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Effect of seed treatment with organic and inorganic substances on economics of coriander (*Coriandrum sativum* L.)

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Abstract
The experiment was carried out in the experimental field of Pt. K.L.S. College of Horticulture and Research Station, Rajnandgaon (C.G.) in the year 2021-22 under Department of Vegetable Science with a view to study the "Effect of seed treatment with organic and inorganic substances on economics of coriander (*Coriandrum sativum* L.)". The crop Coriander of variety Chhattisgarh Shri Chandrahasini Dhania-2 were used to grown in 12 number of treatments with 3 replications into the field in a Randomized Block Design (RBD). The soil of experimental field was sandy clay loam. Fertilizer dosage recommended for coriander is 24:16:16 gm/plot (N: P_2O_5:K_2O) was applied in 12 treatments. The economic parameters like maximum total cost of cultivation Rs 50726.50 ha^{-1}, maximum gross return Rs 167103.75 ha^{-1}, maximum net return Rs 116377.25 ha^{-1} and maximum B:C Ratio (2.29) were found significantly superior in the treatment T_5 (GA_3 100 ppm + *Trichoderma viride* 2 ml per liter of water) and which was at par with treatment T_6 (GA_3 75 ppm + *Trichoderma viride* 2 ml per liter of water) and T_7 (GA_3 50 ppm + *Trichoderma viride* 2 ml per liter of water). On the basis of overall performance, the treatment T_5 (GA_3 100 ppm + *Trichoderma viride* 2 ml per liter of water) was found best for cultivation of coriander with higher green foliage yield and economic return.

Keywords: Organic, inorganic substances, economics, cow urine, *Trichoderma viride* and GA_3

Introduction
Coriander generally known as "Dhania" (*Coriandrum sativum*) belongs to family Apiaceae with chromosomes number 2n=22. The plant is a native to Mediterranean and near eastern region. Its leaves are popular for garnishing of variety of Indian dishes. It is widely cultivated in Rajasthan, Gujarat, Madhya Pradesh, Tamil Nadu, U.P., etc. (Bhandari and Gupta 1999) [3].
India, being the land of spices, is the foremost country with regard to production of coriander and there is a good demand for this crop as seed and fresh leaves for international consumption (Kumar, 1997). India is world's largest producer of coriander although; the major quantity is consumed within the country (John, 1994).
In India coriander is cultivated under an area of 629 thousand hectares with an annual production of 822 thousand MT (NHB, 2020) [1]. Rajasthan, Gujarat, Madhya Pradesh, Tamil Nadu, U.P. are the major coriander producing states. Chhattisgarh produced 87850 MT coriander covering an area at 18961 hectares. (Directorate of Horticulture, Govt. of Chhattisgarh, 2020).
Application of GA_3, *Trichoderma* and cow urine becomes useful for any crop production in order to get a good yield. It is involved in photosynthesis, respiration and protein synthesis. It impart the dark green color of the leaves, promotes vigorous vegetative growth and more efficient use of available inputs finally leads to higher productivity. Plant growth regulators leads to better growth and yield without substantial increase in the cost of production. Gibberellic acid is found to induce stem and internode elongation, flowering and fruit setting and growth.
GA_3 compounds applied as seed treatment and it has been found to greatly enhance stem elongation as its most striking effect. GA_3 application as seed treatment helps in increasing the foliage productivity of coriander, and also, in various physiological activities such as growth and ion transport (Wareing and Phillips, 1981; Khan and Samiullah, 2003) [14, 10]. Plant growth regulators (PGRs), have emerged as magic chemical that could increase agricultural

production at an unprecedented rate and help in removing or circumventing many of the barrier imposed by genetics and environment.

Materials and Methods

The experiment was carried out in the experimental field of Pt. K.L.S. College of Horticulture and Research Station, Rajnandgaon (C.G.). Rajnandgaon is located in central plane of Chhattisgarh at latitude 21.10° N, and longitude 81.03° E and an altitude of 330.70 meters above the mean sea level. Rajnandgaon witnesses normal tropical wet and dry climate. The soil of the experimental site was sandy clay loam. The soil was neutral in reaction, medium in organic carbon, low in nitrogen and medium in phosphorus and potash content.

Details of experimental layout

Crop	**:**	**Coriander (*Coriandrum sativum* L.).**
Season	:	Rabi, 2021-22
Variety	:	Chhattisgarh Shri Chandrahasini Dhania-2
Location	:	Experimental field at Pt. K. L. Shukla. College of Horticulture and Research Station, Rajnandgaon (C.G.)
No. of Treatments.	:	12
Design of Experiment	:	Randomized Block Design (RBD).
Number of Replications	:	03
No. of Plot.	:	36
Plot Size	:	2 x 2 m = 4 m^2
Spacing.	:	20 (Row to Row) x 10 (Plant to Plant) cm.

Details of the treatments

Tr. No.	**Treatment details**
T_1	Cow urine 100% + *Trichoderma* 2 ml per liter of water
T_2	Cow urine 75% + *Trichoderma* 2 ml per liter of water
T_3	Cow urine 50% + *Trichoderma* 2 ml per liter of water
T_4	Cow urine 25% + *Trichoderma* 2 ml per liter of water
T_5	GA_3 100 ppm + *Trichoderma* 2 ml per liter of water
T_6	GA_3 75 ppm + *Trichoderma* 2 ml per liter of water
T_7	GA_3 50 ppm + *Trichoderma* 2 ml per liter of water
T_8	GA_3 25 ppm + *Trichoderma* 2 ml per liter of water
T_9	Cow urine 100%
T_{10}	*Trichoderma* 2 ml per liter of water
T_{11}	GA_3 100 ppm
T_{12}	Control (Water)

Economics

a) Cost of cultivation (Rs./ha): Cost of cultivation is the total expenditure incurred for raising crop in a treatment. The cost included of labour and ploughing charge, value of seed, manures, fertilizers, macro & micro foliar nutrients, pesticides and irrigation charges.

b) Gross return (Rs./ha): Gross returns are the total monetary value of the produce and by products obtained from the crop raised in the different treatments is calculated, based on the local market prices.

c) Net return (Rs./ha): It is computed by subtracting cost of cultivation from gross returns. It is good indicator of suitability of a treatment since this represents the actual income.

Net Return (Rs./ha) = Gross income (Rs./ha) – Cost of cultivation (Rs./ha)

d) B:C Ratio: Benefit Cost Ratio is the ratio of net profit to the cost of cultivation. Benefit cost (B:C) ratio was worked out by using the following formula.

$$\text{Benefit: Cost ratio} = \frac{\text{Net income (Rs./ha)}}{\text{Cost of cultivation (Rs./ha)}}$$

Results and Discussion

Data pertaining to economic parameters influenced by 12 treatments has been given in Table 1 & 2 and fig 1 & 2.

In Green foliage leaf yield q. per ha ranges between 27.85 (T_5) to 12.25 (T_{12}). The maximum leaf yield q. per ha (27.85) was reported in T_5 (GA_3 100 ppm + *Trichoderma viride* 2 ml per liter of water). While the minimum leaf yield q. per ha (12.25) was reported in treatment T_{12} Control (Water). The higher coriander green foliage leaf yield q. per ha might be because the combination of GA_3 and *Trichoderma viride* greatly increases the plant biomass by boosting photosynthetic activity and leaf production. An increase in plant biomass leads to higher green foliage leaf yield q. per ha. This result is in accordance with Jain *et al.* (2013) [9].

The perusal of detailed Total cost of cultivation data revealed that maximum total cost of cultivation Rs 50726.50 ha^{-1} were calculated for treatment T_5 (GA_3 100 ppm + *Trichoderma viride* 2 ml per liter of water and minimum was Rs 48726.50 ha^{-1} for T_{12} Control (Water). The data revealed that maximum gross return Rs 167103.75 ha^{-1} was obtained in treatment T_5 (GA_3 100 ppm + *Trichoderma viride* 2 ml per liter of water), followed by Rs 122223.75 ha^{-1} obtained in T_7 (GA_3 50 ppm + *Trichoderma viride* 2 ml per liter of water) and minimum gross return Rs 73500.00 ha^{-1} was obtained in T_{12} Control (Water). The perusal of detailed net returns (Rs ha^{-1}) data revealed that Maximum net return Rs 116377.25 ha^{-1} was obtained in treatment T_5 (GA_3 100 ppm + *Trichoderma viride* 2 ml per liter of water), followed by Rs 71822.55 ha^{-1} obtained in T_7 (GA_3 50 ppm + *Trichoderma viride* 2 ml per liter of water) and minimum net return Rs 24773.50 ha^{-1} was obtained in T_{12} Control (Water). The data revealed that maximum B:C Ratio (2.29) was obtained in treatment T_5 (GA_3 100 ppm + *Trichoderma viride* 2 ml per liter of water), followed by (1.43) obtained in T_{11} (GA_3 100 ppm) and minimum B:C Ratio (0.51) was obtained in T_{12} Control (Water). This might be due to the treatment of GA_3 increases the root and shoot growth by stimulating the process of cell elongation and cell expension, which leads better green foliage yield with increase higher economics. Similar result obtained by Das *et al.* (2018) [5].

Table 1: Effect of seed treatment with organic and inorganic substances on yield of coriander

Tr. No.	Treatment details	Green foliage leaf yield q. per ha.
T1	Cow urine 100% + *Trichoderma viride* 2 ml per liter of water	19.99
T2	Cow urine 75% + *Trichoderma viride* 2 ml per liter of water	18.40
T3	Cow urine 50% + *Trichoderma viride* 2 ml per liter of water	16.32
T4	Cow urine 25% + *Trichoderma viride* 2 ml per liter of water	15.94
T5	GA3 100 ppm + *Trichoderma viride* 2 ml per liter of water	27.85
T6	GA3 75 ppm + *Trichoderma viride* 2 ml per liter of water	20.14
T7	GA3 50 ppm + *Trichoderma viride* 2 ml per liter of water	20.37
T8	GA3 25 ppm + *Trichoderma viride* 2 ml per liter of water	18.12
T9	Cow urine 100%	16.66
T10	*Trichoderma viride* 2 ml per liter of water	15.66
T11	GA3 100 ppm	20.08
T12	Control (Water)	12.25
SEm (±)		2.22
CD (5%)		6.52
CV (%) =		20.85

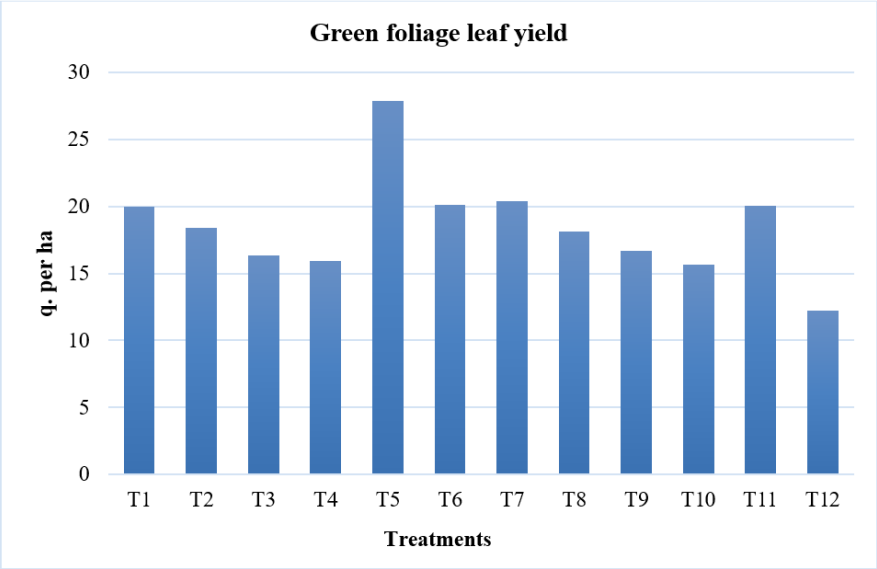

Fig 1: Effect of seed treatment with organic and inorganic substances on yield of coriander

Table 2: Effect of seed treatment with organic and inorganic substances on economics of coriander. (Rs.ha-1)

Tr. No.	Treatment details	Economics			
		Cost of cultivation	Gross Return	Net Return	B:C ratio
T1	Cow urine 100% + *Trichoderma viride* 2 ml per liter of water	50276.50	119910.25	69633.75	1.39
T2	Cow urine 75% + *Trichoderma viride* 2 ml per liter of water	50226.50	110379.00	60152.50	1.20
T3	Cow urine 50% + *Trichoderma viride* 2 ml per liter of water	50176.50	97923.75	47747.25	0.95
T4	Cow urine 25% + *Trichoderma viride* 2 ml per liter of water	50126.50	95651.25	45524.75	0.91
T5	GA3 100 ppm + *Trichoderma viride* 2 ml per liter of water	50726.50	167103.75	116377.25	2.29
T6	GA3 75 ppm + *Trichoderma viride* 2 ml per liter of water	50564.50	120852.75	70288.25	1.39
T7	GA3 50 ppm + *Trichoderma viride* 2 ml per liter of water	50401.50	122223.75	71822.25	1.43
T8	GA3 25 ppm + *Trichoderma viride* 2 ml per liter of water	50239.50	108741.00	58501.50	1.16
T9	Cow urine 100%	48926.50	99957.75	51031.25	1.04
T10	*Trichoderma viride* 2 ml per liter of water	50076.50	93936.75	43860.25	0.88
T11	GA3 100 ppm	49376.50	120487.50	71111.00	1.44
T12	Control (Water)	48726.50	73500.00	24773.50	0.51

*Selling price of green leaf of coriander Rs. 60.00/ kg.

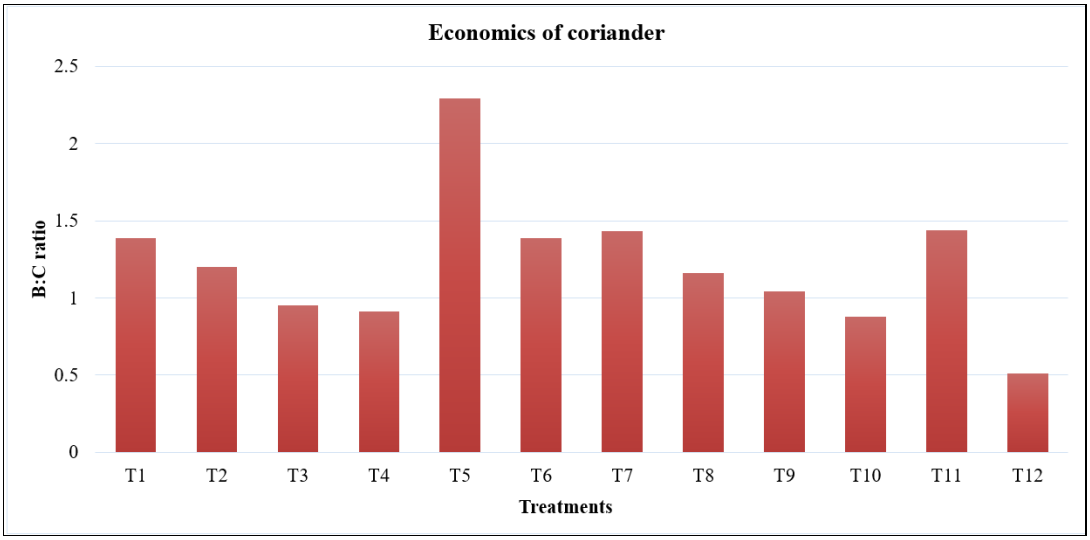

Fig 2: Effect of seed treatment with organic and inorganic substances on economics of coriander. (Rs. ha-1)

Conclusion

The economic parameters like cost of cultivation (Rs. ha^{-1}), gross return (Rs. ha^{-1}), net return (Rs. ha^{-1}) and B: C ratio were found significantly superior in the treatment T_5 (GA_3 100 ppm + *Trichoderma viride* 2 ml per liter of water) and which was at par with treatment T_6 (GA_3 75 ppm + *Trichoderma viride* 2 ml per liter of water) and T_7 (GA_3 50 ppm + *Trichoderma viride* 2 ml per liter of water).

On the basis of overall performance, the treatment T_5 (GA_3 100 ppm + *Trichoderma viride* 2 ml per liter of water) was found best for cultivation of coriander with higher green foliage yield and economic return.

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