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Effect of Seed Priming on Germination Percentage and Productivity in Sesamum Indicum L.

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Abstract

Sesame (Sesamum indicum L.) is a crucial oilseed crop placed in family Pedaliaceae, known for its high nutritional and economic value. Poor seed germination and seed deterioration during storage are major constraints affecting crop establishment and productivity. The present study was conducted to evaluate the effect of hydropriming on seed germination in Sesamum indicum L. Hydroprimed seeds showed improved germination percentage, faster seedling emergence compared to untreated seeds. The treatment also may reduce the adverse effects of seed deterioration by improving water uptake and metabolic activity during germination. Hydropriming is an economical and eco-friendly technique that may help improve seed quality and overall sesame productivity.

Keywords: *Sesame, Hydropriming, Germination Percentage, Seed deterioration*

Introduction

Sesame (Sesamum indicum L.), a member of the Pedaliaceae, is considered one of the oldest oilseed crops, domesticated around 3,000 years ago and among the earliest sources of edible oil used by humans. Often referred to as the "Queen of oilseeds," it is also described as an orphan crop due to relatively limited research focus. In recent decades, however, the demand for sesame has grown significantly because of its superior oil quality, high protein and antioxidant content, and its ability to thrive under diverse and even harsh climatic and soil conditions (Yadav et.al 2022). Sesame is an erect annual herb that grows about 60 –150 cm tall. The stem is hollow or contains white pith. The leaves are 3–10 cm long and 2.5 – 4 cm wide, with an ovate to rectangular shape and a slightly hairy surface. Flowers occur singly or in groups of 2 – 3 in the leaf axils. The calyx lobes are lanceolate, measuring 5–8 mm in length and 1.6 – 3.5 mm in width, and possess a pilose surface. The corolla is tubular, about 2.5 – 3 cm long and 1 – 1.5 cm in diameter, usually white with a purplish-red or yellow halo. The flower contains four stamens enclosed within it, while the ovary is superior, 4 - loculed and pilose externally. Flowering generally occurs during late summer and early autumn. The fruit is a rectangular capsule measuring 2–3 cm in length and 6–12 mm in diameter, with longitudinal ribs and microscopic hairs present on the epidermis (Panpan Wei et. al 2022). Despite its significant agricultural and economic importance, sesame productivity remains relatively low, primarily due to poor seed quality, uneven germination, and rapid loss of seed viability during storage (Gebregergis et al., 2024). Seed quality is a critical factor influencing crop establishment, uniform plant stand, and overall yield performance. Sesame seeds are small, delicate, and rich in oil content, making them highly vulnerable to ageing and oxidative damage during storage (Usman et al., 2022). Seed priming is a process of controlled hydration that enhances the metabolic activity of seeds while preventing radicle growth. It is widely used in seed germination research as it improves germination percentage, promotes uniform germination, imparts resistance to water and temperature stress, increases seed shelf life, and is highly suitable for small seeds with low germination capacity (Salve, 2021).

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Materials And Methods

The present study was conducted in the Department of Botany, Pemraj Sarda College, Ahilyanagar, to investigate the effect of hydropriming on seed germination in white sesame (*Sesamum indicum* L.). Healthy, mature, and uniform seeds were selected for the experiment. The seeds were cleaned, dried, and stored under appropriate laboratory conditions prior to treatment. Hydropriming was carried out by soaking the seeds in distilled water for predetermined time intervals to facilitate controlled imbibition. This treatment initiated early metabolic activities associated with germination without permitting radicle emergence. After completion of the soaking period, the seeds were removed and re-dried under ambient conditions to restore their initial moisture content. Germination studies were performed under controlled laboratory conditions using both treated and untreated seeds. A fixed number of seeds were sown for each treatment, and germination was monitored at regular intervals. Seeds exhibiting radicle emergence were considered germinated. Germination percentage was calculated using the following formula:

$$\text{Germination Percentage} = \frac{\text{Mean number of seeds germinated}}{\text{Total number of seeds sown}} \times 100$$

Result And Discussion

Table 1: Effect of hydropriming on seed germination percentage at different time intervals (8 to 24 hrs.) at 25° C in *Sesamum indicum* L.

Period (Hours)	Germination in Percentage			Mean Germination % (± SE)
	Set I	Set II	Set III	
Control	75	72.1	76.2	74.43 (±0.5)
8	82.6	85.9	84.8	84.43 (±0.4)
10	84.2	84.4	86.6	85.06 (±0.3)
12	85.7	86.4	87.4	86.5(±0.2)
14	88.1	87.2	89.3	88.2 (±0.2)
16	88.8	89.2	92.8	90.26 (±0.5)
18	88.1	89.5	93.3	90.3 (±0.6)
20	75.5	73.7	76.3	75.16 (±0.3)
22	71.1	68.3	67.6	69 (±0.4)
24	68.1	65.8	63	65.63 (±0.6)

The effect of hydropriming on seed germination percentage in *Sesamum indicum* L. showed noticeable improvement over untreated seeds. The control seeds recorded the lowest germination percentage, whereas hydroprimed seeds exhibited higher germination at all treatment durations up to 18 hrs. Germination percentage gradually increased from 8 to 18 hrs. of hydropriming. The highest germination percentage was observed in seeds hydroprimed for 18 hrs. However, further increase in soaking duration beyond 18 hrs. caused a decline in seed germination percentage. Seeds treated for 20-24 hrs. showed reduced germination compared to the optimum treatments. Hydropriming helps in faster enzyme activation, repair of cellular membranes, and better utilization of stored food materials, resulting in rapid and uniform germination. Similar findings were reported in sesame (Manojkumar and Padmavathi 2026), who observed that seed priming treatments improved germination, seedling vigour, and seed quality during storage. This technique was convenient to farmers for resolving drought and weed competence (Bhosale R. S. and Inamdar V. G., 2020).

Conclusion

Hydropriming may be useful for improving field establishment, achieving uniform crop stand, and enhancing productivity in Sesame cultivation. It had showed higher germination percentage and decreased germination days. Being simple, low-cost, and easy to apply, hydropriming can be effectively adopted by farmers as a practical pre-sowing seed treatment technique.

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Conflicts of interest
The authors declare that there are no conflicts of interest regarding the publication of this paper.

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