato variety “Kashi Aman” under different growing containers and found that the substantial variations among treatments in growth parameters, flowering patterns and yield characteristics. Of all the containers, white polythene bags (T₃) consistently produced the highest values for most parameters such as plant height, number of leaves, branches and roots, early flowering and yield attributes. White polythene bags emerged as the best performing container for cultivation of tomato variety Kashi Aman under the agro-climatic conditions of Chhuikhadan, Chhattisgarh.

Keywords: Tomato, containers, grow bags

Introduction

Tomato (*Solanum lycopersicum* L.) is one of the most widely grown vegetable in India. It is grown in small home gardens and market gardens for fresh consumption as well as processing purposes. Although, a ripe tomato has 94 percent water, being a good source of vitamin A and B and excellent source of vitamin C and has a good nutritive value. It is very appetizing, removes constipation and has a pleasing taste. Grow bags are great for terrace farming in urban areas where land is limited. They can be used for small-area gardening, balcony gardens and indoor growing to produce healthy food. Container size has a huge effect on plant growth and it may affect root and shoot growth, biomass accumulation and flowering (Al-Menaie *et al.*, 2012) [2]. Many farmers are using grow bags for vegetable production but they do not have information about composition of media and exact requirement of pots or bags for a particular crop. Maximizing tomato yields and quality depends on providing optimal growing conditions. The use of appropriate growing containers is an important cultural practice for tomato production.

Materials and Methods

The present study was carried out under the Department of Vegetable Science, at Research and Instructional Farm, RABL CARS Chhuikhadan (C.G.) during the year 2022-23. The experiment was laid out in Completely Randomized Design (CRD) with three replications. Nine treatments (T₁ Green Grow Bags, T₂ Plastic Pots, T₃ White Polythene Bags, T₄ Black Polythene Bags, T₅ Tin Pots, T₆ Cloth Bags, T₇ Cement Pots, T₈ Clay Pots and T₉ Jute Bags) were allocated in each replication. The size of grow bag or container for each treatment was same i.e. 18 x 18 inch. Growing media was combination of soil: FYM: sand (1:1:1) filled in different treatment growing bags. Thirty days old seedlings were transplanted in the evening hours and immediately followed by irrigation for proper establishment of the seedlings. All the other recommended package of practices was followed to raise a healthy crop. The data collected for different characters were analysed by the method of analysis of variance as derived by Panse and Sukhatme (1978) [5].

Results and Discussion

Plant height and number of leaves per plant varied significantly among the treatments under study (Table 1). Remarkably the highest plant height (88.08 cm) and highest number of leaves per plant (72.43) was recorded at 90 days after transplanting with the treatment T₃ (White Polythene Bags). These outcomes are consistent with findings of Akter *et al.* (2021)^[1]. Whereas, the highest number of primary branches per plant (5.54) and highest number of secondary

branches per plant (10.61) was noted by the treatment T₃ (White Polythene Bags). More branches can lead to increased flowering and fruit production, ultimately contributing to higher yields. Further Table 1 also revealed that the treatment T₃ (White Polythene Bags) observed the highest stem base diameter (1.47 cm). Similar result was also reported by Akter *et al.*, (2021)^[1], Islam *et al.* (2019)^[3] and Sharma *et al.* (2021)^[7].

Table 1: Performance of tomato under different growing containers.

| Tr. No. | Treatment details | Plant height (cm) | Number of leaves per plant | Number of primary branches per plant | Number of secondary branches per plant | Stem base diameter (cm) |
|----------------|----------------------|-------------------|----------------------------|--------------------------------------|--|-------------------------|
| T ₁ | Green Grow Bags | 87.35 | 70.39 | 5.35 | 10.42 | 1.44 |
| T ₂ | Plastic Pots | 86.42 | 65.40 | 5.32 | 10.14 | 1.38 |
| T ₃ | White Polythene Bags | 88.08 | 72.43 | 5.54 | 10.61 | 1.47 |
| T ₄ | Black Polythene Bag | 85.40 | 68.58 | 5.21 | 9.89 | 1.42 |
| T ₅ | Tin Pots | 84.33 | 63.42 | 5.06 | 9.50 | 1.34 |
| T ₆ | Cloth Bags | 81.20 | 55.32 | 4.11 | 8.02 | 1.25 |
| T ₇ | Cement Pots | 83.40 | 61.38 | 4.85 | 8.82 | 1.30 |
| T ₈ | Clay Pots | 82.22 | 59.60 | 4.55 | 8.78 | 1.25 |
| T ₉ | Jute Bags | 81.12 | 57.39 | 4.36 | 8.25 | 1.20 |
| | S.Em (±) | 0.57 | 1.31 | 0.20 | 0.50 | 0.04 |
| | CD (at 0.05%) | 1.69 | 3.90 | 0.59 | 1.48 | 0.12 |

The data provided in Table 2 expressed that the treatment T₃ (White Polythene Bags) observed the highest root length (15.25 cm), whereas significantly highest number of primary roots (6.07) and highest number of secondary roots (22.12) was also observed by the treatment T₃ (White Polythene Bags). Longer root lengths generally indicate better nutrient uptake and overall plant health. Remarkably the highest roots surface area (192.18 cm²), fresh weight of

roots (43.30 gm) and dry weight of roots (5.00 gm) was recorded by the treatment T₃ (White Polythene Bags), which was at par with the treatment T₁ (Green Grow Bags) and T₂ (Plastic Pots). Overall, the data demonstrates that the white polythene, green grow and plastic pot treatments allowed for the greatest roots surface area, while the cloth bags severely limited root growth in tomato plants. Similar result was also found by Pramanik *et al.* (2007)^[6].

Table 2: Performance of root traits of tomato under different growing containers.

| Tr. No. | Treatment details | Root length (cm) | Number of primary roots | Number of Secondary roots | Roots surface area (cm ²) | Fresh weight of roots (gm) | Dry weight of roots (gm) |
|----------------|----------------------|------------------|-------------------------|---------------------------|---------------------------------------|----------------------------|--------------------------|
| T ₁ | Green Grow Bags | 15.17 | 5.96 | 21.17 | 190.19 | 42.47 | 3.95 |
| T ₂ | Plastic Pots | 14.42 | 5.80 | 20.49 | 180.34 | 41.60 | 3.80 |
| T ₃ | White Polythene Bags | 15.25 | 6.07 | 22.12 | 192.18 | 43.30 | 5.00 |
| T ₄ | Black Polythene Bag | 13.89 | 5.71 | 19.45 | 177.37 | 40.70 | 3.58 |
| T ₅ | Tin Pots | 13.50 | 5.63 | 18.80 | 155.61 | 39.27 | 3.57 |
| T ₆ | Cloth Bags | 10.44 | 5.10 | 15.24 | 145.14 | 35.58 | 3.03 |
| T ₇ | Cement Pots | 12.59 | 5.43 | 17.31 | 150.99 | 38.80 | 3.36 |
| T ₈ | Clay Pots | 11.48 | 5.30 | 16.15 | 148.15 | 37.55 | 3.25 |
| T ₉ | Jute Bags | 10.97 | 5.23 | 15.98 | 146.51 | 36.43 | 3.08 |
| | S.Em (±) | 0.48 | 0.17 | 0.32 | 0.43 | 0.56 | 0.31 |
| | CD (0.05) = | 1.44 | 0.52 | 0.95 | 1.27 | 1.67 | 0.93 |

The days to early flowering is an important characteristic in crop production, especially for multiple harvest crops like vegetables. Significantly minimum days to first flowering (36.24 days) and days to 50% flowering (47.36 days) was noted with the treatment T₃ (White Polythene Bags), which was comparable with treatment T₁ (Green Grow Bags) and treatment T₂ (Plastic Pots) (Table 3). Similar result was also reported by Soumya (2015)^[8]. In case of number of flowers per cluster, significantly highest number of flowers per cluster (4.62) was observed in treatment T₃ (White Polythene Bags) which was at par with treatment T₁ (Green

Grow Bags) (4.46) and T₂ (Plastic Pots) (4.38). While remarkably highest number of fruits per cluster (4.71) and highest number of fruits per plant (33.39) was observed in treatment T₃ (White Polythene Bags). The variation in fruit production can be attributed to differences in properties of the growing containers like availability of nutrients, water retention capacity, aeration, etc. which influences plant growth and productivity. The results obtained in the present study is in accordance with the results of Kumar *et al.* (2019)^[4].

Table 3: Flowering and fruiting behavior of tomato crop in different growing containers

| Tr. No. | Treatment details | Days to first flowering | Days to 50% flowering | Number of flowers per cluster | Number of fruits/cluster | Number of fruits per plant |
|----------------|----------------------|-------------------------|-----------------------|-------------------------------|--------------------------|----------------------------|
| T ₁ | Green Grow Bags | 36.89 | 47.47 | 4.46 | 4.02 | 32.58 |
| T ₂ | Plastic Pots | 37.17 | 47.86 | 4.38 | 3.83 | 30.83 |
| T ₃ | White Polythene Bags | 36.24 | 47.36 | 4.62 | 4.71 | 33.39 |
| T ₄ | Black Polythene Bag | 37.77 | 48.08 | 4.10 | 3.40 | 31.54 |
| T ₅ | Tin Pots | 38.22 | 48.30 | 3.71 | 3.39 | 29.40 |
| T ₆ | Cloth Bags | 40.23 | 51.14 | 3.30 | 3.03 | 25.52 |
| T ₇ | Cement Pots | 38.83 | 48.53 | 3.65 | 3.36 | 28.82 |
| T ₈ | Clay Pots | 39.15 | 48.53 | 3.48 | 3.34 | 27.49 |
| T ₉ | Jute Bags | 39.88 | 48.89 | 3.32 | 3.05 | 26.88 |
| | S.Em ± | 0.83 | 0.68 | 0.31 | 0.34 | 1.56 |
| | CD (0.05) = | 2.47 | 2.03 | 0.91 | 1.00 | 4.63 |

Among the data Table 4, significantly early days to first fruit harvest (66.34), highest fruit weight (70.63 grams) and highest diameter of the fruit (4.52 cm) was observed in treatment T₃ (White Polythene Bags), which was at par with treatment T₁ (Green Grow Bags) and T₂ (Plastic Pots). Containers that facilitated faster plant growth would provide earliest harvest. The weight and diameter of the fruits is an important consideration for farmers as it affects their market value and overall profitability. Photosynthates are the products of photosynthesis, which are synthesized in the leaves of the plant and transported towards the fruit. The increased accumulation of photosynthates in treatments T₃, T₁, and T₂ might have contributed to the larger fruit diameter and heavier fruit weight. The results obtained in the present study are supported by the works of Islam *et al.* (2019 and Soumya (2015) [3, 8].

The data presented in Table 4 provides insights into the yield per plant influenced by various treatments in tomato plants grown in different types of grow bags. The analysis of the data reveals that treatment T₃, which utilized White Polythene Bags, exhibited the significantly highest yield per plant, with an average of 2.36 kg. This result was comparable to the yield observed in treatment T₁ using Green Grow Bags (2.27 kg) and treatment T₄ using Black Polythene Bags (2.15 kg). Higher yields translate to greater market availability and potential revenue. Factors such as the availability of nutrients, water, and sunlight, as well as the overall growth and vigor of the plants, can contribute to differences in yield among the different treatments. These outcomes are consistent with findings of Sharma *et al.* (2021) [7].

Table 4: Performance of yield parameters under different growing containers.

| Tr. No. | Treatment details | Days to first fruit harvest | Fruit weight (g) | Diameter of fruit (cm) | Yield per plant (kg) |
|----------------|----------------------|-----------------------------|------------------|------------------------|----------------------|
| T ₁ | Green Grow Bags | 67.33 | 69.57 | 4.27 | 2.27 |
| T ₂ | Plastic Pots | 68.32 | 68.39 | 4.10 | 2.08 |
| T ₃ | White Polythene Bags | 66.34 | 70.63 | 4.52 | 2.36 |
| T ₄ | Black Polythene Bag | 69.10 | 67.47 | 3.85 | 2.15 |
| T ₅ | Tin Pots | 70.34 | 66.73 | 3.77 | 1.96 |
| T ₆ | Cloth Bags | 75.30 | 62.51 | 2.93 | 1.59 |
| T ₇ | Cement Pots | 71.40 | 65.85 | 3.75 | 1.90 |
| T ₈ | Clay Pots | 73.70 | 64.31 | 3.60 | 1.76 |
| T ₉ | Jute Bags | 74.37 | 63.48 | 3.33 | 1.71 |
| | S.Em (±) | 0.53 | 0.50 | 0.27 | 0.14 |
| | CD (at 0.05%) | 1.59 | 1.48 | 0.79 | 0.41 |

Conclusion

The study evaluated the performance of tomato variety Kashi Aman under different growing containers. Results indicated that container type had a significant influence on various growth, flowering, yielding and quality parameters of tomato. Of all the containers, white polythene bags (T₃) consistently produced the highest values for most parameters such as plant height, number of leaves, branches and roots, early flowering, fruit yield as well as quality attributes. Green grow bags (T₁) and plastic pots (T₂) also showed comparable performance. In contrast, cloth bags (T₆) recorded the lowest values. Appropriate selection of growing container plays a critical role in optimizing growth, yield and quality of tomato variety Kashi Aman. In conclusion, white polythene bags emerged as the best performing container for cultivation of tomato variety Kashi Aman under the agro-climatic conditions of Chhuikhadan, Chhattisgarh.

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