

# International Journal of Statistics and Applied Mathematics



ISSN: 2456-1452  
Maths 2023; SP-8(4): 420-423  
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<https://www.mathsjournal.com>  
Received: 07-05-2023  
Accepted: 14-06-2023

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## Benefit cost analysis of entomopathogenic fungi and botanicals for the control of onion thrips (*Thrips tabaci* L.).

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### Abstract

The existing investigations on "Bioefficacy of Biopesticides in opposition to Onion Thrips, *Thrips tabaci* L. On Onion" had been performed at the academic Farm of Barrister Thakur Chhedilal university of Agriculture and studies Station, Bilaspur, a constituent university of Indira Gandhi Vishwavidyalaya, Raipur (Chhattisgarh), in the course of Rabi 2019-20. The results revealed that the best biopesticide was Spinosad 45 SC at 0.016% with the highest yield of onion bulbs at one hundred ninety q/ha, accompanied via Garlic extract at 5% and Beauveria bassiana at 10.00% WP. *Metarhizium anisopliae* (10.00% WP), *Lecanicillium lecanii* (10.00% WP), and NSKE (five %), with yields of 170 q/ha, 148 q/ha, 137 q/ha, one hundred thirty q/ha, and 128 q/ha, respectively. The least yield of all remedies of 107 q/ha was recorded at simple water at 500 liters/ha. The best gain-fee ratio was acquired at Spinosad 45 SC at zero.016% of 03:1, accompanied by way of Garlic Extract five%, Beauveria bassiana 10.00% WP, *Metarhizium anisopliae* 10.00% WP, *Lecanicillium lecanii* 10.00% WP, and NSKE five% with advantage-price ratios of 2.Eighty:1, 2.37:1, 2.11:1, 1.96:1, and 1.90:1. The bottom advantage-value ratio become obtained at undeniable water spray @500 lit./ha treatment with a 1.49:1

**Keywords:** Revenue, bio-efficacy, marketable, biopesticides and yield

### Introduction

The onion (*Allium cepa* L., from Latin *Cepa* "Onion") additionally called the bulb onion or commonplace onion, is a distinguished, maximum cultivated vegetable crop most of the genus *Allium*. The garlic, shallot, leek, chive, and chinese onion are the close family with same cultivation practices. India is the large producer of onion as compare to different bulb vegetation with the production of 23262.33 thousand metric tonnes from 1284.Ninety nine thousand hectares. (Anonymous, 2017-2018) [7] The bulbs are wealthy in nutrition C (10%), iron (2%). Phyto-chemicals *Allium* and Allyl propyl disulphide inside the onions convert into allicin for decreasing blood vessel stiffness by liberating nitric oxide (NO) and there via brings reduction inside the total blood stress. The nutrient composition of Onion in step with 100 g seed carries 343 kcal, 10.Fifty nine in line with cent moisture content, sixty two.78 g carbohydrate, 21.70 g protein, 1.Forty nine g fat, 15 g nutritional fiber, 456 µg folates, 2.965 mg niacin, 0.283 mg pyridoxine, 0.187 mg riboflavin, zero.643 mg thiamin, 17 mg sodium, 1392 mg potassium, a hundred thirty mg calcium, 1.057 µg copper, 5.23 mg iron, 183 mg magnesium, 1.791 mg manganese, 367 mg phosphorus, eight.2 µg selenium and 2.76 mg zinc (Anonymous, 2018) [7]. A number of the insect pest complicated of onion, *Thrips tabaci* is maximum critical insect-pest infesting onion causes up to 34-forty three percent lack of yield (Kumar *et al.*, 2001) [5], Heavy yield loss caused even ninety percentage has also been reported on onion when thrips attack the early crop tiers of crop increase (Anon, 1984) [1]. Nymph and grownup each are triggered infestation on sheath portion of plant due to due to its destructive rasp to cell saps results in oozing, leaves grow to be dry and twisted from apex developing into white patches.

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## Method and Materials

Entomopathogenic fungi and botanicals insecticides solutions were prepared at their recommended doses except garlic extract and sprayed in the field twice.

### Method of preparation Garlic Extract

Extract: Steep the finally grated garlic for 24 hours in the kerosene oil. Dissolve the soap in the water, mix the infusion of garlic and kerosene oil, stir will together filter through a fine cloth. Before use dilute the solution with 20 parts of water (Ellis, B.W, and Bradly, F.M. 1992) [3].

### Materials

100 gm garlic cloves, 0.5 lit of water, 10 gm soap, and 2 teaspoons kerosene oil.

The cost of each treatment including material and labour was calculated and the revenue of each derived using the value of the marketable yield of Onion bulb. The cost: benefit ratios of sprayed treatments were derived by comparing the cost of each plant protection regime against the additional market value of the treatment yield above that obtained in the control treatment.

### Economics of treatment

- **Cost of cultivation:** (Rs ha-1) Cost of production for all treatments were worked out on the basis of the prevailing market price of input and the produce.
- **Gross return:** (Rs ha-1) Gross return (Rs. ha-1) was obtained by converting the harvest into monetary terms at the prevailing market rate during the course of investigation for each treatment.

- **Net returns:** (Rs ha-1) The net returns (Rs ha-1) were calculated by deducting the cost of production (Rs ha-1) from the gross return (Rs ha-1).
- **Benefit cost ratio (B: C ratio):** Benefit cost ration calculated to net returns (Rs ha-1) divided by cost of cultivation (Rs ha-1).

### Result and Discussion

8 treatments (entomopathogenic fungi and botanicals insecticides) have been evaluated for their efficacy against onion thrips on the premise of yield of onion bulb. The treatment Spinosad forty five SC @ 0.016% become observed to be handiest towards onion thrips, with highest yield of onion bulb a hundred ninety q/ha increase in yield over manipulate 98.00 q/ha. Garlic extract 5% turned into next great treatment was found to be 2d simplest with yield of onion marketable bulb 170 q/ha and increase in yield over manage seventy eight.00 q/h production. Subsequent excellent remedy turned into Beauveria bassiana 10.00percentWP (1x10<sup>9</sup>CFU/g min) @ 10ml/lit. Of water recorded in these remedy marketable bulb 148q/ha within boom in yield over manipulate fifty six.00 q/h manufacturing, Metarhizium anisopliae 10.00p.CWP (1x10<sup>9</sup>CFU/g min) @ 10ml/lit. Of water, with marketable yield of onion bulb 137.00 q/ha boom in yield over control 45.00 q/ha manufacturing, *Lecanicillium lecanii* 10.00%WP (1x10<sup>9</sup>CFU/g min) @ 10ml/lit. Of water recorded marketable 130q/ha with growth in yield over manage 38.00 q/ha and subsequent better treatment become NSKE 5% remedy marketable 128 q/ha boom in yield over manipulate 36.00 q/ha production and least manipulate by using plain water@ 500lit.Ha-1 marketable bulb 107q/ha within boom in yield over manage 15.00 q/ha.

**Table 1:** Effect of different biopesticides on onion yield

S. No.	Treatments	Marketable bulb yield (q/ha)	Increase in yield over Control (q/ha)	Percent increase in yield over control	Percent avoidable losses
1.	<i>Beauveria bassiana</i> 10.00%WP (1x 10 <sup>9</sup> CFU/gm min)	148.0	56.00	60.86	22.10
2.	<i>Metarhizium anisopliae</i> 10.00%WP (1 X 10 <sup>9</sup> CFU/gm min)	137.0	45.00	48.91	27.89
3.	<i>Lecanicillium lecanii</i> 10.00%WP (1x10 <sup>9</sup> CFU/gm min)	130.0	38.00	41.30	31.57
4.	NSKE 5%	128.0	36.00	39.13	32.63
5.	Garlic Extract 5%	170.0	78.00	84.78	10.52
6.	Spinosad 45 SC @ 0.016 %	190.0	98.00	106.52	-
7.	Plain water spray @500 lit./ha	107.0	15.00	16.30	44.74
8.	Control	92.0	-	-	51.57
	CD%	1.58			
	SEm±	0.30			

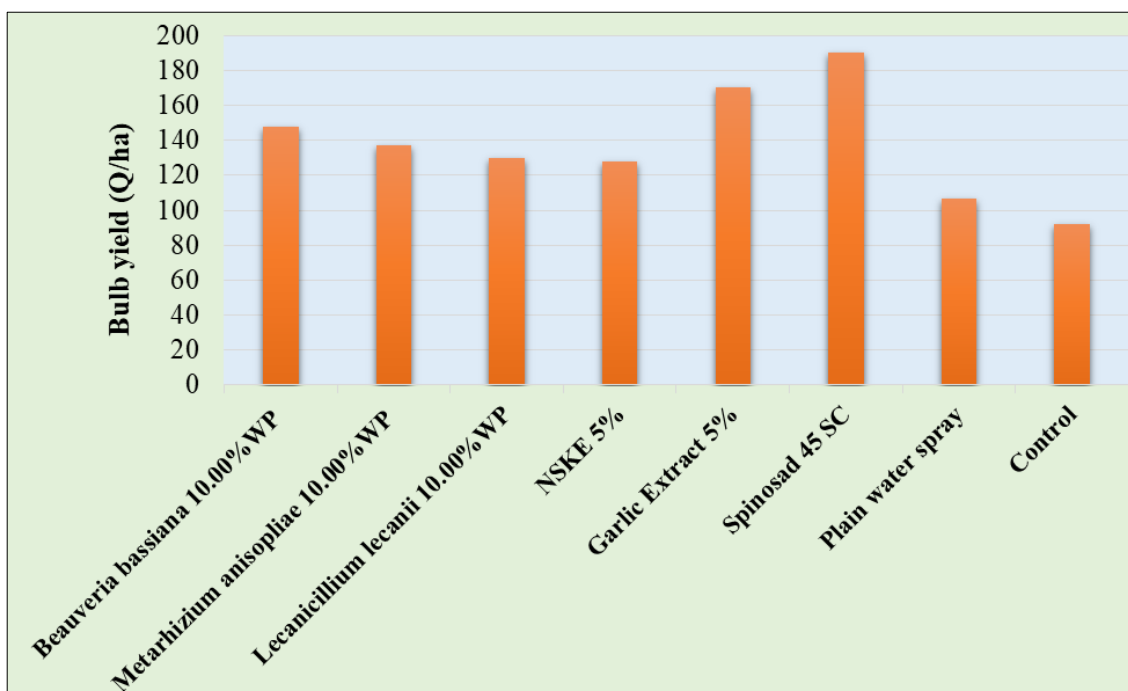


Fig 1: Onion marketable bulb yield of different treatments

All of the treatments in a season had been superior financially compared to the control remedy wherein onion closely attacked by means of onion thrips (*Thrips tabaci* L.) and reduce trojan horse (*Spodoptera litura*). Consequently, remedies aside from the manipulate had better yields which resulted in sales that surpassed the value of the plant safety regime (Tables 1). There had been variations within the total price of plant protection. The best advantage-fee ratio of 03:1 was obtained from traetment Spinosad forty five SC @ zero.016 % intently observed by using plot sprayed with Garlic Extract five% benefit cost ratio 2.80:1, Beauveria bassiana 10.00percentWP (1x 10<sup>9</sup> CFU/gm min) 2.37:1, Metarhizium anisopliae 10.00percentWP (1 X 10<sup>9</sup> CFU/gm min) 2.11:1, *Lecanicillium lecanii* 10.00% WP (1x10<sup>9</sup> CFU/gm min) 1.96:1 and NSKE five% 1.Ninety:1, the bottom

was observed at undeniable water remedy plot with gain value ratio of 1.Forty nine:1

It's far clean that all remedies for biopesticides efficaciously reduced the onion thrips and enrolled better yield of onion bulb as compared to untreated manage.

The existing findings are according with Kalola *et al* (2017) <sup>[4]</sup> wherein Spinosad 45SC 0.009 % @ 02 ml/10 lit. Of water changed into found powerful in opposition to onion thrip. Kumar *et al* (2012) <sup>[6]</sup> discovered Beauveria bassiana (Bals) @ 1x 10<sup>9</sup> spores/ml two times become observed to be pleasant remedy with lowest suggest thrips populace (nine.Fifty three/plant) with highest per cent discount (sixty four.15) confirms the prevailing findings. Iqbal *et al* (2015) stated that plant extracts own sizable capacity toxicity towards okra thrips and Garlic extract became determined to be 2d great remedy against *Thrips tabaci*.

Table 2: Economics of different biopesticides and botanicals

S. No.	Treatment	Yield of bulb (q ha <sup>-1</sup> )	Total cost of cultivation	Gross income (Rs ha <sup>-1</sup> )	Net income (Rs ha <sup>-1</sup> )	Benefit over control (Rs ha <sup>-1</sup> )	B:C Ratio
1.	<i>Beauveria bassiana</i> 10.00% WP (1x 10 <sup>9</sup> CFU/gm min)	148.0	65,963	2,22,000	1,56,037	82,599	2.37:1
2.	<i>Metarhizium anisopliae</i> 10.00% WP (1 X 10 <sup>9</sup> CFU/gm min)	137.0	65,963	2,05,550	1,39,587	66,150	2.11:1
3.	<i>Lecanicillium lecanii</i> 10.00% WP (1x10 <sup>9</sup> CFU/gm min)	130.0	65,963	1,95,000	1,25,037	55,600	1.96:1
4.	NSKE 5%	128.0	66,063	1,92,000	1,87,947	52,500	1.90:1
5.	Garlic Extract 5%	170.0	67,053	2,55,000	2,13	1,17,000	2.80:1
6.	Spinosad 45 SC @ 0.016 %	190.0	71,233	2,85,000	2,30,635	1,40,330	03:1
7.	Plain water spray @500 lit./ha	107.0	64,563	1,60,500	95,937	21,320	1.49:1
8.	Control	92.0	63,383	1,38,000	90,305	-	-

**Note:** Labour charge @295 Rs./day. (2 labour required for one hactare spraying), Onion Bulb rate per kg = 15 Rs., *Beauveria bassiana*, *Metarhizium anisopliae*, *Lecanicillium lecanii* @ 70 Rs/ kg (Required 3.5kg/h)., NSKE 5% @ 60Rs/liter, Garlic extract 5% @ 50 Rs/ liter, Spinosad 45SC @ 1450 Rs/75ml.

**Conclusion**

The highest yield changed into received from the plots handled with Spinosad forty five SC at 0.016%, at the side of a most 106.Fifty two% growth over manipulate. The bottom percentage boom in onion yield over control turned into received in undeniable water spray remedy. A few of the

unique bio-pesticides and botanicals, Garlic Extract five% was the nice remedy with an eighty four. Seventy eight% growth in yield over manipulate, followed by Beauveria bassiana 10.00% WP (1 x 10<sup>9</sup> CFU/gm min) with a 60.86% boom, and Metarhizium anisopliae 10.00% WP (1 X 10<sup>9</sup> CFU/gm min). 48.91% increase, *Lecanicillium lecanii*

10.00% WP (1109 CFU/gm min) 41.30% increase, NSKE five%, 39.13% boom, and simple water spray simplest sixteen.30% growth in yield over untreated manage. In phrases of advantage value ratio, Spinosad forty five SC @ zero.016% changed into discovered to be the first-class with a ratio of 03:1, accompanied by using Garlic Extract five%, *Beauveria bassiana* 10.00% WP, *Metarhizium anisopliae* 10.00% WP, *Lecanicillium lecanii* 10.00% WP, and NSKE five%. The lowest benefit cost ratio was obtained at undeniable water treatment with a 1.49:1 benefit cost ratio.

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