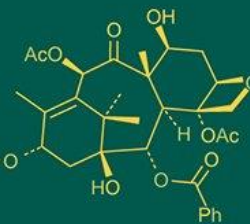
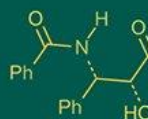


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Effect of seed pretreatments on germination of *Ocimum tenuiflorum* var. CIM Ayu.

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Abstract

The present investigation entitled “Effect of seed pretreatments on germination of *Ocimum tenuiflorum* var. CIM Ayu” was carried out at Pt. KLS College of Horticulture and Research Station, Rajnandgaon, during Summer season 2024-25. The experiment was conducted in Completely Randomized Block Design with 11 treatments of Control, scarification, Hot water treatment, water soaking, concentrated sulphuric acid, 2 levels of GA₃ (1000, 2000 µm), 2 levels of IAA (1 µm, 2 µm), 2 levels of BA (100 µm, 200 µm) and replicated in three times. The observations were recorded for germination and growth characters of *Ocimum*. In case of seed pretreatments, GA₃ @ 2000 µm has resulted in maximum germination percentage, survival percentage, quickest mean germination time, highest shoot length and IAA @ 1 µm produced highest root length in 30 DAS. Hence, on the basis of result obtained from the present investigation it can be concluded that the GA₃ @ 2000 µm was found best treatment for seed germination of *Ocimum tenuiflorum* var. CIM Ayu.

Keywords: *Ocimum*, GA₃, IAA, BA, scarification, hot water treatment, water soaking, concentrated sulphuric acid

Introduction

Ocimum (also known as Basil) is the most important is aromatic annual or perennial herb and shrub native to the tropical and subtropical regions of the world. The name *Ocimum* was derived from the word “Ozo” (Greek), which means smell. Due to its enormous use in traditional medicine and pharmaceutical industry and perfumery purposes, it is also referred to as the “king of herbs”. The genus *Ocimum* with over 150 species, is said to be the largest genera belonging to the Lamiaceae family. (Chinedu *et al.* 2021) [4].

Medicinal and aromatic plants (MAPs) have been integral to traditional healthcare practices since ancient times. Globally, an estimated 50,000 to 70,000 plant species are utilized in both traditional and modern medicinal systems. Furthermore, ongoing research continues to identify additional species with potential applications as raw materials for plant-based cosmetics and health-related products.

The genus *Ocimum*, a member of the family Lamiaceae (order Lamiales), comprises a highly diverse group of over 150 species. These species are widely distributed across tropical, subtropical, and warm temperate regions of the world (Runyoro *et al.*, 2010) [10]. The *Ocimum* genus exhibits considerable variability in morphological traits, including growth habits, reproductive behavior, and chemical composition.

Ocimum tenuiflorum L. has been prioritized by both the National and State Medicinal Plant Boards for commercial cultivation, with an estimated annual trade volume ranging between 2,000 and 3,000 metric tonnes (NMPB, 2020) [9]. Given the growing global interest in herbal products, there is an increasing emphasis on the sustainable production and utilization of medicinal and aromatic plants. Transitioning from wild collection to systematic cultivation is essential to ensure the purity, authenticity, and long-term availability of raw materials. In *Ocimum*, biomass production, essential oil yield, and oil composition are influenced by various factors such as environmental conditions, the developmental (ontogenetic) stage of the plant, and the method of harvesting. Therefore, identifying optimal light intensity, appropriate harvest timing, and suitable harvesting techniques is crucial for achieving high yield and quality, particularly when recommending this crop for commercial-scale cultivation.

Ocimum tenuiflorum is recognized for its high yield of raw materials and bioactive constituents, including total phenols, flavones, chlorophyll, and L-ascorbic acid. The plant is propagated by seeds. The seeds are likely to deteriorate in future generations on account of the highly cross-pollinated nature of the crop. Hence, for fresh plantings, the growers have to take fresh seeds from the pedigree stock.

Material and Methods

The present study involved the evaluation of different seed pre-treatments on the germination of *Ocimum tenuiflorum* L. at 15 feb. 2025. The treatments included various physical, mechanical, chemical and hormonal priming techniques, while untreated seeds served as the control. After applying the respective pre-treatments, seeds were sown in pottrays filled with a potting mixture composed of cocopeat compost and farmyard manure (FYM) in a 1:1 ratio. The seedlings were maintained in these pottrays for a period of 30 days after sowing to assess the influence of the treatments on germination. The experiment was conducted using a Completely Randomised Design (CRD), with each treatment replicated three times, and each replicate consisting of 25 seeds.

Result and Discussion

Germination percentage

The seedling growth parameters of *Ocimum* such as Germination percent influenced significantly due to different pretreatments under study. The perusal of data revealed that higher Germination percent was observed with the application T₆ @ 2000 µm of GA₃ (96.52%) which was at par by T₅ @ 1000 µm of GA₃ (92.63%) and followed by T₄ Concentrated sulphuric acid (83.73%) while, lower germination percent was noticed under the treatment T₀ control (48.54%). The increase in germination might be due to the reason that the exogenous application of GA₃ antagonizes the ill effect of inhibitors and increases endogenous gibberellins like substances. GA₃ helps in the synthesis of enzymes and one of them is α-amylase which converts the starch into simple sugars during the process of germination. Out of all the hormonal treatment T₇ and T₈. Auxin took maximum germination time. Auxin can prolong seed dormancy by reducing enzyme activity essential for starch mobilization (Kucera *et al.* 2005, Shu *et al.* 2016) [5, 11]. These findings are in the accordance with the finding of Muralidhara *et al.* (2015) [8], Venkatrao and Reddy (2005) [14].

Survival percentage

A significant difference in survival percentage was noticed among the various seed priming agents observed at 30 days after sowing. The maximum Survival percent was observed with the application T₆ @ 2000 µm of GA₃ (94.33%) which was closely followed by T₅ @ 1000 µm of GA₃ (89.56%) while, minimum Survival percent was noticed under the treatment T₀ control (45.67%). The probable cause for high

survival percentage of seedlings in gibberellic acid might be due to early germination of seeds which helps in successful acclimatization of seedlings in field conditions and vigour of seedlings ultimately leads to better growth, thus less mortality i.e. higher survival percentage of seedlings. These findings are in the accordance with the finding of Meena *et al.*, (2003) [7] and Bagal (2004) [1].

Mean germination time

The minimum days taken to initiate seed germination was registered under the treatment T₆ @ 2000 µm of (4.51), which was found at par with T₅ @ 1000 µm GA₃ of (4.24) and the maximum mean germination time was recorded T₈ IAA @ 2 µm of (7.21). Based on the data, it can be concluded that due to GA₃ has minimum mean germination time which may be due to the fact that Gibberellic acid increases de novo synthesis of hydrolyzing enzymes ssparticularly amylase and protease. The hydrolyzed food was subsequently utilized for growth of embryo which in turn reduced germination time. IAA delay germination as it promotes seed dormancy, often through interaction with abscisic acid (ABA) signalling pathways (Shuai 2017) [12].

Shoot length (cm)

It is evident from the results obtained under the present investigation, that the treatment T₆ GA₃ @ 2000 µm (8.52 cm.) certified the maximum seedling height at 30 days after sowing Which was at par with T₅ GA₃ @ 2000 µm (8.14cm.), respectively. Which, followed by T₉ BA @ 100 µm (7.05 cm.) whereas the least value was recorded T₀ control (3.11 cm.). The maximum shoot length in GA₃ treated seeds might be attributed due to the fact that this hormone increased osmotic uptake of nutrients, causing cell multiplication and elongation in the cambium tissue of the internodal region leading to an increase in length of the shoots because GA₃ apparently activates the metabolic processes or nullifies the effect of growth inhibitors the results are closely confirmed with the finding of Barathkumar (2019) [2].

Root length (cm)

The maximum root length was registered under the superiority of treatment T₇ IAA @ 1 µm (10.36cm) after 30 days, which was found at par with T₈ IAA @ 2 µm (10.24 cm) followed by T₆ GA₃ @ 2000 µm (8.34 cm.). The least value was recorded T₀ control (5.12 cm.). The result reveals highest root length was obtained at T₈ (IAA @ 1 µm). This increase in root length over the other treatments may be attributed to the fact that, exogenous application of auxin which breaks starch into simple sugars. This is needed to a greater extent for the production of new cells and increased respiratory activity in the regeneration of tissue at the time of initiation of new primordial Shinde *et al.* (2021) [13]. The results are in conformity with the findings, Kumar *et al.*, (2014) [6].

Effect of various pretreatment on Seed germination

T. No.	Pretreatment	Gn(%)	S (%)	MGT(Days)	SL(Cm)	RL(Cm)
T ₀	Control	48.54	45.67	5.06	3.11	5.12
T ₁	Scarification (using sand paper)	60.53	50.78	5.16	5.00	5.95
T ₂	Water soaking (overnight)	69.41	67.48	4.58	5.85	7.11
T ₃	Hot water treatment (65 °C for 10 min)	69.23	66.25	4.98	5.09	6.32
T ₄	Concentrated sulphuric acid treatment (1 min)	83.73	80.71	4.56	4.00	6.02
T ₅	GA ₃ @ 1000 µm	92.63	89.56	4.24	8.14	7.78
T ₆	GA ₃ @ 2000 µm	96.52	94.33	4.15	8.52	8.34
T ₇	IAA @ 1 µm	58.56	57.00	6.80	6.61	10.36
T ₈	IAA @ 2 µm	53.66	51.30	7.21	6.11	10.24
T ₉	BA @ 100 µm	62.63	61.33	5.26	7.05	7.23
T ₁₀	BA @ 200 µm	59.66	58.00	6.15	7.00	7.17
	C.D. (5%)	5.31	4.86	0.314	0.86	0.69
	SE(m)	1.80	1.64	0.106	0.29	0.20
	C.V	4.54	4.29	3.46	3.86	5.50

Concussion

The study revealed that pretreatments significantly influenced seedling growth parameters of *Ocimum*. Among all treatments, GA₃ @ 2000 µm (T₆) recorded the highest germination percentage (96.52%), survival rate (94.33%), and shoot length (8.52 cm) with the shortest mean germination time, indicating its effectiveness in promoting rapid and vigorous growth. Auxin treatments (IAA) enhanced root length but delayed germination. The improved performance with GA₃ may be attributed to enhanced enzyme activity, nutrient mobilization, and early seedling establishment. Overall, gibberellic acid proved most effective in improving germination, survival, and shoot growth in *Ocimum* seedlings.

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