

Review Article

Seed Priming: A New Technology for Improve Early Seed Emergence & Establishments of Crops in Rainfed Conditions of India

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ABSTRACT

The emergence and early establishment of soybean (*Glycine max*) is a major constraint in rainfed conditions in India. The research hypothesised that early seed emergence, and increased seedling establishment, would minimize the weed growth in the early stages of crop growth. Seed Priming Techniques provide better opportunity to decrease time of germination % of soybean seed. The reason for early emergence of the primed seed may be due to the completion of pre-germinate metabolic activities making the seed ready for radical protrusion and the primed seed germinated soon after planting compared with untreated dry seed (Heydecker & Coolbear, 1978). Brocklehurst *et al.*, (1987) who reported faster emergence of primed seed. Similarly Harris & Jones (1997) showed 50% reduced germination time of rice cultivars from West Africa after water priming for 12-24 h. Several other reports showed improved and early seedling emergence in rice, sorghum, millet, cotton, soybeans and maize as a result of water priming (Harris *et al.*, 1999; Mujalde *et al.*, 2011).

Keywords

Seed priming,
early establishment
and crop growth

Introduction

India is a large country after China in food production but its productivity/ha is very low as compared with other developing countries i.e. USA, CHINA, Brazil, Canada etc. because falls up to 60 % area under rainfed agriculture but production only 43 % due to poor emergence and failure of early establishment of crops (Agri. statistics at a glance, 2016). Number of factors affecting the emergence and early establishment of crops such as uneven distribution of rainfall, fluctuation in temperature and variable soil moisture (Harris, 2006).

Seed Priming Techniques provide better opportunity to decrease time of germination

% of soybean seed. The reason for early emergence of the primed seed may be due to the completion of pre-germinate metabolic activities making the seed ready for radical protrusion and the primed seed germinated soon after planting compared with untreated dry seed (Heydecker & Coolbear, 1978). Brocklehurst *et al.*, (1987) who reported faster emergence of primed seed. Similarly Harris & Jones (1997) showed 50% reduced germination time of rice cultivars from West Africa after water priming for 12-24 h. In agreement with these findings, several other reports showed improved and early seedling emergence in sorghum, millet, cotton, beans and maize as a result of water priming

(Harris, 1996; Harris *et al.*, 1999; Murungu *et al.*, 2004).

New crop management techniques such as integrated nutrient management, plant protection and seed priming seems to be the best option to increase the early emergence of and early establishment of principles crops i.e. wheat, rice, maize, sorghum, chickpea and soybean (Chiduzza *et al.*, 1994).

What is seed priming?

Soaking of crop seed or crop seedlings e.g. wheat, rice etc in any media i.e. water, fertilizer or insecticide at optimum time before sowing or transplanting can increase the rate of emergence, seedling vigour, advance flowering, early maturity and increase the productivity (harris,1991; Howarth *et al.*,1997). Seed priming technology increase the seed emergence and early establishment of crop due to plants more able the absorb available natural resources i.e. soil moisture, plant nutrient and solar energy and produce synchronize plant stand per unit area (Subedi and Ma, 2005)

Methods of seed priming techniques are differed among crop to crop i.e.

Wheat

Seeds of wheat soaking in water for 8 hours at 20⁰C, it is helpful to minimize the mean 50% emergence as compared with dry seed. Primed seeds were emerged 24 hours before than the unprimed seed due to the primed seed more able to retain water and grow faster than non-primed seeds (Harries *et al.*, 2001b). Rashid *et al.*, (2002) recorded the priming of wheat seed with sodium chloride (NaCl) @ 200 mol m⁻³. Seed emergences stimulate by NaCl treatment and grow faster as compared to non-primed seeds.

Rice (direct - seeded)

Harries and Jones (1997) analyze the response of seed priming on different varieties of rice (*Oryza sativa L.*) under rainfed conditions. Seeds of rice were soaked in water within 32-46 hours. Under such conditions priming treatment saved 7 to 20 hours in seed emergences period as compared with the none primed. In early stage of seed emergence, water plays important role for boosting up the rate of emergence and reduced the emergence period.

Rice (transplanting)

In this method, seedlings of rice grow in controlled condition of nursery, 25 days after sowing seedlings are ready to transplant in the field. These seedlings of rice establishments faster with treated by 2.5 % solutions of phosphorus fertilizer, due to phosphorus treatments provide food to root in early stage of rice seedlings as compared to non-primed seedlings (Redford, 1983).

Maize

Seed soaking of maize in water in 36 hours and 1 hours drying, these period is more suitable for taking good emergence and vigorous seedling as compared to without priming and short priming treatments (Moradi *et al.*, 2008). Duration of priming is important factor to influence the emergence rate and early establishment of maize due to water takes more time to inter in non-primed seed because seed coat of maize is very hard.

Sorghum

Al- Soqueer (2004) recommended the soaking of sorghum seed in water 12 hours. This period is optimum for achieving higher

% of emergences and vigorous ability of seedling under water stress conditions. He is also founded that the non-significant difference between 12, 24, 48 & 72 hours priming treatments.

Chickpea

Chickpea seeds cannot be emerged similarly under stress conditions, these circumstances with water, faster emergence and vigorous seedlings chick pea is possible with 8 hours seed soaking with water. According to Harries *et al.*, (1999) 190 to 230 hours reduced the emergence of chickpea seed by sowing of priming seed with water in at black soils of Madhya Pradesh (India) under water stress conditions.

Soybean

Soybean seeds need short period in water soaking as compared to all the above mentioned crops because seed coat of soybean is very thin. 4 hours of soybean seed soaking in water and one hour is drying is enough to get uniform emergence and early establishment of crop. Poor seed emergence and early crop establishments are major constraints of crop production in rainfed areas of Madhya Pradesh, India. Re-sowing is costly and expensive in this reason because arrangement crop production inputs i.e. seeds, fertilizers etc. cannot be afforded by poor farmers in this area. Due to this reasons seed priming technology is not only important for increasing the % emergence but also helps to obtain vigorous seedlings, boosting up plant growth and provide best opportunity to minimize cost of cultivation.

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