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Effect of different seed treatment on germination, growth and yield attributes of Coriander (*Coriandrum sativum* L.) in Bemetara district of Chhattisgarh

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Abstract
A field experiment entitled "Effect of different seed treatment on germination, growth and yield attributes of Coriander (*Coriandrum sativum* L.) in Bemetara district of Chhattisgarh" was conducted at the Department of Horticulture Nursery, Mohgaon, Saja, Bemetara (C.G.) during *Zaid* season 2024-25. The experiment was laid out in RBD with three replications and eight treatments: T_0 (Control), T_1 (Tap water 12 hrs), T_2 (2% *Calotropis* leaf extract 12 hrs), T_3 (3% *Azadirachta* leaf extract 12 hrs), T_4 (GA_3 50 ppm 12 hrs), T_5 (2% *Calotropis* leaf extract 12 hrs + *Pseudomonas fluorescens*), T_6 (3% *Azadirachta* leaf extract 12 hrs + *Pseudomonas fluorescens*), and T_7 (GA_3 50 ppm 12 hrs + *Pseudomonas fluorescens*).Seed treatments significantly influenced emergence, germination, growth, yield, and economics. T_7 (GA_3 50 ppm + *P. fluorescens*) recorded the earliest emergence, highest germination, maximum plant height, branches, fresh and dry weight, foliage yield, and net returns. T_6 and T_5 also performed well but were slightly inferior to T_7, while T_0 (Control) gave the lowest values. Thus, GA_3 50 ppm seed soaking combined with P. fluorescens proved most effective and profitable for coriander

Keywords: GA_3, tap water, *Calotropis leaf extract*, *Azadirachta* leaf extract

Introduction
Coriander (*Coriandrum sativum* L.), belongs to the family Apiaceae with chromosomes number 2n=22. commonly known as Cilantro or Dhania, is an annual herb. The plant is a native to Mediterranean and near Eastern region. The plant is valued not only for its culinary uses but also for its medicinal properties, which include antioxidant, antimicrobial and digestive benefits (Mandal & Mandal, 2015) [8]. India is one of the largest producers of coriander, with major cultivation in states like Rajasthan, Madhya Pradesh, and Gujarat. Favourable agro climatic conditions and increasing demand for coriander in domestic and international markets have made its cultivation economically significant (Anonymous, 2024) [1]. The productivity of coriander depends on various agronomic factors, including seed quality, nutrient management and pest and disease control. Among these factors, seed treatment plays a crucial role in improving germination, early seedling vigour, and foliage yield (Chudamani *et al*., 2023) [2]. India is world's largest producer of coriander although; the major quantity is consumed within the country (John, 1994) [6]. In India coriander is cultivated under an area of 629 thousand hectares with an annual production of 822 thousand MT (NHB, 2020) [10]. Rajasthan, Gujarat, Madhya Pradesh, Tamil Nadu, U.P. are the major coriander producing states. Chhattisgarh produced 60425 MT coriander covering an area of 15169 hectares. (Directorate of Horticulture, 2024) [4]. Bemetara produced 73420 Q Coriander covering an area 1274 hectares. (Anonymous, 2024) [1]. Seed treatment is a crucial agronomic practice that enhances germination, seedling vigour and overall crop productivity. Various organic and inorganic substances are used to improve seed quality and plant growth. Organic treatments, such as microbial inoculants (*Trichoderma viride* and *Pseudomonas fluorescens*), improve plant resistance against pathogens while promoting growth (Chudamani *et al*., 2023) [2]. Overall, the seed treatment of coriander with *Pseudomonas fluorescens* leads to improved germination, healthier seedlings, disease resistance, and ultimately higher yield and better crop quality (Mishra *et al*., 2025) [9].

Materials and Methods

A field investigation was carried out at Department of Horticulture Nursery, Mohgaon, Saja, Bemetara (C.G.) during *Zaid* season of 2024-25, to study the "Effect of different seed treatment on germination, growth and yield attributes of Coriander (*Coriandrum sativum* L.) in Bemetara district of Chhattisgarh". The details of the materials used and methods adopted during the course of investigation are described in this chapter. The was laid out in Randomized Block Design (RBD) with 8 treatment and 3 replication Plot size 1.8 m × 0.9 m, Spacing 15 cm × 10 cm Net plot size 38.88 m^2, Gross plot size 79.18 m^2 Coriander cv. Sardar seeds were treated with soaked in water for 12 hrs or with other leaf extracts, GA3 solution and the soaked seed was sown after treating it with the culture of Pseudomonas fluorescence. T_0 Control, T_1 Soaking in Tap water, T_2 Soaking in 2% *Calotropis* leaf extract, T_3 Soaking in 3% *Azadirachta* leaf extract T_4 Soaking in GA_3 50 ppm, T_5 Soaking in 2% *Calotropis* leaf extract (12 hrs) + Pseudomonas fluorescens, T_6 Soaking in 3% *Azadirachta* leaf extract + *Pseudomonas fluorescens*, T_7 Soaking in $GA_3$50 ppm + *Pseudomonas fluorescens.*

Results and Discussion

Germination attributes

Coriander germination behaviour was significantly impacted by seed treatments. The control (T_0) had the maximum number of days (12.52), while T_7 (GA_3 50 ppm + *Pseudomonas fluorescens*) had the earliest emergence (6.89 days), followed by T_6 (7.12 days) and T_5 (7.34 days). GA_3 may have improved early seedling vigour by promoting cell elongation, mobilizing stored food material, and stimulating hydrolytic enzymes, all of which contributed to the enhanced germination. These results closely match those of Chudamani *et al.* (2023) [2], who also found that GA_3 seed soaking enhanced coriander germination.

Growth Parameters

Treatments had a significant impact on plant height and branching pattern. At 60 DAS, T_7 produced the tallest plants (63.60 cm), followed by T_6 (62.54 cm) and T_5 (61.78 cm). In contrast, control produced the shortest plants (43.78 cm). Likewise, T_7 (8.08) had the most branches per plant, followed by T_6 (7.66) and T_5 (7.35), suggesting that GA_3 and *P. fluorescens* worked in concert to promote vegetative growth. The combined effects of gibberellic acid, which promotes cell division and elongation, and *Pseudomonas fluorescens*, which produces substances that promote plant growth and suppresses soil-borne pathogens, may be responsible for the increased plant height and branching. Mishra *et al.* (2025) [9] reported similar findings, emphasizing the beneficial role of microbial inoculants with growth regulators in coriander (Table 1).

Fresh Weight and Foliage Yield

Fresh weight per plant and fresh foliage yield (Table 2) showed a significant increase from the seed treatments. At 30 days after sowing (DAS), the highest fresh weight per plant was recorded in T_7 at 2.55 g. T_6 followed with 2.42 g, and T_5 had 2.32 g. The control group had the lowest weight at 1.27 g. At 60 DAS, the maximum fresh foliage yield was observed in T_7 at 15.10 g per 100 g sample, which was significantly higher than the other treatments. The lowest yield was in T_0 at 12.54 g. The increase in yield may be due to better germination, stronger growth, and more efficient nutrient uptake from *Pseudomonas fluorescens*. These results support the findings of Mandal & Mandal (2015) [8], who noted that GA_3 and beneficial microbes improve biomass accumulation and yield in coriander.

Economics Parameters

Economic analysis showed (Table 2) clear differences among treatments. The highest benefit-to-cost ratio, 3.89, was found in T_7, followed by T_6 at 3.86 and T_5 at 3.71. The lowest ratio, 2.55, was seen in the control group, T_0. The greater profitability in T_7 came from a larger foliage yield and better-quality produce, which made it the most profitable treatment.

Table 1: Effect of different seed treatment on Days taken for first emergence, Plant height, Number of branches (plant^{-1}) of Coriander

Treatment details	Days taken for first emergence	Plant height (cm)		Number of branches (plant^{-1})	
		30 DAS	60 DAS	30 DAS	60 DAS
T_0 - Control	12.52	10.12	43.78	2.12	4.03
T_1 - Soaking in Tap water (12 hrs)	11.85	10.41	45.17	2.41	4.58
T_2 - Soaking in 2% *Calotropis* leaf extract (12 hrs)	9.11	10.95	52.56	2.95	5.61
T_3 - Soaking in 3% *Azadirachta* leaf extract (12 hrs)	8.75	11.13	53.42	3.13	5.95
T_4 - Soaking in GA_3 50 ppm (12 hrs)	8.41	11.34	54.43	3.34	6.35
T_5 - Soaking in 2% *Calotropis* leaf extract (12 hrs) + *Pseudomonas fluorescens*	7.34	11.87	61.78	3.87	7.35
T_6 - Soaking in 3% *Azadirachta* leaf extract (12 hrs) + *Pseudomonas fluorescens*	7.12	12.03	62.54	4.03	7.66
T_7 - Soaking in GA_3 50 ppm (12 hrs) + *Pseudomonas fluorescens*	6.89	12.25	63.60	4.25	8.08
S.Em (±)	0.26	0.16	2.32	0.15	0.30
CD (5%)	0.79	0.48	7.04	0.46	0.92

Table 2: Effect of different seed treatment on Fresh weight of per plant (g), Fresh weight of 100 g fresh foliage (g), B:C ratio of Coriander

Treatment details	Fresh weight of per plant (g) 30 DAS	Fresh weight of 100 g fresh foliage (g) 60 DAS	B:C ratio
T_0 - Control	1.27	12.54	2.55
T_1 - Soaking in Tap water (12 hrs)	1.77	12.89	2.75
T_2 - Soaking in 2% *Calotropis* leaf extract (12 hrs)	1.77	13.54	3.11
T_3 - Soaking in 3% *Azadirachta* leaf extract	1.88	13.76	3.29
T_4 - Soaking in GA_3 50 ppm (12 hrs)	2.00	14.01	3.33
T_5 - Soaking in 2% *Calotropis* leaf extract (12 hrs) + *Pseudomonas fluorescens*	2.32	14.64	3.71
T_6 - Soaking in 3% *Azadirachta* leaf extract (12 hrs) + *Pseudomonas fluorescens*	2.42	14.84	3.86
T_7 - Soaking in GA_3 50 ppm (12 hrs) + *Pseudomonas fluorescens*	2.55	15.10	3.89
SEm (±)	0.10	0.21	
CD (5%)	0.29	0.61	

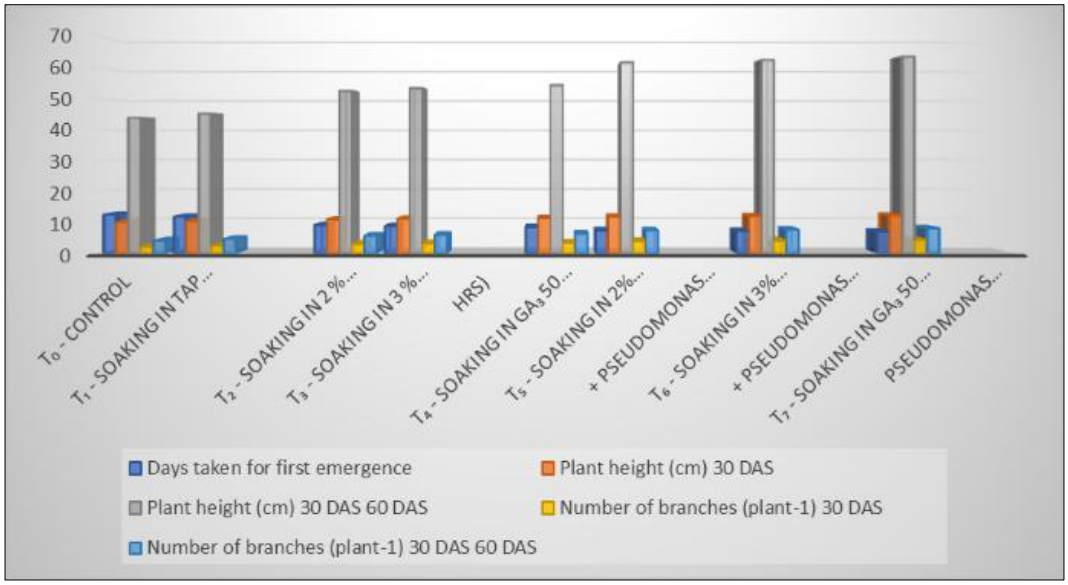

Fig no. 1: Effect of different seed treatment on Days taken for first emergence, Plant height, Number of branches (plant^{-1}) of Coriander.

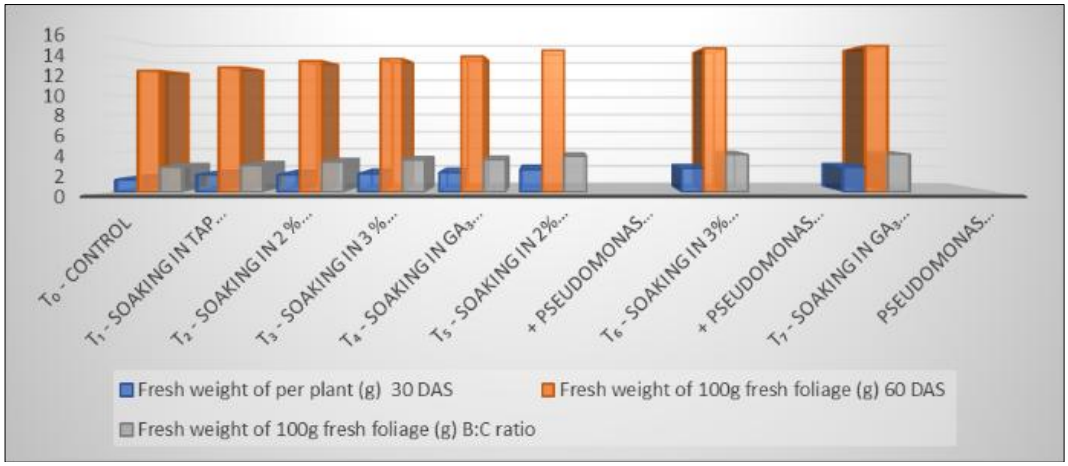

Fig 2: Effect of different seed treatment on Fresh weight of per plant (g), Fresh weight of 100 g fresh foliage (g), B:C ratio of Coriander

Conclusion

The present study demonstrated that seed treatments significantly influenced the growth, yield, and economic returns of the crop. Among all treatments, T_7 - Soaking in GA_3 50 ppm (12 hrs) + *Pseudomonas fluorescens* consistently showed superior performance, recording the earliest seedling emergence, highest germination percentage, maximum plant height, number of branches, fresh and dry weight and foliage yield. Treatments T_6 - Soaking in 3% *Azadirachta* leaf extract (12 hrs) + *Pseudomonas fluorescens* and T_5 - Soaking in 2% *Calotropis* leaf extract (12 hrs) + *Pseudomonas fluorescens* also exhibited favorable growth and yield parameters, though slightly lower than T_7 - Soaking in GA_3 50 ppm (12 hrs) + *Pseudomonas fluorescens.* The T_0 - Control consistently recorded the lowest performance across all parameters. Economically, T_7 - Soaking in GA_3 50 ppm (12 hrs) + *Pseudomonas fluorescens* proved most profitable, with the highest gross and net returns and benefit-cost ratio, indicating that the combined use of GA_3 and *Pseudomonas fluorescens* effectively enhances vegetative growth, biomass accumulation, and yield.

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