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# Effect of Naphthalene Acetic Acid (NAA) and Different Mulches on Yield of Okra var. GOH-1

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## ABSTRACT

**A field experiment was conducted during summer season of 1995 and 1996 to examine the effect of naphthalene acetic acid (NAA) and different mulches on yield of okra var. GOH-1. The experiment was conducted on the farm of main Irrigation Research Station, Gujarat Agricultural University, Navsari. Fifteen treatment combinations comprising of NAA (25 and 50 mg/1) and mulches (black, green yellow plastic mulch and sugarcane straw mulch) alongwith their respective controls were tried. All twenty three pickings of green pods were possible in all the treatments. Among NAA, the NAA sprayed at 50 mg/l registered highest yield which was 19.61% higher than the control. Among mulches, black plastic mulch enhanced maximum green pod yield with 12.04% increase over the control. Interaction effect between NAA and mulch was significant and NAA 50 mg/l with black plastic mulch recorded highest green pod yield. The results were consistent during both the years. The net realization went up from Rs. 1.05 lacs/ha in the control to Rs. 4.57 lacs/ha with 50 mg/l NAA application registering cost benefit ratio of 1 : 12.81 and ICBR of 1 : 135.60 black plastic mulch treatment also registered net realization of Rs. 1.44 lacs/ha interaction effect between NAA and mulch was synergestic and registered highest net realization and higher additional yield as compared to NAA or mulch alone.**

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## INTRODUCTION

Research efforts are in progress in the country as well as in the world to improve the level of production to keep pace with the ever increasing demands. Growth regulators help in efficient utilization of metabolites and thereby improve the yielding potential. Naphthalene Acitic Acid (NAA) is one such growth promoter which is being used beneficially on large scale in a number of fruits, vegetables and flowering crops. Working with three different Okra varieties, Bhatt and Shah (1990) observed increase in yield and growth of the plant by NAA application.

Mulching is also known to influence crop growth and development. Mulching being a precious input especially during summer season, its judicious use alongwith NAA would certainly be of great help in better utilization and saving in available irrigation water resources. Since very little work has been done to examine the effect of mulching with growth regulators, the present study has beer undertaken to examine the effect of NAA and or mulching on yield of Okra (*Abelmoschu esculentus* (L.) Moench) var. GOH-1.

## MATERIALS AND METHODS

A field experiment was conducted during summer season (Feb. to May) of the year 1995 and 1996 at the Soil and Water Management, Main Irrigation Centre, Gujarat Agricultural University, Navsari. It was laid out in factorial randomized block design with three replications. The treatments consisted of combination of 3 levels of NAA ($G_0$ - 0, $G_1$ – 25 and $G_2$ – 50 mg/l) and 5 different mulchings ($M_0$ – no mulch, $M_1$ – sugarcane trash, $M_2$ – black, $M_3$ – green and $M_4$ – yellow plastic mulches). For the sowing, furrows were opened manually at a distance of 60 cm. Healthy seeds (@ 8 kg/ha) of okra, var. GOH-1 were sown at a depth of 2-3 cm in the soil at a distance of 30 cm within the row the gross and net plot size was 3.00 m x 4.50 m and 1.80 x 3.30 m, respectively. The fertilizers were applied as per recommended dose of 150-50-50 kg N, P and K/ha, respectively. Irrigation were applied to each plot as per recommended IW/CPE ratio of 1.0 with water depth 60 mm as per daily pan evaporation. All the recommended agronomic practices were followed, including plant protection measures for raising the healthy crop.

The NAA was sprayed at two growth stages, i.e. 15 ml/plant just before flowering (25 days after sowing) and 20 ml/plant just before first picking of green pods (45 days after sowing). Mulching was done 25 days after sowing using 10 tonnes/ha sugarcane trash ($M_1$) and 50 M black ($M_2$), green ($M_3$) or yellow ($M_4$) colour plastics keeping okra plants open.

## RESULTS AND DISCUSSION

### Fresh Pod Yield

There were total of twenty-three pickings of fresh marketable pods. Total combined 23 pickings marketable yield as influenced by NAA and different mulching treatments are presented in Table 1.

### Effect of NAA

There was considerable significant increase in fresh pod yield with both the NAA treatments over the control during both the years; NAA at 50 mg/l was better than 25 mg/l. In the year 1995, NAA at 50 mg/l registered 21.75 t/ha fresh pod yield as against 17.92 t/ha in control. The 17.60% higher yield over the control was recorded with this treatment. In the year 1996, this increase was 21.62%. NAA at 25 mg/l also recorded 10.96 and 13.12% increase in pod yield over the control during the year 1995 and 1996, respectively. The increase in pod yield over the control in pooled mean data was 13.65 and 24.33% with 25 mg/l and 50 mg/l NAA treatments, respectively.

### Effect of Mulching

Different mulches significantly influenced fresh pod yield in both the years and also in pooled data. In the year 1995, black plastic mulch treatment recorded 24.10 t/ha pod yield which was 24.21% higher than the control. Similarly, in the year 1996, this treatment registered 27.66% more yield than the control. Overall, in pooled data 26.03% more fresh pod yield was obtained as compared to control. Only yellow plastic mulch treatment was found to be not effective in increasing yield.

The interaction effect between NAA x mulching treatments was significant with NAA 50 mg/l in combination with black plastic mulch recording highest fresh pod yield. This treatment registered 42.82%, 46.03% and 44.42% higher yield than the control in the year 1995, 1996 and in pooled data, respectively.

Our results with NAA are not without precedence. Singh and Upadhyay (1967) observed significant increase in yield of okra var. Pusa Sawani with NAA sprays. Reddy (1968) and Bhatt (1987) obtained similar results in different okra varieties with NAA

TABLE 1

**Influence of foliar application of growth regulator (NAA) and different mulches on yield of fresh pods t/ha okra var. GOH-1.**

| Treatments | Yield of fresh pods (t/ha) | | |
|---|---|---|---|
| | 1995 | 1996 | Pooled |
| $G_0$ $M_0$ | 15.47 | 13.85 | 14.66 |
| $G_0$ $M_1$ | 18.70 | 16.84 | 17.77 |
| $G_0$ $M_2$ | 20.62 | 19.70 | 20.16 |
| $G_0$ $M_3$ | 17.83 | 16.02 | 16.93 |
| $G_0$ $M_4$ | 16.98 | 15.12 | 16.05 |
| $G_1$ $M_0$ | 17.57 | 15.62 | 16.59 |
| $G_1$ $M_1$ | 20.44 | 19.93 | 20.18 |
| $G_1$ $M_2$ | 24.63 | 23.69 | 24.16 |
| $G_1$ $M_3$ | 20.02 | 17.97 | 18.99 |
| $G_1$ $M_4$ | 17.98 | 16.66 | 17.32 |
| $G_2$ $M_0$ | 21.76 | 20.48 | 21.12 |
| $G_2$ $M_1$ | 20.93 | 20.69 | 20.77 |
| $G_2$ $M_2$ | 27.06 | 25.67 | 26.37 |
| $G_2$ $M_3$ | 20.35 | 19.58 | 19.94 |
| $G_2$ $M_4$ | 18.71 | 17.68 | 18.20 |
| **Growth regulator** | | | |
| $G_0$ | 17.92 | 16.31 | 17.11 |
| $G_1$ | 20.13 | 18.77 | 19.45 |
| $G_2$ | 21.75 | 20.81 | 21.28 |
| S.Em. ± | 1.95 | 2.05 | 1.41 |
| C. D. at 5% | 5.67 | 5.95 | 4.02 |
| **Mulches** | | | |
| $M_0$ | 18.27 | 16.65 | 17.46 |
| $M_1$ | 20.02 | 19.13 | 19.58 |
| $M_2$ | 24.10 | 23.01 | 23.56 |
| $M_3$ | 19.38 | 17.86 | 18.62 |
| $M_4$ | 17.89 | 16.49 | 17.19 |
| S.Em. ± | 2.53 | 2.65 | 1.83 |
| C. D. at 5% | 7.32 | 7.69 | 5.19 |
| **Interaction** | | | |
| S.Em. ± | 4.38 | 4.59 | 3.17 |
| C. D. at 5% | 12.69 | 13.31 | 8.99 |
| C. V. % | 3.80 | 4.27 | 4.03 |

**Economics of okra var. GOH-1 as affected by growth regulator (NAA) and different mulch treatment.**

| Sr. No. | Treatment combination | Fresh pod yield (t/ha) | Incremental pod yield (t/ha) | Gross realization (lacs/ha) | Total cost of cultivation (Rs/ha) | Net realization (lacs/ha) | Incremental cost of treatments (Rs) | Value of additional yield (Rs) | Cost benefit ratio (CBR) | ICBR Gross | ICBR Net |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. | $G_0M_0$ | 14.66 | — | 1.17 | 11915 | 1.05 | 60 | — | 1 : 8.84 | — | — |
| 2. | $G_0M_1$ | 17.77 | 3.11 | 1.42 | 12565 | 1.30 | 650 | 24840 | 1 : 10.32 | 1 : 38.21 | 1 : 37.21 |
| 3. | $G_0M_2$ | 20.16 | 5.50 | 1.61 | 17615 | 1.44 | 5700 | 43984 | 1 : 8.16 | 1 : 7.72 | 1 : 6.72 |
| 4. | $G_0M_3$ | 16.93 | 2.27 | 1.35 | 17615 | 1.18 | 5700 | 18136 | 1 : 6.69 | 1 : 3.18 | 1 : 2.18 |
| 5. | $G_0M_4$ | 16.05 | 1.39 | 1.28 | 17615 | 1.11 | 5700 | 11080 | 1 : 6.29 | 1 : 1.94 | 1 : 0.94 |
| 6. | $G_1M_0$ | 16.59 | 1.93 | 1.33 | 12076 | 1.29 | 221 | 15440 | 1 : 10.07 | 1 : 69.86 | 1 : 68.86 |
| 7. | $G_1M_1$ | 20.18 | 5.52 | 1.61 | 12726 | 1.49 | 871 | 44176 | 1 : 11.69 | 1 : 50.72 | 1 : 49.72 |
| 8. | $G_1M_2$ | 24.15 | 9.49 | 1.93 | 17776 | 1.75 | 5921 | 75936 | 1 : 9.87 | 1 : 12.82 | 1 : 11.82 |
| 9. | $G_1M_3$ | 18.99 | 4.33 | 1.52 | 17776 | 1.34 | 5921 | 34656 | 1 : 7.55 | 1 ; 5.85 | 1 : 4.85 |
| 10. | $G_1M_4$ | 17.32 | 2.66 | 1.39 | 17776 | 1.21 | 5921 | 21272 | 1 : 6.80 | 1 : 3.59 | 1 : 2.59 |
| 11. | $G_2M_0$ | 21.12 | 6.56 | 1.69 | 12336 | 1.57 | 381 | 51664 | 1 : 12.70 | 1 : 135.6 | 1 : 134.60 |
| 12. | $G_2M_1$ | 20.77 | 6.11 | 1.66 | 12886 | 1.53 | 1681 | 48872 | 1 : 11.90 | 1 : 29.07 | 1 : 28.07 |
| 13. | $G_2M_2$ | 26.37 | 11.70 | 2.11 | 17936 | 1.93 | 6081 | 93624 | 1 : 10.76 | 1 : 15.40 | 1 : 14.40 |
| 14. | $G_2M_3$ | 19.94 | 5.28 | 1.60 | 17936 | 1.42 | 6081 | 42208 | 1 : 7.89 | 1 : 6.94 | 1 : 5.94 |
| 15. | $G_2M_4$ | 18.20 | 3.54 | 1.46 | 17936 | 1.28 | 6081 | 28280 | 1 : 7.12 | 1 : 4.65 | 1 : 3.65 |

* Average price of okra fresh pods/kg = Rs. 8.00.

application. These workers and Patel *et al.* (1997) reported that beneficial effect of NAA on yield in okra may be because of effective manipulation of yield attributing parameters by foliar application of NAA.

The appropriate relationship between source and their capacity leads to higher productivity of the crops. Application of growth regulators is known to increase the sink capacity. To meet the demand of sink capacity, the soil must not be deprived of water and nutrients. Mulching treatments are known to prevent evaporation and thereby maintain moisture level of soil for longer period. Moreover, mulching also reduced weed growth whereby decreased competition for nutrients. In light of this, the synergestic effect of NAA and mulching is obivious. The combination of NAA and mulching resulted in maximum yield increase by way of better utilization of source and effective manipulation of sink.

## ECONOMICS

**Effect of NAA** : The net realization went up from Rs. 1.05 lacs/ha in the control (only water spray) to Rs. 1.21 lacs/ha with 25 mg/l NAA and Rs. 1.57 lacs/ha with 50 mg/l NAA sprays indicating an increase of 15.45 and 48.73 per cent in net realization, respectively. The cost benefit ratio was 1 : 10.07 with 25 mg/l and 1 : 12.81 with 50 mg/l NAA treatments as compared to 1 : 8.84 in the control. Similarly, gross ICBR was maximum (1 : 135.60) in 50 mg/l NAA treatment.

**Effect of Mulches** : Mulching ga higher net return over no mulch treatme The net realization recorded with black plas mulch was the highest (Rs. 1.44 lacs/h followed by sugarcane trash mulch (Rs. 1. lacs/ha) as compared to Rs. 1.05 lacs/ha the control (no mulch). As compared to blac plastic mulch and sugarcane trash mulch, ne realization with green and yellow plast mulches were less. The cost benefit ratio wa higher in sugarcane trash treatment (1 10.32) than the black plastic mulch treatme (1 : 8.16). Except sugarcane trash mulch CBR was lower than the no mulch treatme

**Interaction Effect** : Intraction o growth regulator (NAA) and mulches was ver clear and the effect was synergestic. The NA and mulch treatment combinations record higher net realization and higher additiona yield as compared to NAA or mulchin treatment alone, except in case of yello plastic mulch treatment in combination wit NAA ($G_2M_3$) where both net realization an additional yield were being less than eithe NAA or mulch treatments alone. Similarly, a the G x M combinations registered less CB as compared to CBR recorded in $G_2M_0$ (NA alone) treatment.

Economics consideration clearl suggested that the combination treatment o NAA (50 mg/l) with black plastic mulc recorded maximum realization.

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