Current Journal of Applied Science and Technology

40(44): 39-43, 2021; Article no.CJAST.83535
ISSN: 2457-1024
(Past name: British Journal of Applied Science & Technology, Past ISSN: 2231-0843, NLM ID: 101664541)

An Economic Analysis of Tomato Cultivation under Polyhouse Condition

K. S. Rajawat [a*], K. D. Ameta [a], J. K. Tak [a], S. L. Jat [a] and Mohan Singh [a]

[a] Department of Horticulture, Rajasthan College of Agriculture, MPUAT, Udaipur, India.

Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/CJAST/2021/v40i4431621

Open Peer Review History:
This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: https://www.sdiarticle5.com/review-history/83535

Original Research Article

Received 21 October 2021
Accepted 25 December 2021
Published 26 December 2021

ABSTRACT

A study was conducted at Hi-Tech Unit, Department of Horticulture, Rajasthan College of Agriculture, MPUAT, Udaipur to evaluate the effect of different nutrient sources in tomato under Naturally Ventilated Polyhouse**.** The study comprises eight treatment combinations with four replications under completely randomized design. The present investigation was undertaken with a view to work out the costs and returns from polyhouse grown tomato under low cost naturally ventilated polyhouse conditions. Polyhouse cultivation of tomato is emerging as specialized production technology to overcome biotic and abiotic stresses during off-season and also ensure round the year production of tomato. Application with 50 per cent organic and 50 per cent inorganic fertilizers was found best in terms of economic feasibility in tomato as it produced the highest gross return (Rs. 266200.00/1000 m^2 area), net return (Rs. 188420.00) and net return per rupee investment (2.42) and was also found to be superior in terms of good quality produce. These results suggested that the optimum production and net return can be obtained with the integrated application of 50 per cent organic and 50 per cent inorganic fertilizers.

Keywords: Tomato; gross income; profitability; production cost.

1. INTRODUCTION

Tomato (*Solanum lycopersicon* L.) is one of the most important vegetable crop in the world. It belongs to the family solanaceae have diploid chromosome number 24 and a self pollinated crop. Tomato is cultivated throughout the world in tropics and subtropics and more extensively in

**Corresponding author: E-mail: rajawatkd@gmail.com;*

United States, China, Italy, Turkey and India. Tomato is one of the popular vegetables of great commercial value and is used in various forms of salad, soup, ketchup, sauce, chutney, pickles, powder, paste, juice, puree, and many other products. The ripened fruit have medicinal properties. India is second largest producer (11.50 %) of tomato in the world [1]. In India during 2016-17 tomato had an area of 808.5 ('000' ha) with production 19696.9 ('000' MT) and productivity 24.4 MT per hectare. Protected cultivation of tomato not only overcomes the biotic and abiotic stresses but fulfills the demand of quality products and has encouraged commercial growers to raise tomato under greenhouses for year round supply with remunerative prices to the growers [2]. Greenhouse cultivation could, therefore, be resorted to increase the tomato production. Vegetable cultivation in polyhouse, not only increases the productivity but also, enhances the quality of vegetables and it is being practiced in more than fifty countries all over the world [3] and [4]. The present study was taken up to examine the factors affecting gross return and profitability of tomato in a naturally ventilated polyhouse condition under different treatment combinations with sustainable crop production technology.

2. METHODS AND METHODOLOGY

The experiments were carried out during two consecutive years 2017 and 2018 in naturally ventilated polyhouse for standardization of production of tomato and to workout economic feasibility of investment under polyhouse conditions was evaluated at MPUAT, Udaipur. The polyhouse was covered with UV stabilized low density 200 micron thick polyethylene sheet along with aluminate sheet, insect proof net and foldable side covers by taking into account the depreciation cost of the life of permanent structure as 20 years, while the life of UV poly cladding material and insect proof net were considered as five years. Eight different nutrient sources module including organic and inorganic fertilizers were involved in the present study. The experiment was laid out in completely randomized design with four replications. Data were generated by cost accounting method from 2017 to 2018.

2.1 Cost of Cultivation Calculation

Costs were computed by grouping following certain items (Table 1) of costs as discussed below:

A) General costs like value of hired labour and machineries
B) Fixed cost/ infrastructure
C) Material inputs
D) Variable cost due to different module applied

Total cost of cultivation= A+B+C+D

Gross Returns: Gross return was estimated on the basis of the average fruit yield per 1000 square meter by considering the present price of inputs and current selling price of produce.

Gross Income **=** Yield per 1000 square meter × Current selling price of product

Net Returns: It is the net profit after deducting total cost of cultivation from gross income.

Net returns = Gross returns – total cost of cultivation per 1000 meter square

Returns per rupee: Net returns per rupee investment (B:C ratio) was estimated by using following formula:

$$\text{B:C Ratio} = \frac{\text{Net returns (Rs. per 1000 square meter)}}{\text{Total cost of cultivation (Rs.per 1000 square meter)}}$$

3. RESULTS AND DISCUSSION

Polyhouse production of vegetable is a capital-intensive technology requiring a substantial investment especially during initial investment. The details of total costs including variable costs due to different module applied in polyhouse are given in Table 1 and Table 2 revealed that the lowest total cost of cultivation 73660.00 rupees was found with application of 100 % vermicompost and highest total cost of cultivation 80410.00 rupees was found with module 2 treated with 100 % RDF and Biofertilizers while total cost of cultivation of highest net return producing module was found 77780.00 rupees with application of 50 per cent both organic and inorganic fertilizers. The break-up of costs indicated that the highest costs was incurred on labour and material inputs like plastic ropes, insecticides, seedling etc. indicating that polyhouse cultivation of tomato is both labour and capital intensive [5].

Economic analysis showed that application of 50 per cent both organic and inorganic fertilizers

significantly produced higher gross return (Rs. 266200.00), net return (Rs. 188420.00) and net return per rupee investment of Rs. 2.42 closely followed by 75 % organic and 25 % inorganic fertilizers. Yeptho *et al.* [6] revealed that the treatment 50 per cent NPK + 50 per cent PM + biofertilizers gave the highest net return Rs. 3,49,887 of tomato under polyhouse condition. Similar findings were also reported by Murlidharan *et al.* [7] and Kumar *et al.* [8] in tomato, Tuti *et al.* [9] and Lal and Kanaujia [10] in pepper and Laxmi *et al.* [11] in tomato. Besides yield, the quality of fruits was found to be superior in terms of its size, colour and shining as compared to open field condition [12]. The cost of cultivation of tomato under poly houses was higher by Rs. 206816.90/acre as compared to open field conditions [13]. Protected technology breaks the seasonal barriers of production and thus, ensures availability of the tomato throughout the year by proper crop planning. It will be even more profitable for the growers if the market prices are found to be higher due to superior quality and off season produce.

Table 1. Expenditure of tomato cultivation under naturally ventilated polyhouse condition for (1000 m^2 area)

(A) General cost per 1000 m^2 area		
S.No.	**Particulars**	**Expenditure (**Rs.)
A	**Variables:**	
(i)	Nursery preparation and sowing	440.00
(ii)	Nursery management (Two hours for 30days)	1100.00
(iii)	Bed preparation	880.00
(iv)	Transplanting	440.00
(v)	Manuring and fertilization	1320.00
(vi)	Intercultural operations (Hoeing, weeding, earthing up and irrigation)	7040.00
(vii)	Spraying (insecticides, pesticides and organic substance)	5500.00
(viii)	Training and pruning	4400.00
(ix)	Picking and harvesting	6600.00
	Total	**27720.00**
B.	**Fixed Cost/ Infrastructure**	
(i)	Depreciation on fixed cost + interest on invested money	25000.00
C.	**Material Input**	
(i)	Soil treatment	1600.00
(ii)	Seedling cost	10800.00
(iii)	Insecticide and fungicides	1740
(iv)	Plastic ropes	1800.00
	Total cost (A+B+C)	**68660.00**
D.	**Variable Cost Due to Different Module Applied:**	
T_1	100% RDF (180:100:100 kg/ha NPK)	11600.00
T_2	100% RDF + Biofertilizers	11750.00
T_3	100% Vermicompost + Biofertilizers	5150.00
T_4	100% Vermicompost	5000.00
T_5	100% organic management	6140.00
T_6	75% organic management	5305.00
T_7	50% organic + 50% inorganic fertilizers	9120.00
T_8	75% organic + 25% inorganic fertilizers	6730.00

Table 2. Benefit cost ratio, gross returns, net returns of different module combinations of tomato under naturally ventilated polyhouse condition

S. No.	Module	Estimated yield (Quintal/ 1000 m^2)	Total cost of cultivation (Rs. / 1000m^2)	Gross return (Rs. / 1000m^2)	Net return (Rs. / 1000m^2)	B:C ratio
1.	100% RDF	116.70	80260.00	233400.00	153140.00	1.91
2.	100% RDF + biofertilizers	120.40	80410.00	240800.00	160390.00	1.99
3.	100% vermicompost + biofertilizers	112.50	73810.00	225000.00	151190.00	2.05
4.	100% vermicompost	103.60	73660.00	207200.00	133540.00	1.81
5.	100% organic management	126.30	74800.00	252600.00	177800.00	2.38
6.	75% organic management	102.10	73965.00	204200.00	130235.00	1.76
7.	50% organic + 50% inorganic fertilizers	133.10	77780.00	266200.00	188420.00	2.42
8.	75% organic + 25% inorganic fertilizers	128.70	75390.00	257400.00	182010.00	2.41

**Retail sale price of tomato @ Rs. 20 per kg*

4. CONCLUSION

Cultivation of tomato under low cost polyhouse emerged as a profitable and economically viable option to increase the farmers' income by using cost effective, eco friendly and sustainable production with minimum deterious effects on soil health and environment. The best combination of organic and inorganic fertilizers for obtaining the maximum net returns was found with the application of 50 per cent both organic and inorganic fertilizers.

ACKNOWLEDGEMENT

The authors are thankful to Hi-tech Unit, Department of Horticulture, Rajasthan College of Agriculture, MPUAT, Udaipur (Rajasthan) for providing facilities for the investigation.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Anonymous. Indian Horticulture Database; 2017.
   Available: www.nhb.gov.in
2. Ameta KD, Kaushik RA, Dubey RB, Rajawat KS. Protected cultivation- An Entrepreneurship for modern agriculture, Biotech Today. 2019;9(1):35-40.
3. Singh. Vegetable production under protected conditions: Problems and Prospects. Indian Soc. Veg. Sci. Souvenir: Silver Jubilee, National Symposium. Varanasi, U.P. India. 1998;90.
4. Raturi HC, Uppal GS, Singh SK, Kachwaya DS. Effect of organic and inorganic nutrient sources on growth, yield and quality of bell pepper (*Capsicum annum L.*) grown under polyhouse condition. Journal of Pharmacognosy and Phytochemistry. 2019;8(1):1788-1792.
5. Murthy DS, Prabhakar BS, Hebber SS, Srinivas V, Prabhakar M. Economic feasibility of vegetable production under polyhouse: A case study of capsicum and tomato. Journal of Horticultural Sciences. 2009;4(2):148-152.
6. Yeptho V, Kanaujia SP, Singh VB, Shrama A. Effect of integrated nutrient management on growth, yield and quality of tomato under poly-house condition. Journal of Soils and Crops. 2012;22(2): 246-252.
7. Muralidharan B, Saravanan S, Prasad VM, Ramteke PW, Dawson J. Effect of organic manures and inorganic fertilizers on plant yield and economics indeterminate tomato (*Solanum lycopersicom L.*) Hy. GS-600. International Journal of Research in Applied, Natural and Social Sciences. 2016;4(9):177-182.
8. Kumar P, Chauhan RS, Grover RK. An economic analysis of cucumber (*Cucumis sativus L.*) cultivation in eastern zone of Haryana (India) under polyhouse and open field condition. Journal of Applied and Natural Sciences. 2017;9(1):402-405.
9. Tuti MD, Hedau NK, Bisht JK, Bhatt JC. Effect of organic and inorganic sources of nutrient on yield, economics and energetic of pepper and soil properties in naturally ventilated polyhouse. Archives of Agronomy and Soil Science. 2014;60(7):1005-1014.
10. Lal S, Kanaujia SP. Integrated nutrient management in capsicum under low cost polyhouse condition. Annals of Horticulture. 2013;6(2):170-177.
11. Laxmi RP, Saravanan S, Naik ML. Effect of organic and inorganic fertilizers on plant growth, yield, fruit quality and shelf-life of tomato (*Solanum lycopersicon L.*) cv. PKM-1. International Journal of Agriculture Science and Research. 2015;5(2):7-12.
12. Duhan PK. Cost benefit analysis of tomato production in protected and open farm. International Journal of Advances Research in Management and Social Sciences. 2016;5(12):140-148.
13. Kumar P, Chouhan RS, Grover RK. Economics analysis of tomato cultivation under poly house and open field conditions in Haryana, India. Journal of Applied and Natural Science. 2016;8(2):846 – 848.

Peer-review history:
The peer review history for this paper can be accessed here:
https://www.sdiarticle5.com/review-history/83535