Original Research Article

Standardization of hormone-based seed coating formulation for coriander Dosage and Formulation optimization

ABSTRACT

Aims: This study aimed to standardize the dosage of hormone-based seed coating formulations to enhance germination and seedling growth in coriander seeds.
Study design: Completely Randomized Design.
Place and Duration of Study: Department of seed science and technology, Tamil Nadu Agricultural University, Coimbatore, India.During the year of 2023-2024.
Methodology: Coriander seeds were coated with different concentrations of seed coating polymer and germination study was conducted in laboratory using rolled towel method with four replications.Data were analyzed by ANOVA with significance at $p \leq 0.05$.
Results: The hormone-based seed coating formulation has recorded significantly higher germination% (69%), root length (16.75 cm), shoot length (7.9 cm), dry matter production (0.058 g/10 seedlings), Vigour Index I (1706) and II (3.9) at10g polymer/kg of seed and 290mL of water.
Conclusion: Seed Coating with 10 seed coating formulation dissolved in 290 mL of water enhanced the seed germination and seedling growth

Keywords: [Coriandrum sativum, Seed coating, Dosage, Germination, Vigour]

1. INTRODUCTION

*Coriandrum sativum*belongs to the family Apiaceae. It is commonly known as Cilantro and one of the most important spices crops in India. It is cultivated worldwide for seed and leaf purpose.Its leaves are used for culinary purposes.Its seeds are used as aromatic fruits and flavouring agents [1][2].
Coriander has wide range medicinal properties, includingsedative-hypnotic,anxiolytic, anticonvulsant effects, andantidepressant. It also enhances memory, progresses orofacial dyskinesia, and offers antibacterial, neuroprotective, antifungal, and anthelmintic benefits. Additionally, coriander demonstrates insecticidal, antioxidant, anti-inflammatory, hypolipidemic, cardiovascular,antidiabetic, and analgesic properties[3].
Seed enhancements refer to post-harvest treatments which are essential to germination improvement, growth of seedling and ease delivery of seeds at the time of sowing [4]. Seed coating is considered as an effective approach for promoting sustainable agriculture by enhancing the physiological and physical qualities of seeds. This process helps to improve planting efficiency, boosts growth parameters, and mitigates both abiotic and biotic stresses[5].

Seed coating includes application exogenous materials such as nutrients, microorganisms, plant growth regulators etc., which helps in positive regulation of seed germination, speed of germination and seedling growth [6].
Concentration of the seed coating agent have noticeable influence on physiology and growth of various crops under different environmental condition [7].
Nutrient requirement is a very important during the initial stages of plant life cycle. Nutrient required largely based on the size of seeds and type of seeds. In general, smaller seeds require small amount as compare to larger seeds [8].
As chemicals applied to seeds will be in safe and effective manner. The exact dosage required depends on the product applied, the targeted seed, and the application method.
Considering the above discussion the present study was caried out for standardize the dosage of hormone-based seed coating polymer in order to improve the germination and seedling growth of Coriander seeds.

2. MATERIAL AND METHODS

2.1 Seed and polymer source

Coriander seeds of var CO5 were procured from the Department of Spices and Plantation Crops, Tamil Nadu Agricultural University, Coimbatore. The laboratory experiments were conducted in Department of Seed Science and Technology, Tamil Nadu Agricultural University, Coimbatore. The polymer source used for the conduct of experiment was TNAU VidhaiAmirtham, which is a hormone-based seed coating polymer[9].

2.2 Germination Test

Coriander seeds were placed as four replicates of hundred seeds in paper media implementing Rolled towel method (between paper method) and Germination test was conducted in germination room with 25±1°C and 95±2 per cent RH. Illuminated using fluorescent light. (ISTA, 1999) Seedling evaluation was done after 21 days from sowing.

2.2.1 Germination (%)

Germination % = (No.of seeds germinated /Total No.of seeds sown) × 100

2.2.2 Root length (cm)

Ten normal seedlings were selected from each replication, Root lengths were measured from tip of the primary roots to the collar region using measuring scale and mean of the root lengths were expressed in centimeter.

2.2.3 Shoot length (cm)

Ten normal seedlings were selected from each replication, shoot lengths were measured from the tip of the primary leaf to the collar regionusing measuring scale and mean of the shoot lengths were expressed in centimeter.

2.2.4 Dry matter production (g/10 seedlings)

Seedlings used to measure root and shoot lengths were dried at 85±2ºC in hot air oven for 12 hours and cooled for 30 mins in a desiccator and weighed in electronic balance. The results were expressed as g/10 seedlings.

2.2.5 Vigour index

Vigour index I and II were calculated as per Abdul–Baki and Anderson, (1973) implementing the following formula [10]

Vigour Index I=Germination (%) × Total seedling length (cm)

Vigour Index II =Germination % × Dry Matter production (g/10 seedlings)

Treatment details

Coriander seeds were coated with TNAU- Vithaiamirtham polymer at different concentration given below and tested for germination parameter.

Treatment No.	Treatment details
T_1	Control
T_2	8 g polymer + 92 mL water
T_3	8 g polymer + 192 mL water
T_4	8 g polymer + 292 mL water
T_5	10 g polymer + 90 mL water
T_6	10 g polymer +190 mL water
T_7	10 g polymer + 290 mL water
T_8	12 g polymer + 88 mL water
T_9	12 g polymer +188 mL water
T_{10}	12 g polymer +288 mL water

Statisticalanalysis

Analysis of Data were done by analysis of variance (ANOVA) as a Completely randomized design. Separation of means were based on the least significant difference (LSD). If the F-test from the ANOVA for the treatments was significant at the 0.05 probability level.

3. RESULTS AND DISCUSSION

The objective of the experiment was to evaluate the effect of seed coating formulation on germination percentage, root length, shoot length, dry matter production andvigour indexof coriander. The obtained result showed highly significant variations among the treatments in seedling growth parameters. The results revealed that germination percentage was recorded higher in 10 g polymer/kg of seed and 290 mL of water (69%) followed by 10 g +190 mL water (66%) and least germination percentage was recorded in untreated seeds.(61%).

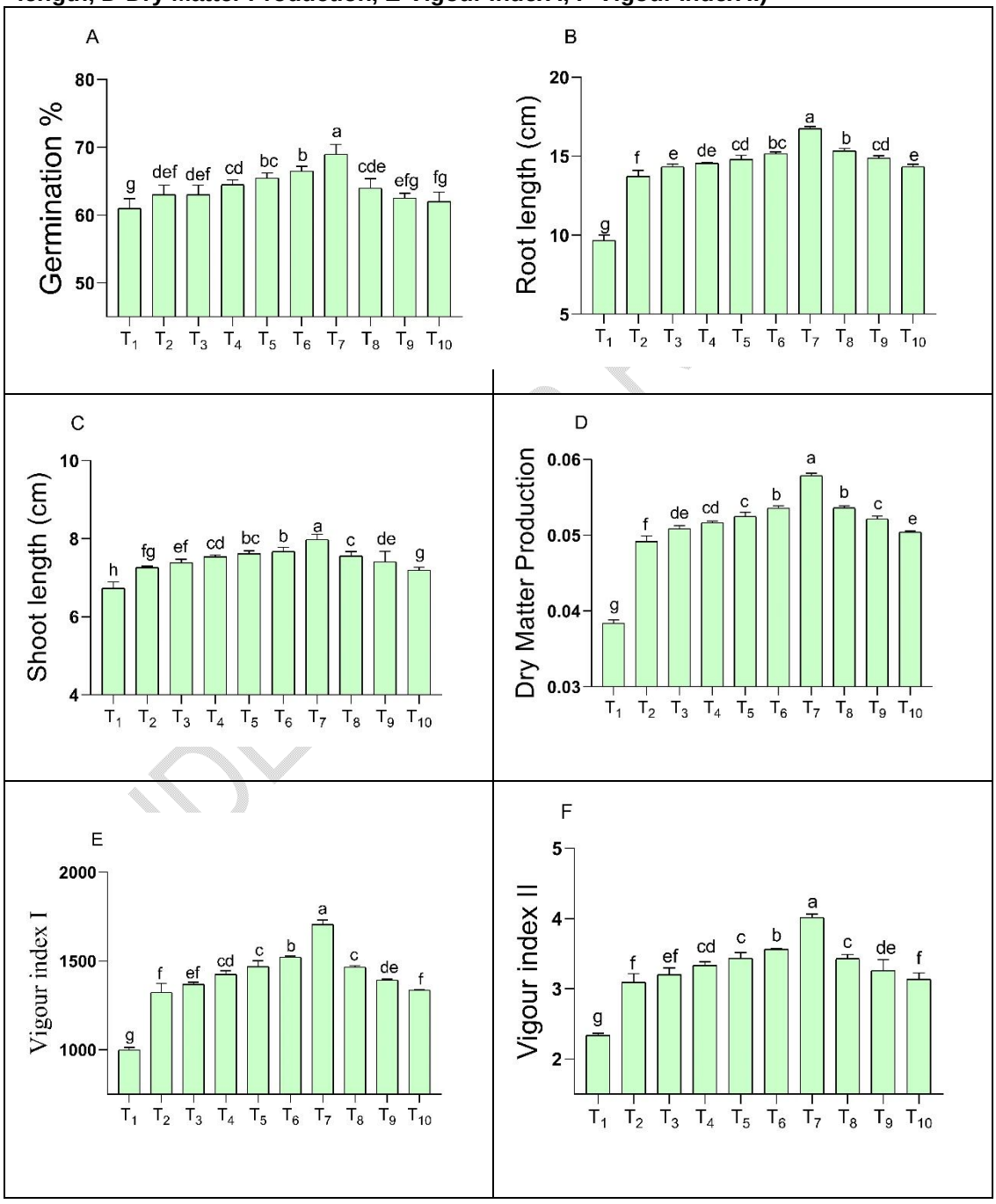
Similarly, Bhaskaran et al., 2017 also found that in cotton seeds treated with 40 g kg^{-1} polymer showed higher seed germination percentage (83%) [11].The root length was also higher in 10 g + 290 mL water (16.75 cm) followed by 12 g + 88 mL water (15.35 cm) least was observed in control (9.67 cm). The shoot length was also higher in 10 g + 290 mL water (7.99 cm) followed by 10 g +190 mL water (7.72 cm) and least was observed in control (6.730 cm). The dry matter production was higher in 10g polymer/kg of seed and 290 mL of water (0.058 g/10seedlings), followed by 10g polymer/kg of seed and 90mL of water has (0.054 g/10seedlings) and significant from control (0.038 g/10seedlings).

Vigour index I was recorded higher in 10g polymer/kg of seed and 290 mL of water (1706) followed by 10g polymer/kg of seed and 190mL of water (1522) least was recorded in control has (1000). Vigour index II was recorded higher in 10g polymer/kg of seed and 290

mL of water (3.99) followed by 10g polymer/kg of seed and 190mL of water (3.560) and least was recorded in control (2.340).

Based on the results 10g polymer/kg of seed and 290 mL of water were standardized for the seed coating dosage. Similar results were reported by Leelavathi P and Umarani R. (2017) in ridge gourd [12]and Kokila et al., 2023 inrice [13].

Fig. 1. Effect of different doses hormone-based seed coating formulationfor seed quality parameters of coriander seeds. (A-Germination%, B-Root length, C-Shoot length, D-Dry Matter Production, E-Vigour Index I, F-Vigour Index II)



4. CONCLUSION

The hormone-based seed coating formulation @10g polymer/kg of seed and 290mL of water has significantly increased the germination, seedling growth and Vigour. Hence 10g polymer/kg of seed and 290 mL of water will be standardized for Coriander seeds.

Disclaimer (Artificial intelligence)

Authors hereby declares that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

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