

# INFLUENCE OF PLANT GROWTH REGULATORS WITH PRUNING AND TRAINING ON COMPARATIVE ECONOMICS OF CUCUMBER CULTIVATION UNDER OPEN FIELD AND PROTECTED CONDITIONS

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## ABSTRACT

*In the present experiment an attempt has been made to study the comparative economics of cucumber, Hyb. (Malini F<sub>1</sub>) cultivation in open field and protected condition. An experiment was conducted at the Precision Farming Development Center Department of Horticulture, University of Agricultural Sciences GKVK, Bangalore during (2017-18) under open field and protected conditions, to study the effect of different combined doses of GA<sub>3</sub> and NAA with pruning levels on comparative economics of cucumber cultivation under open field and protected conditions. The overall findings of the study reveal that the cost of cultivation of cucumber under greenhouse was higher by ₹1389449/hectare as compared to open field conditions. At the same time, the net returns under greenhouse were higher by ₹6672151/hectare. Cultivating cucumber in greenhouse condition results in higher crop production as well as productivity; fetches better market price and can be cultivated in off-season as compared to open field condition. Since, three cropping seasons of cucumber can be successfully taken; requirement of plant growth regulators and fertilizers ultimately goes high which can't be considered as a big constraint.*

**Key words:** GA<sub>3</sub>; NAA; NP: no pruning; DSP: double stem pruning; Cost of cultivation.

## INTRODUCTION

Cucumber (*Cucumis sativus* L.) known as Khira in Hindi is an important summer vegetable crop, generally grown throughout India. It is commonly a monoecious, annual, trailing or climbing vine having hirsute or scabrous stems with triangular ovate leaves with shallow and acute sinuses. Unbranched lateral tendrils developed at the leaf axils. The cucumber is used as salad, pickle and also as cooked vegetable. It has a cooling effect, prevents constipation, useful in jaundice and its seeds have number of ayurvedic uses. It is a warm season crop and grows best at a temperature between 18<sup>o</sup>C and 24<sup>o</sup>C. The cucumber can be grown all over the year in greenhouse. Cropping intensity of cucumber was 300% in greenhouse condition. First crop of cucumber was planted in August and prolonged up to November. Second crop was planted in December and prolonged up to

March. Third crop of cucumber was planted in April and prolonged up to June. In open field conditions cucumber was planted in February and harvested up to April-May. Cucumber is short duration (90-100 days) crop. Different varieties and high yielding hybrids can be grown under greenhouse and open field conditions. In the present investigation Malini F<sub>1</sub> was grown under both growing conditions to find out the comparative economics cultivation in Bangalore condition.

## MATERIAL AND METHODS

The present research was carried out during the Rabi season of 2017-18, at Precision Farming Development Center (PFDC), Department of Horticulture, University of Agricultural Sciences GKVK, Bangalore at the experimental field and greenhouse of PFDC. The hybrid used in this experiment was Malini F<sub>1</sub>. Malini one of the high yielding F<sub>1</sub> hybrid, produced by Semins seed Company is authorized by the Government for commercial cultivation by farmers in the state of Karnataka. The soil of the experimental field and greenhouse was red sandy loam in texture having pH of (6.25). After bringing the soil to fine tilth, beds were raised of 1 meter width, 30 cm in height and 15 meter length. The spacing between two beds was 60 cm and between plants 45 cm. sowing was done in the month of November at two seeds per hill at a depth of 2-3 cm in zigzag manner (quanix method). Later, gap filling and thinning were done to retain one plant per hill. Regular watering and plant protection measures were carried out as and when required. The experiment was carried out in a factorial randomized complete block design, with three replicates, using two growth regulators at three different concentrations namely, GA<sub>3</sub> at two levels (25 and 50 ppm) and NAA at two levels (500 and 1000 ppm). Solutions were applied at the 4 true leaf stages at 3 times; with two pruning levels namely (no pruning and double stem pruning). Total nine treatments were tried including control. The treatments were consisted of (T<sub>1</sub>) control, (T<sub>2</sub>) 25 ppm GA<sub>3</sub>+ 500 ppm NAA+ double stem pruning, (T<sub>3</sub>) 25 ppm GA<sub>3</sub>+ 500 ppm NAA+ no pruning, (T<sub>4</sub>) 25 ppm GA<sub>3</sub>+ 1000 ppm NAA+ double stem pruning, (T<sub>5</sub>) 25 ppm GA<sub>3</sub>+ 1000 ppm NAA+ no pruning, (T<sub>6</sub>) 50 ppm GA<sub>3</sub>+ 500 ppm NAA+ double stem pruning, (T<sub>7</sub>) 50 ppm GA<sub>3</sub>+ 500 ppm NAA+ no pruning, (T<sub>8</sub>) 50 ppm GA<sub>3</sub>+ 1000 ppm NAA+ double stem pruning, (T<sub>9</sub>) 50 ppm GA<sub>3</sub>+ 1000 ppm NAA+ no pruning. Four plants in each plot were randomly selected for recording observations.

## RESULTS AND DISCUSSION

The data on Comparative economic analysis of cucumber hybrid (Malini.F<sub>1</sub>) cultivation with varied doses of plant growth regulators and pruning levels under open field and greenhouse condition were made on per hectare basis.

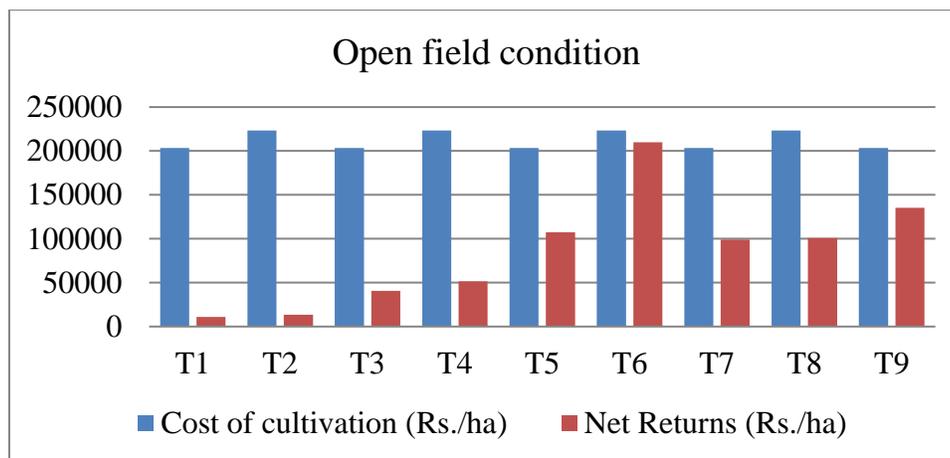
Among all the treatment combinations under greenhouse condition T<sub>6</sub> (50 ppm GA<sub>3</sub>+ 500 ppm NAA + double stem pruning) turned out to be the most profitable as revealed by the net income (Rs. 1212994 ha<sup>-1</sup>) and total cost of this treatment was (Rs. 387056 ha<sup>-1</sup>) with a B: C ratio of 4.13.

And lowest treatment combination was T<sub>1</sub> (control) resulted net income of (Rs. 663599 ha<sup>-1</sup>) with a B: C ratio of (2.86).

Similarly under open field condition treatment combination of (50 ppm GA<sub>3</sub>+ 500 ppm NAA + double stem pruning) T<sub>6</sub>, was found to be the most profitable compare to other treatment combinations, it resulted net income (Rs. 209772 ha<sup>-1</sup>) and the total cost of this treatment was (Rs. 223428 ha<sup>-1</sup>) with a B: C ratio of 1.94. And lowest treatment combination was T<sub>1</sub> (control) resulted net income of (Rs. 11072 ha<sup>-1</sup>) with a B: C ratio of 1.05.

In case of open field cultivation of cucumber, the total variable cost was worked out to be ₹1910852. The cost structure of the total variable cost indicates that the highest proportion was spent on harvesting with ₹30505.26 followed by plant growth regulators, plant protection, fertilizer and FYM, seed, weed control, field preparation, ridging/bed preparation and irrigation charges with ₹8000, ₹7252.1, ₹5394.73, ₹4778.94, ₹4289.47, ₹1926.31 and ₹1347.36 respectively. Similar findings were also reported by Rajuret *al*,

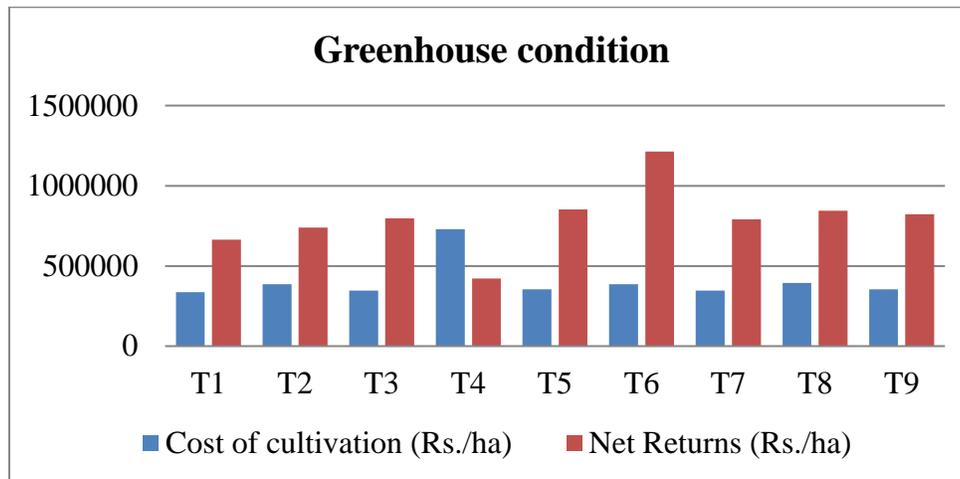
The overall findings of the study revealed that the total cost incurred on cucumber under greenhouse and open field conditions was worked out ₹3300301 and ₹1910852 per hectare respectively. It is also shown in Fig 1 and Fig 2 that the highest proportion in total cost of cucumber cultivation and highest net returns under greenhouse and open field condition was incurred on T<sub>6</sub> viz., (50 ppm GA<sub>3</sub>+ 500 ppm NAA + double stem pruning).



**Fig 1: Cost of cultivation and net returns per hectare of cucumber in open field condition**

The above finding clearly indicates that the most profitable treatment under both growing conditions was found to be T<sub>6</sub> viz., (50 ppm GA<sub>3</sub>+ 500 ppm NAA + double stem pruning) followed by other treatment combinations. And the less profitable treatment was T<sub>1</sub> (control) under both growing conditions.

An average yield of 106.67 tons and 28.88 tons per hectare was obtained under greenhouse and open field cultivation of cucumber respectively. In open field cultivation of cucumber under normal package of practices without using growth regulators the yield is estimated to be 15 tons per hectare.



**Fig 2: Cost of cultivation and net returns per hectare of cucumber in greenhouse condition**

The difference between cucumber cultivation under greenhouse and open field conditions revealed that in case of variable cost, maximum difference was observed for labor charges which were more than 3 times as compared to open field conditions. This was followed by plant growth regulators, ridging/bed preparation, fertilizer & manures, field preparation, plant protection and harvesting. The plausible reasons for such heavy differences were, in greenhouse more seedlings were planted and these were costlier also. Field preparation and bed preparation cost was also found higher in greenhouse because more agronomical practices were performed. The proportion spent on harvesting (₹34479.16) was 19.58 per cent higher as compared to the open field conditions (₹30505.26). This was because of more number of skilled labour being used and also due to long harvesting period of cucumber in greenhouse as compared to open field conditions.

The results further revealed that the expenditure on irrigation and weed control was higher in case of open field conditions by ₹654.4 and ₹383.02, respectively as compared to cultivation under greenhouse. This indicates that there was more infestation of weed in case of cultivation of cucumber under open field conditions. Again marketing cost under greenhouses was higher by ₹6276.46 as compared to open field conditions.

The data pertaining to returns from cucumber crop under greenhouse and open field conditions as illustrated in Table 1 revealed that, in case of greenhouse cultivation of cucumber, gross return per hectare was estimated ₹10741650. Total net returns were calculated ₹7441349 per hectare. In case of open field cultivation of cucumber gross returns per hectare was estimated ₹2680050, and total net returns were calculated ₹769198 per hectare.

Treatments		Yield (kg/ha)	Rate (Rs./kg)	Gross returns (Rs./ha)	Cost of cultivation (Rs./ha)	Net returns (Rs./ha)	Cost: benefit Ratio
Greenhouse condition	T <sub>1</sub>	64100	15	1000050	336451	625049	2.86
	T <sub>2</sub>	75070	15	1126050	386418	739632	2.91
	T <sub>3</sub>	76270	15	1144050	346418	797632	3.30
	T <sub>4</sub>	76670	15	1150050	394385	755665	2.92
	T <sub>5</sub>	80400	15	1206000	353742	852258	3.41
	T <sub>6</sub>	106670	15	1600050	387056	1212994	4.13
	T <sub>7</sub>	75870	15	1138050	347061	790989	3.28
	T <sub>8</sub>	82530	15	1237950	394385	843565	3.14
	T <sub>9</sub>	78530	15	1177950	354385	823565	3.32
Open field condition	T <sub>1</sub>	14300	15	214500	203428	11072	1.05
	T <sub>2</sub>	15800	15	237000	223428	13572	1.06
	T <sub>3</sub>	16280	15	244200	203428	40772	1.20
	T <sub>4</sub>	18330	15	274950	223428	51522	1.23
	T <sub>5</sub>	20720	15	310800	203428	107372	1.53
	T <sub>6</sub>	28880	15	433200	223428	209772	1.94
	T <sub>7</sub>	20170	15	302550	203428	99122	1.49
	T <sub>8</sub>	21620	15	324300	223428	100872	1.45
	T <sub>9</sub>	22570	15	338550	203428	135122	1.66

**Table 1: Cost economics of different treatment combinations of GA<sub>3</sub>, NAA and pruning levelson cucumber (Malini F<sub>1</sub>) production in open field and greenhouse condition**

Cucumber growers have recognized that yield, gross return, net return, quality fruit production, sale price in market and all other profits are significantly higher as compared to open field condition. Hence, it can safely be concluded that yield of cucumber and income of farmers can be increased by adoption of greenhouse technology.

## CONCLUSION

1. In case of open field condition, expenditure on irrigation and weed control was higher by 10.11 and 18.15 per cent respectively.
2. In comparative economic analysis, in case of both growing conditions T<sub>6</sub> (50 ppm GA<sub>3</sub>+ 500 ppm NAA + double stem pruning) was found to be the most profitable treatment with regard to net return and highest B:C ratio.
3. In case of greenhouse condition, expenditure on skilled labour charges was 12.7 per cent higher as compared to open field condition.
4. Total cost of cucumber cultivation in greenhouse was nearly 1.5 times higher as compared to open field conditions.
5. Farmers realized 145.32 per cent higher yield of cucumber under greenhouse as compared to open field condition.
6. The gross returns and net returns in case of cucumber in greenhouse were found more as compared to open field cultivation.

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