Profitability from Okra Cultivation during Different Seasons under Terai Agro-Climatic Zone of West Bengal

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Abstract: There was a significant influence of planting time on fruit yield (t/ha) of okra. The maximum fruit yield of 24.60 t/ha was recorded from July planted crop and a minimum fruit yield of 13.28 t/ha from September planted crop. The fruit yield also markedly varied with F1 hybrids. The closer spacing resulted higher marketable fruit yield. Higher benefit cost ratio per hectare (3.98 to 4.97) was achieved in late planting from July to September with closer spacing of 60 cm x 30 cm for all the F1 hybrids mainly due to high average market price of okra fruits during the crop period for their yield compared to early (March planted) and mid-season (May planted) crop.

Key Words: — ***Profitability, Okra Cultivation, Yield, Benefit Cost Ratio.***

I. INTRODUCTION

Okra (*Abelmoschus esculentus* L. Moench) is an economically important vegetable crop widely cultivated in tropical, subtropical climates (Philip *et al*., 2010) and warm temperate regions of the world. Okra is a multipurpose crop due to its various uses of the fresh leaves, buds, flowers, pods, stems and seeds (Mihretu *et al*., 2014). The immature fruits of okra (green seed pods), which are consumed as vegetables, can be used in salads, soups and stews, fresh or dried, fried or boiled. Okra fruits contain several minerals and vitamins like calcium, magnesium, phosphorus, potassium, iron, sodium, zinc, vitamins A, B (B1, B2, B3, B6, B9), C and K (USDA Nutrient Database, 2016) in addition to carbohydrates, fibres, sugar and fat. The consumption of okra by both low-income and high-income groups can also be used as a means of dietary diversification approach. Okra is suitable for cultivation as a garden crop as well as on large commercial farms. It is one of the most important exports-oriented vegetable crops of India ranking first in production with 6126 thousand tonnes from an area of 514 thousand hectare.

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In West Bengal, it occupies an area of 73.1 thousand hectares producing 869.1 thousand tonnes per annum (Anonymous, 2018). However, the average yield of crop is comparatively low in India as compared to the other developed countries in the world. There are several reasons for poor growth and yield of okra and among these; time of sowing, variety and plant spacing plays an important role. The day temperature ranging from 25 ^{0}C to 40 ^{0}C and night temperature over 22 ^{0}C is required for its proper growth for its proper growth, flowering and fruit development (Thamburaj and Singh, 2018). There is a good demand of okra throughout the year for its nutritional importance and role in improved nutrition and health. The climate of Terai agro-climatic zone of West Bengal is subtropical humid in nature with distinctive characteristics of high rainfall, high humidity and a prolonged winter. The planting times have a great impact on production, productivity and profitability of okra as temperature, humidity and radiation influence all aspects and stages of crop growth and development. Besides, the time of planting has a direct bearing on the incidence of insect pests and diseases particularly YVMV disease.

Higher production of this crop is possible by the cultivation of high yielding varieties or F1 hybrids which produce high yield and give better returns compared to other cultivars grown at same agro-climatic conditions and inputs applied. Its productivity could be improved through careful selection of agro-techniques, F1 hybrids based on location (Deepak *et al*.,

2015). The information available so far regarding planting time, variety and plant spacing for okra fruit production to give high returns in different seasons is inadequate under Terai agro-climatic zone of West Bengal. The present investigation was carried out to exploit planting time, F1 hybrid cultivar and spacing combination for profit maximization from its cultivation.

II. Materials And Methods

The experiment was carried out at the Horticulture Instructional Farm, Uttar Banga Krishi Viswavidyalaya, Pundibari, Cooch Behar (26^{0}19′ 86 ′′ N latitude, 89 ^{0}23′ 53′′ E longitude and altitude of 43 m above the mean sea level) in three factor factorial randomized block design with three replications to find out the individual as well as their interaction effects of planting times of 1st week of the months of March (S_1), May (S_2), July (S_3) and September (S_4) and plant spacing with 60×30 cm (D_1)and 60×60 cm (D_2) on different F1 hybrids of okra namely Mahyco Hybrid-10 (H_1), Varun F1 hybrid (H_2), Venus (H_3) and Noori (H_4) for its growth, yield and quality attributes under Terai agro-climatic zone(25^0 57 ′′ to 26 ^{0}36 ′′ N latitude and 89 ^{0} 54 ′′ to 88 ^{0}47 ′′ E longitude) of West Bengal during two consecutive years of 2020 and 2021. The average soil properties of the experimental site in agricultural entisol before conducting the experiment was sandy clay loam having pH 5.7, 0.91% organic carbon, 132.46 kg ha^{-1} available nitrogen, 46.48 kg ha^{-1} available phosphorous and 67.85 kg ha^{-1} potash. The meteorological information of the experimental site was collected and presented in Table 1. Seed sowing of four okra F1 hybrid cultivars was done on four different times dibbling two seeds per hill at different spacing at two months interval starting from 1st week of March to 1st week of September to get crop period in different seasons of a year. Thinning of okra was done at 15 days after sowing retaining one plant per hill. Well-decomposed farmyard manure @ 10 t ha^{-1} and fertilizers (200:100:100 kg ha^{-1} N, P_2O_5 and K_2O) based on Mal *et al*. (2013) were applied. Half dose of recommended nitrogen and full dose of phosphorous and potash were applied as basal and remaining nitrogen was top dressed in two equal splits, first after three weeks of sowing and second at the time of flowering. Irrigation and plant protection measures are followed as per the scheduled package of practice. Tender green fruits were harvested every two days as practiced by the farmers. Fruit yield obtained from each treatment wise plot after periodic pickings of tender marketable fruits was converted to get the yield in tonnes per hectare. The data obtained from the experiment was pooled analyzed as per standard method suggested by Panse and Sukhatme (1985) and presented in Table 2.

III. Results And Discussion

3.1 Fruit Yield

3.1.1 Effect of planting time:

There was a significant influence of planting time on fruit yield of okra in the first year. The maximum fruit yield of 22.52 t/ha was observed in the month of July (S_3) planted crop and a minimum fruit yield of 11.12 t/ha was recorded in September (S_4) planted crop. There was 50.62 % increase in fruit yield of okra was recorded in July (S_3) planted crop over September (S_4) planted crop. In the second year also the fruit yield was markedly varied with planting time. The maximum fruit yield of 26.69 t/ha was observed in July (S_3) planted crop and a minimum fruit yield of 15.45 t/ha in September (S_4) planted crop. There was 42.11 % increase in July (S_3) planted crop over September (S_4) planted crop. Similarly, pooled data revealed that the fruit yield greatly varied with planting time. Maximum fruit yield of 24.60 t/ha was observed in July (S_3) planted crop and minimum fruit yield of 13.28 t/ha was observed in September (S_4) planted crop. There was 46.02 % increase of fruit yield in July (S_3) planted crop over September (S_4) planted crop. This might be due to favourable prevailing environmental conditions especially temperature and relative humidity throughout the crop growth and developmental stages up to the month of December that is very special in this agro-climatic zone. Similar results were also recorded by Kumar *et al*. (2021).

3.1.2 Effect of F1 hybrids:

There was a significant influence of F1 hybrids on fruit yield in the first year. A maximum value of 14.58 t/ha was observed in F1 hybrid Noori (H_4) and a minimum of 14.23 t/ha in F1 hybrid Mahyco Hybrid No. 10 (H_1). There was 2.40 % increase in F1 hybrid Noori (H_4) over the F1 hybrid Mahyco Hybrid No. 10 (H_1). In the second year also, there was markedly variation in yield with different F1 hybrids. Maximum of 18.87 t/ha was observed in F1 hybrid Varun (H_2) and a minimum of 18.28 t/ha in F1 hybrid Noori (H_4). There was 3.13 % increase in yield in F1 hybrid Varun (H_2) over F1 hybrid Noori (H_4). Pooled data also revealed that the yield greatly varied with F1 hybrids. Maximum yield of 16.69 t/ha was observed in F1 hybrid Venus (H_3) and a minimum of

16.43 t/ha in F1 hybrid Noori (H_4). There was 1.56 % increase of fruit yield (t/ha) in F1 hybrid Venus (H_3) over F1 hybrid Noori (H_4). This might be due to differences in their genetic makeup and their requirement of environmental conditions to produce optimum yield.

3.1.3 Effect of spacing:

There was a significant influence of plant spacing on yield in the first year. However, there was a non-significant variation observed in the second year and for pooled analysis. In the first year, the maximum fruit yield of 19.12 t/ha was recorded with the spacing of 60 x 30 cm (D_1) and a minimum of 9.78 t/ha fruit yield was observed in the spacing of 60 x 60 cm (D_2). There was an increase of 48.85 % in 60 x 30 cm (D_1) over 60 x 60 cm (D_2) spacing. The closer spacing resulted in higher marketable fruit yield. Increase in marketable fruit yield for closer spacing was also reported by Zibelo *et al.* (2016) in okra. The plants with wider spacing may get sufficient space, light and nutrient for higher growth but the number of plants per hectare is reduced. It may result in lower fruit yield. This result agreed with the finding of Dhankar *et al.* (2012) and Shukla *et al.* (2013).

3.1.4 Interaction effect:

There was a significant and marked effect between planting time and F1 hybrids on fruit yield (t/ha) in the first year, second year and also in pooled analysis. Maximum fruit yield of 22.57 t/ha, 27.28 t/ha and 24.88 t/ha were observed with S_3H_3, S_3H_2 and S_3H_2 respectively, and a minimum of 10.31 t/ha, 14.53 t/ha and 12.42 t/ha were observed in S_4H_1 treatment combination in the first year, second year and also in pooled analysis, respectively. There was 54.32 % increase in S_3H_3 over S_4H_1, 46.74 % increase in S_3H_2 over S_4H_1 and 50.08 % in S_3H_2 over S_4H_1. There was a non-significant effect observed in the interaction with F1 hybrids and spacing. There was a significant effect found in the interaction between spacing and planting time. The maximum value of 30.89 t/ha was observed in D_1S_3 and a minimum value of 13.11 t/ha was recorded in D_1S_4. There was 57.56 % increase in D_1S_3 over D_1S_4. The interaction of planting time, F1 hybrids and spacing recorded a significant variation in the first year. A maximum of 30.89 t/ha was observed in the treatment combination $S_3H_1D_1$ and a minimum of 13.11 t/ha was observed in $S_4H_1D_1$ as shown in Table 2. There was an increase of 57.56 % in the fruit yield (t/ha) in $S_3H_1D_1$ over $S_4H_1D_1$. Mahapatra *et al.* (2007) and Simon *et al.* (2013) also noticed similar observation.

3.1.5 Economics of okra cultivation

The economic analysis revealed that maximum gross return of ₹1092600 was achieved in September planted Noori F1 hybrid with 60cm x 30cm spacing ($S_4H_4D_1$) followed by ₹1092600 in September planted Varun F1 hybrid with 60cm x 30cm spacing ($S_4H_2D_1$) and ₹ 996900 in July planted Mahyco Hybrid No. 10 F1 hybrid with 60cm x 30cm spacing ($S_3H_1D_1$) in pooled analysis. These higher gross returns were simply due to higher crop yield and market price of the produce in different crop period of different planting times. The results showed that early and late crop gave higher return compared to mid-season crop and also late crop gave higher return compared to early crop. Lower spacing recorded higher gross return compared to wider spacing mainly due to higher plant population per unit area that resulted comparatively higher yield. Benefit cost ratio per hectare markedly varied among the treatment combinations as shown in Table 3. The highest (4.97) and the lowest (0.28) benefit cost ratio per hectare were obtained from September planted Noori F1 hybrid with 60cm x 30cm spacing ($S_4H_4D_1$) and May planted Noori F1 hybrid with 60cm x 60cm spacing ($S_2H_4D_2$), respectively. Marked increase in benefit cost ratio per hectare (3.98 to 4.97) was found in late planting of July and September with closer spacing of 60 cm x 30 cm in all the F1 hybrids mainly due to high average market price during the crop period for their good yield as the area under okra reduces for land preparation works for winter crops. Dash *et al.* (2013) also found the highest (4.19) benefit cost ratio per hectare by planting okra out its normal season.

IV. CONCLUSION

On the basis of present study, it may be concluded that there is significant amount of benefit cost ratio per hectare (3.98 to 4.97) in late planting of July and September compared to early (March planted) and main season (May planted) crop with closer spacing of 60 cm x 30 cm in all the F1 hybrids. Therefore, farmers of Terai agro-climatic zone of West Bengal can choose okra cultivation with July to September planting to achieve high economic potential.

REFERENCES

[1]. Anonymous. National Horticulture Board. Indian Horticulture Database, Ministry of agriculture and farmers welfare, Government of India, New Delhi, 2018.

[2]. Dash, P. K., Rabbani, M. G. And Mondal, M. F. (2013), Effect of variety and planting date on growth and yield of okra. International Journal of Biosciences, 3 (9): 123-131.
[3]. Deepak K, Saryam S.K., Mitra A.K, Mehta Prajapati S., Kadwey S. (2015), Correlation and Path co-efficient analysis of quantitative traits in okra (Abelmoschus esculentus L. Moench). The Bioscan, 10 (2):735-739.
[4]. Dhankar, S.K., Deswal D.P. and Singh S. (2012), Impact of weather variables on yield and yield attributes of okra under different growing environments. Journal of Agrometeorology, 14 (1): 54-56.
[5]. Kumar, S., Kumar, K., Yugvinder, Singh, U. And Kumar, N. (2021), Effect of sowing date and varieties on growth and yield of okra. The Pharma Innovation Journal, 10 (10):903-910.
[6]. Mahapatra M.R., Acharyya P., Sengupta S. (2007), Variability and association analysis in okra. Indian Agriculture, 51: 17-26.
[7]. Mal, B., Mahapatra, P., Mohanty S. and Mishra H. N. (2013), Growth and yield parameters of okra (Abelmoschus esculentus) influenced by Diazotrophs and chemical fertilizers. J. Crop and weed, 9 (2):109-112.
[8]. Panse V.G., Sukhatme P.V. (1985), Statistical Methods for Agricultural Workers. Indian Council of Agricultural Research, New Delhi.
[9]. Philip, C. B., Sajo, A. A., and Fatuless, K. N. (2010), Effect of spacing and NPK fertilizer on the yield and yield components of okra (Abelmoschus esculentus L.) in Mibi, Adamania State, Nigeria. J. Agron. 9: 131-134.
[10]. Shukla U.N., Khakare M.S., Srivastava V.K., Kumar Rakesh, Singh Smita, Kumar V. (2013), Effect of spacing and fertility level on growth, yield and quality of cotton hybrids under rainfed condition of Vidarbh. The Bioscan. 8 (2): 561-567.
[11]. Simon, S.Y., Gashua, I.B. and Musa, I. (2013), Genetic variability and trait correlation studies in okra (Abelmoschus esculentus (L.) Moench). Agric. Bio. J. North America, 10: 532-538.
[12]. USDA (2016). USDA National Nutrient database for standard reference.
[13]. Zibelo H., Wtsadik K. and Sharma J.J. (2016), Effect of inter- and intra-row spacing on growth and yield of okra (Abelmoschus esculentus (L.) Moench) at Humera, Northern Ethiopia. Journal of Biology, Agriculture and Healthcare, 6 (3):92-108.