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Effect of NPK Fertilizers and Spacing on the Yield of Bottle Gourd (*Lagenaria siceratia* M.)

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Abstract: A field trial was conducted to assess the effect of different plant spacing ($S_1 = 50$ cm, $S_2 = 75$ cm and $S_3 = 100$ cm) and NPK doses ($T_1 =$ control, $T_2 = 10454-104$, $T_3 = 12474-124$, $T_4 = 144-94-144$ and $T_5 = 164114-164$ kg per hectare) on the growth and yield of bottle gourd. The NPK fertilizer doses has significant effect on days to germination, fruit weight (gm), fruit volume (ml), number of fruits per vine, vine length (cm) and yield per hectare (tones). Increasing NPK fertilizer doses also increased the above mentioned parameters. Maximum yield (20.403 t ha⁻¹) was obtained from T_5 (164-114-164). Plant spacing had significant influence on days to germination, fruit weight (gm), fruit volume (ml,) number of fruits per vine, vine length (cm) and yield per hectare. Increasing plant spacing increased all the above mentioned parameters, except yield per hectare. Maximum yield (19.709 t ha⁻¹) was obtained from S_1 (50 cm).

Key words: Bottle gourd, *Lagenaria siceratia*., NPK fertilizers, spacing, crop yield

Introduction

Application of 900 kg ha⁻¹ for bottle gourd plants at 50 cm apart resulted highest yield and number of fruits. Singh and Chhonkar (1986) made trails with musk melon, application of 100 kg N, 60 kg P and 50 kg K per hectare gave the best relative growth, fruit weight and yield. The closest spacing i.e. 60 cm gave a higher yield than spacing at 90 or 120 cm. Bolotskikh and Leivi (1987) conducted trails on cucumber and found that the highest yield of 28.2 t ha⁻¹ and economic returns were produced after applying 90 kg N, 60 kg each of P_2O_5 and K_2O and 40 t FYM/ha, at a plant density of 150000 per hectare. Shukla and Prabhakar (1987) observed that the bottle gourd with the spacing of plants at 300×45 cm gave the highest average yield of 384.54 q ha⁻¹. The average yield was 385.37 q ha⁻¹ with the full dose of NPK and 300.74 q ha⁻¹ with the reduced dose. Arora and Mallik (1990) reported that ridge gourd *Luffa acutangula* was sown on 2×4 m raised beds with $12,9$ or 6 plants per bed. A spacing of 9 plants per bed gave the highest number and weight of fruit and yields. Kumar *et al.* (1990) also observed that the number of fruit per plant increased from 111.3 at Zero N to 167.16 at 60 kg ha⁻¹ and declined to 165.44 at the highest N rate. With P, the number of fruit/plant increased from 130.82 at Zero P to 150.8 at highest P rate. The present investigation was conducted to find out the suitable doses of NPK fertilizers and suitable distances between the plants, in order to get higher yield of this vegetable crop under the agro-climatic conditions of D.I.Khan.

Materials and Methods

The experiment was conducted at the research field area of the Faculty of Agriculture, Gomal University, Dera Ismail Khan. Soil was analyzed at the time of land preparation, seed sowing was done on well-prepared soil. Seed of local cultivar of Bottle Gourd was used for this purpose. The experiment was laid out in Split Plot Design with three replications having spacing in main plots and fertilizers in the sub-plots. The size of the field was kept 19×36 sq m and that of the sub-plot was 3×4 sq.m. Main Plots were assigned to the different spacing of plants within the beds i.e., $S_1 = 50$ cm, $S_2 = 75$ cm and $S_3 = 100$ cm. Whereas the subplots were assigned to different doses of Nitrogen, Phosphorus and Potassium used in the form of Urea, Single Super Phosphate and Potassium Sulphate respectively i.e.,

$T_1 =$ (Control) (000-000-000), $T_2 = 104(N)-54(P)-104(K)$,
 $T_3 = 124(N)-74(P)-124(K)$, $T_4 = 144(N)-94(P)-144(K)$,
 $T_5 = 164(N)-114(P)-164(K)$

The seeds were sown on 18th of March and were sown on the both sides of the raised beds with plant to plant distance of 50 , 75 and 100 cm, while the distance between bed to bed was kept 3 m. There were twelve plants in S_1 , eight plants in S_2 and six plants in S_3 . The seeds were sown by hand in morning time at a depth of $2-2.5$ cm and covered with Farm Yard Manure. N was applied in three split doses. First dose of N and full doses of P and K was applied at the time of sowing. The second dose of N was applied during flowering and the remaining third one was applied after three pickings. Nitrogen, Phosphorus and Potash were applied in the form of Urea, Single super phosphate and Potassium sulphate respectively. All the cultural practices were used accordingly.

The data of all the above detailed parameters were individually subjected to the analysis of variance technique (Steel and Torrie, 1980) in the MSTAT Computer Programme. Subsequently, the significant means were separated by the Least Significant Difference Test by using the MSTATC computer program stated as above.

Results and Discussion

The data shows that the spacing and NPK fertilizer levels had a significant influence on the number of days to germination. Bottle gourd grown in plant spacing 100 cm apart took maximum number of days i.e. 19.47 , followed by 75 and 50 cm plant spacing with 18.72 and 18.17 days to germination, respectively. The results revealed that larger space took more number of days to germination while shorter spacing took less number of days to germination. Whereas $164-114-164$ kg NPK/hac took maximum number of days to germination i.e. 20.49 , while the minimum number of days were taken by $124-74-124$ kg NPK/hac level, as shown in the Table 1.

The data regarding the fruit weight (gm) shown in Table 1 showed that both the factors viz. plant spacing and fertilizer levels had significant effect on fruit weight. Maximum fruit weight was obtained from 100 cm, while the minimum fruit weight was observed from 50 cm plant spacing. According to the results, the fruit weight was increased with increase in plant spacing. The result is similar to that of Purewal and Dargan (1961) and Singh (1972), in which they recorded that wider spacing resulted in greatest weight of individual bulbs (Onion). It is further apparent from the data that the highest fruit weight (602.89 gm) was obtained from $164-114-164$ fertilizer level, whereas the minimum fruit weight was recorded from Control giving 501.57 gm, as shown in the

Table 1: Days to Germination, Fruit weight (cm) and Fruit volume of bottle gourd as affected by different plant spacing and NPK fertilizer level

	Days to germination	Fruit weight (gm)	Fruit volume (ml)
50 cm spacing	18.16 C	520.25 C	585.98 C
75 cm spacing	18.72 B	544.51 B	606.66 B
100 cm spacing	19.46 A	588.31 A	627.37 A
Control	16.08 E	501.07 E	542.11 E
104-54-104	17.82 D	520.07 D	562.62 D
124-74-124	19.42 C	549.20 C	619.44 C
144-94-144	20.09 B	581.41 B	643.53 B
164-114-164	20.49 A	602.88 A	665.81 A

Means followed by different letters are significant different at 1 percent level of probability

Table 2: Number of Fruits per vine, vine length (cm) and yield per hectare (tonnes) of bottle gourd as affected by different plant spacing and NPK fertilizer levels

	No. of Fruits per vine	Vine length (cm)	Yield per hectare ton
50 cm spacing	4.24 C	537.62 C	19.70 A
75 cm spacing	4.59 B	560.36 B	15.06 B
100cm spacing	5.04 A	609.84 A	13.13 C
Control	3.44 E	384.46 E	10.91 E
104-54-104	3.98 D	518.92 D	13.13 D
124-74-124	4.80 C	614.60 C	16.44 C
144-94-144	5.30 B	659.21 B	18.95 B
164-114-164	5.61 A	669.18 A	10.40 A

Means followed by different letters are significant different at 1 percent level of probability

Table 1. This result is in conformity with those of Madayag (1984) and Singh and Chhonkar (1986) who also observed that increased application of NPK improved the fruit weight in cucurbits i.e., bitter gourd and muskmelon.

The data, regarding the fruit volume (ml), reveals that both the factors viz. plant spacing and fertilizer levels had significant effect on the fruit volume. The highest fruit volume of 627.38 ml was observed in 100 cm plant spacing, followed by 75 cm and 50 cm with 606.66 ml and 585.98 ml of fruit volume, respectively. Maximum fruit volume was obtained in 164-114-164 fertilizer level whereas the minimum fruit volume was recorded in Control (Table 1). This might be due to the less competition between the plants for the nutrients and light as they were widely placed and were heavily feed with fertilizers.

The data shown in Table 2 indicated that both the factors viz. plant spacing and fertilizer levels had a significant effect on the number of fruits per vine. 100 cm plant spacing gave the maximum number of fruit per vine i.e. 5.04, followed by 75 cm and 50 cm plant spacing with 4.59 and 4.24 number of fruits per vine respectively. Increase in plant spacing resulted in more number of fruits per vine. This result is similar to that of Sharestha (1983), who concluded that spacing influenced the pod number per plant in Okra. The fertilizer levels also had a significant effect on number of fruits per vine as the maximum number of fruits 5.61 per vine were observed in 164-114-164 Kg NPK hac^{-1} and the minimum number of fruits per vine were recorded in Control. The results observed showed that higher the fertilizer levels higher would be the number of fruits per vine. Similarly, Chauhan and Gupta (1973), also reported that the number of green pods per plant of Okra were increased by increasing the application of NPK. The data shown in Table 2 indicated that plant spacing as well as

fertilizer levels have significant effect on the vine length. 100 cm plant spacing resulted the maximum vine length i.e., 609.84 cm, followed by that of 75 cm and 50 cm with the vine length of 560.36 cm and 537.27 cm respectively. Wider spacing gave longer vine length. This may be due to the less competition of nutrients, light and CO_2 between the wide placed plants. Same results were obtained by Purewal and Dargan (1961), who concluded that wider spacing gave the tallest plants in Onions. The data further revealed that by increasing the NPK fertilizer level, the vine length also increased significantly. The maximum vine length was recorded in 164-144-164 Kg NPK hae, whereas the minimum vine length was recorded in Control as shown in the Table 2. Singh and Chhonkar (1986) also found the same results, in which they found that the application of NPK fertilizers improved the length of main shoot in muskmelon.

Plant spacing affected significantly the yield per hectare. Lesser plant spacing resulted in an increase in yield per hectare due to higher population of plants. Highest yield 19.70 tonnes per hectare was recorded in 50 cm plant spacing, whereas the minimum yield of 13.13 tonnes per hectare was obtained in 100 cm plant spacing. Same results were concluded by Sharestha (1983), Singh and Chhonkar (1986) and Shukla and Prabhakar (1987), they all reported that closer spacing resulted in higher yield per hectare. An increase in the NPK fertilizer levels increased the yield per hectare. Maximum yield of 20.40 tonnes per hectare was obtained in 164-114-164 Kg NPK hac^{-1} , while the minimum yield (10.91 tonnes per hectare) and almost the half of 164-114-164 Kg NPK hac^{-1} was recorded in Control. This result is similar to that of Singh and Chhonkar (1986), who observed that increase in application of NPK fertilizer levels improved the yield per hectare significantly. These results revealed that 100 cm plant spacing was the most beneficial spacing in terms of fruit weight, fruit volume, number of fruits per vine and vine length, while in terms of days to germination and yield 50 cm plant spacing was proved to be the most beneficial. The fertilizer level of 164(N)-114(P)-164(K) was the most suitable for all the parameters studied.

References

- Arora, S.K. and I.J. Mallik, 1990. Effect of pruning and spacing levels on the growth, flowering, earliness and fruit yield in ridge gourd. Haryana J. Hortic. Sci., 18: 27-29.
- Bolotskikh, A.S. and L.I. Leivi, 1987. The application of fertilizers in cucumber cultivation. Agrokhimiya, 12: 50-55.
- Chauhan, D.S. and M.L. Gupta, 1973. Effect of NPK on the growth and development of Okra. Indian J. Hortic. Sci., 30: 401-406.
- Kumar, R., R.K. Singh and M.M. Pujari, 1990. Effect of nitrogen and phosphorus on pointed gourd (*Trichosanthes dioica* Roxb.): A note. Haryana J. Hortic. Sci., 19: 368-370.
- Madayag, M.L., 1984. Effect of complete fertilizer (14-14-14) on seed quality of bitter gourd (ampalaya). CLSU Scient. J., 5: 171-171.
- Purewal, S.S. and K.S. Dargan, 1961. Effect of fertilizers and spacing on the development and yield of garlic (*Allium sativum*). Indian J. Agron., 5: 262-268.
- Sharestha, G.K., 1983. Effect of spacing and nitrogen fertilizers on Pusa Swani, Okra. Nepal Exp. Agric., 9: 239-242.
- Shukla, V. and B.S. Prabhakar, 1987. Effect of plant spacing and fertilizer on yield of bottle gourd. S. Indian Hortic., 35: 453-454.
- Singh, D.N. and V.S. Chhonkar, 1986. Effect of nitrogen, phosphorus, potassium and spacings on growth and yield of musk melon (*Cucumis melo* L.). Indian J. Hortic., 43: 265-269.
- Singh, P.P., 1972. Effect of nitrogen, spacing and clipping of seedling on the yield of onion (*Allium cepa* L.). Indian J. Agric. Res., 6: 221-224.
- Steel, R.G.D. and J.H. Torrie, 1980. Principles and Procedure of Statistics. McGraw Hill Book Co. Inc., New York, pp: 232-249.