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Praveen Gupta
Department of Vegetable Science, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh, India

Jitendra Trivedi
Department of Vegetable Science, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh, India

Pravin Kumar Sharma
Department of Vegetable Science, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh, India

Dhananjay Sharma
Department of Vegetable Science, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh, India

Sukwariya Devi
Department of Vegetable Science, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh, India

Ajeet
Department of Vegetable Science, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh, India

Mukesh Kharsan
Department of Vegetable Science, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh, India

Rishabha Dubey
Department of Vegetable Science, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh, India

Corresponding Author:
Praveen Gupta
Department of Vegetable Science, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh, India

Effect of different bio-fertilizers and organic substances on economics of onion cultivation

Praveen Gupta, Jitendra Trivedi, Pravin Kumar Sharma, Dhananjay Sharma, Sukwariya Devi, Ajeet, Mukesh Kharsan and Rishabha Dubey

Abstract
The present investigation "effect of different bio-fertilizers and organic substances on economics of onion cultivation" was carried out at the Horticultural Instructional cum Research Farm, Department of Vegetable Science, Indira Gandhi Krishi Vishwavidyalaya, Raipur (C.G.) during *Rabi* season of year 2020-21 and 2021-22 with onion cultivar N-53. The experiment was laid down in randomize block design with three replications. The experiment was comprised of nine treatment organic manures and biofertilizers sole and different combination with one control (without organic manures and biofertilizers inoculation). Result revealed that the maximum income (both gross and net) and b:c ratio was obtained with T_9: Vermicompost + *Azospirillum* + *Azotobacter* + PSB and the lowest income (both gross and net) was obtained with T_0: control. It is therefore concluded that application of full dose of biofertilizers (*Azospirillum* + *Azotobacter* + PSB) along with vermicompost were recommended for getting higher profit in onion cultivation.

Keywords: Onion, biofertilizer, vermicompost, gross profit, net profit and b:c ratio

Introduction
Onion (*Allium cepa* L.) is a biennial or perennial herb belongs to family Alliaceae. The place of origin is purported to be in central Asia, and the Mediterranean regions are considered to be the secondary centre of origin. India is the second largest producer of onion in the world, next to China. India produces about 26830 MT of onion from an area of 1639 Mha with productivity of 16.36 metric tonnes. Maharashtra is the leading onion growing state and other important states are Madhya Pradesh, Gujarat, Bihar, Rajasthan, Andhra Pradesh, West Bengal, Haryana and Uttar Pradesh (Anon., 2021a) [2]. In Chhattisgarh, onion is cultivated an area about 25.54 Mha and production of 418.12 MT with productivity of 16.37 metric tonnes (Anon., 2021b) [3].

It is one of the most important cash vegetable crop, among bulb crops with higher market demand and price due to its culinary, dietary and medicinal values (Anon., 2003) [1]. It is especially rich in protein, carbohydrate and ascorbic acid. About 38 kcal. Calories of energy are obtained from 100 g onion. Nutritive value of onion (nutritive value per 100 g onion scales) water (89 g), lipids (0.16 g), carbohydrate (8.6 g), fibre (1.8 g), potassium (157 mg), sulphur (70 mg), phosphorus (33 gm), calcium (20 gm), vitamin C (6.4 gm.), vitamin E (0.26 gm.), vitamin B6 (0.116 gm.), folic acid (19 mcg.), glutamic acid (0.118 g), argentine (0.156 g), lysine (0.055 g) and leucine (0.041 g) (Kumar *et al*., 2019) [9].

Fertilizer application proved to be a great success and production of vegetables crops increasing in our country. But the continuous and liberal use of inorganic fertilizer alone affects soil health and thus resulting in lower yield with poor quality produce (Mamatha, 2006 and Singh *et al*., 2017) [9, 12]. Now a days there is a need to devise alternate ways to collect, process, compost, utilize organic manure like FYM, vermicompost as well as biofertlizers like *Azotobacter*, *Azospirillum*, *Acetobacter*, *Rhizobium*, *Azolla*, Blue green algae and Phosphate solubilizing bacteria for enrich fertility status of the soil (Vachan and Tripathi, 2017) [13].

Combined use of vermicompost, biofertilizers and inorganic fertilizers is of special significance under intensive cropping system as these are complementary and supplementary to each other in sustaining crop yields and soil productivity. Balanced fertilization has to be made for different crops based on soil testing for attaining maximum yield and profit Biofertilizers are economically lucrative, ecologically sound and are also self generating sources without any negative influence either to the crop or to the environment (Dikshit, 2015) [6].

Therefore, keeping in view the production of onion with judicial application of organic substances along with bio fertilizers is an integrated way to reduce health hazards, to protect environment as well as enhancing productivity and obtain higher profit.

Materials and Methods

The present experiment was conducted at Horticultural Research cum Instructional Farm, Indira Gandhi Krishi Vishwavidyalaya, Raipur (C.G.) during *Rabi* season of year 2020-21 and 2021-22 with onion cultivar N-53. The experiment was comprised of nine treatment organic manures and biofertilizers sole and different combination *i.e.* T_1: Vermicompost + *Azospirillum*, T_2: Vermicompost + *Azotobacter*, T_3: Vermicompost + PSB, T_4: Vermicompost + *Azospirillum* + *Azotobacter* (1/2 dose), T_5: Vermicompost + *Azospirillum* + PSB (1/2 dose), T_6: Vermicompost + *Azotobacter* + *Azospirillum* (1/2 dose), T_7: Vermicompost + *Azospirillum* + *Azotobacter* + PSB (1/2 dose), T_8: Vermicompost + *Azospirillum* + *Azotobacter* + PSB (1/3 dose), T_9: Vermicompost + *Azospirillum* + *Azotobacter* + PSB and one control T_0 (without organic manures and biofertilizers inoculation). The experiment was laid out in Randomized Block Design with three replications. The schedules of different pre and post-sowing cultural operations carried out timely during the crop season. The economic analysis *viz*., gross profit, net profit and b:c ratio were calculated.

Results

The economics of all the treatments are calculated from two years pooled data and is presented in Table 1 and depicted through Figure 1 and 2. The net profit/ha ranged from Rs. 126122.42/ha to Rs. 184090.43/ha. The maximum net profit/ha was recorded under T_9: Vermicompost + *Azospirillum* + *Azotobacter* + PSB (Rs. 184090.43/ha). While minimum net profit/ha was obtained in T_0: control (Rs. 126122.42/ha). The gross profit/ha ranged from Rs. 181920.00/ha to Rs. 255840.00/ha. The maximum gross profit/ha was recorded in T_9: Vermicompost + *Azospirillum* + *Azotobacter* + PSB (Rs. 255840.00/ha). However, minimum gross profit/ha was recorded in T_0: control (Rs. 181920.00/ha). Thus, the maximum income (both gross and net) was obtained with T_9: Vermicompost + *Azospirillum* + *Azotobacter* + PSB and the lowest income (both gross and net) was obtained with T_0: control. The benefit cost ratio ranged from 1.94 to 2.57 depending on different treatments. The maximum benefit cost ratio was recorded in T_9: Vermicompost + *Azospirillum* + *Azotobacter* + PSB (2.57). Whereas, minimum benefit cost ratio was recorded in T_3: Vermicompost + PSB (2.26). Similar results were reported by Chattoo *et al.* (2007) [4], Jawadagi *et al*. (2012) [7], Dikshit (2015) [6], Dhaker *et al.* (2017) [5], Vachan and Tripathi (2017) [13], Sharma *et al.* (2018) [11] and Prusty *et al*. (2019) [10].

Table 1: Effect of different bio-fertilizers and organic substances on economics in onion cultivation

Treatments	Gross profit (Rs./ha)	Net profit (Rs./ha)	B:C Ratio
T_0: Control	181920.00	126122.42	2.26
T_1: Vermicompost + *Azospirillum*	211040.00	141925.09	2.05
T_2: Vermicompost + *Azotobacter*	210320.00	141205.09	2.04
T_3: Vermicompost + PSB	203520.00	134405.09	1.94
T_4: Vermicompost + *Azospirillum* + *Azotobacter* (1/2 dose)	228720.00	158946.43	2.28
T_5: Vermicompost + *Azospirillum* + PSB (1/2 dose)	217520.00	147746.43	2.12
T_6: Vermicompost + *Azotobacter* + *Azospirillum* (1/2 dose)	220480.00	150706.43	2.16
T_7: Vermicompost + *Azospirillum* + *Azotobacter* + PSB (1/2 dose)	243680.00	172589.10	2.43
T_8: Vermicompost + *Azospirillum* + *Azotobacter* + PSB (1/3 dose)	232800.00	161928.65	2.28
T_9: Vermicompost + *Azospirillum* + *Azotobacter* + PSB	255840.00	184090.43	2.57

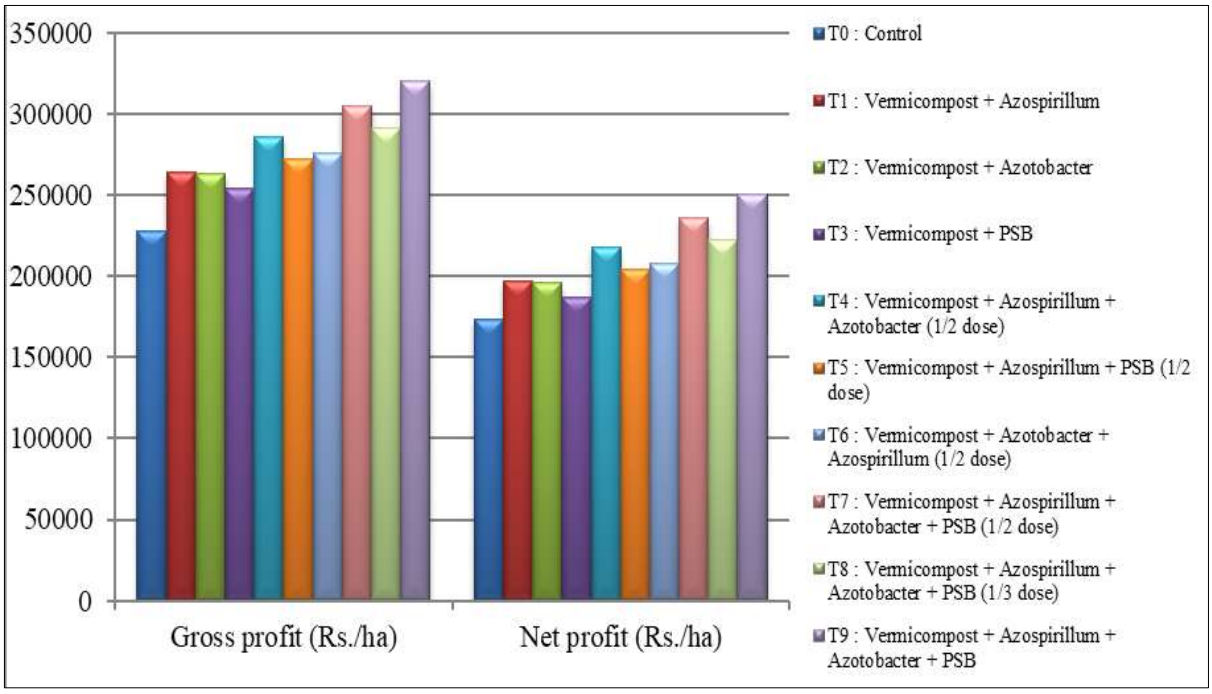

Fig 1: Effect of different bio-fertilizers and organic substances on gross profit and net profit in onion cultivation.

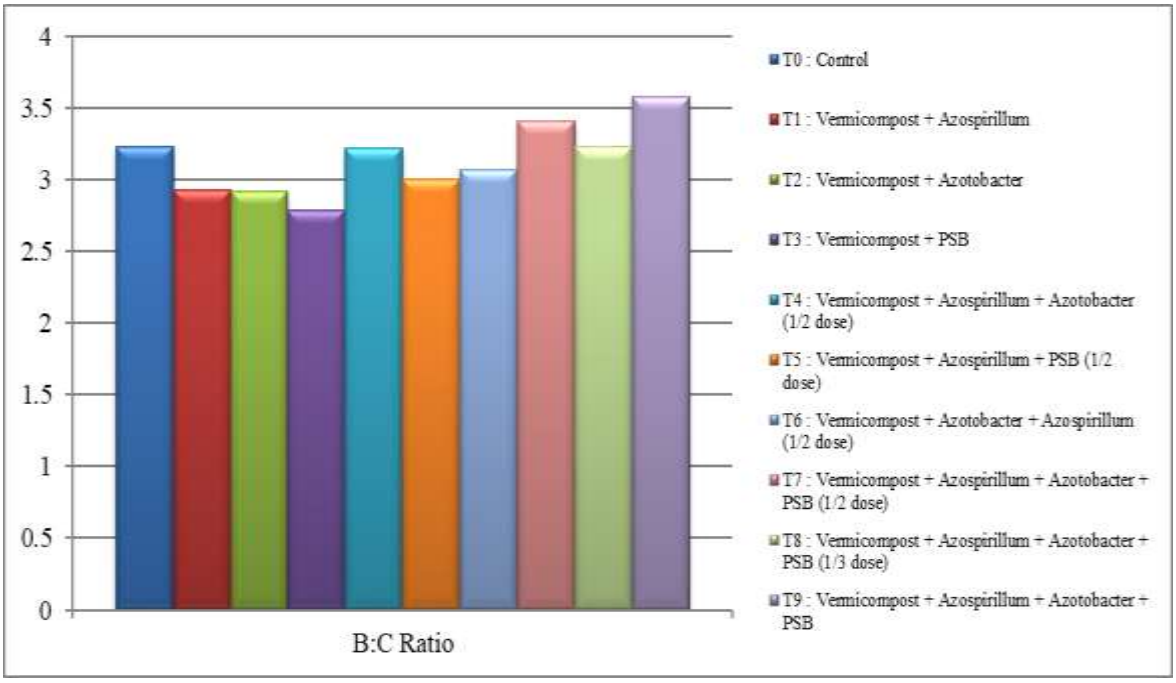

Fig 2: Effect of different bio-fertilizers and organic substances on b:c ratio in onion cultivation

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