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# Evaluating the Impact of Different Pelleting and Priming Techniques on Stand Establishment and Vigour of *Cedrus deodara*

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**ABSTRACT**

Improved seed quality is a major concern of forest scientists throughout the world. Unavailability of poor-quality seed is a major hindrance in crop establishment, growth and development. Pre-sowing seed treatments linked with improved emergence and seedling health in terms of early boosted seedlings growth can be a good adoptive approach to mitigate the seed associated problems. Hence, primed and pelleted *Cedrus deodara* seeds were evaluated in a small experiment having three replicates included hydropriming and biochar pelleting along with their combinations, in comparison to control. A positive impact on seed emergence potential in terms of final emergence percentage (86%) and seedling growth (44cm) have been associated with pre-pelleting and hydropriming for 18 hours followed by pelleting of 30g biochar, as compared to control and other treatments. Seeds subjected to 18 hours hydropriming followed pelleting with biochar took less time for emergence (7 days) as compared to control (11 days). Thus, pre-sowing treatments can provide noticeable results in terms of better emergence and vigour.

**Keywords**: Biochar; hydropriming; emergence; pelleting; growth

## INTRODUCTION

Seed priming is a controlled hydration process which allow pre-germination processes howeverforestalls radicle bulge/development (Afzal *et al.,* 2008). Improve emergence and early seedling vigor or establishment by pre-activating enzymes and DNA replication had been observed in primed seeds (Cheng *et al.,* 1999). Improved stand establishment is in direct line with early imbibition (Murungu *et al.,* 2004), repair and synthesis of heredity material during sensu stricto phase of germination (Burgrass *et al.,* 1984).Hydropriming is a process of seed hydration in which seeds are drenched in water for specific time and then are placed to dry to obtain their original weight (Coolbear *et al.,* 1990) and different studies have revealed that germination rate, germination percentage, root and shoot lengths were enhanced in cereals when seeds were hydro-primed (Basra *et al.,* 2003).

A stable organic compound, rich source of available carbon and other plant nutrients also have high water absorbance and water holding capacity for a longer duration "biochar' which in combination can improve the germination potential and seedlings health and vigor during the early crucial days (Glaser *et al.,* 2001). Direct addition of plant growth promoting substances (nutrients) by application of biochar in soil resulting in higher retention of nutrients, higher capacity of cation exchange, physical properties of soil improved ultimately increased availability of nutrients to plants results in increased growth and yield potential (Lehman *et al.,* 2006). (Major *et al.,* 2010) observed a

significant improvement in grain yield in experimental units having biochar from wood as compared to plots without biochar. In addition to provision of nutrients to plants and improvement of soil physical properties, biochar has positive effects on soil microbial activity due to its porous nature and stability (Gomez *et al.,* 2014).

Hence, application of biochar as seed pelleting agent in combination of pre-sowing completion of imbibition and active metabolism phases of germination by seed priming could be helpful in improving seed quality and ultimately crop performance.

**MATERIALS AND METHODS**

A simple research trial laid out in a randomized complete block design with 8 treatments, having thirty-two one-liter plant pots, replicated in three blocks. In each pot 5 seeds were sown in the early February 2018, and daily count of emerged seeds were taken until steady emergence pattern is achieved for all treatments (ISTA 2010). 2 random seedlings from each pot were taken after 6 months to evaluate seedlings vigor (ISTA 2010). The treatments in this study were as follows:

(1) Hydropriming for 18 hours
(2) Biochar pelleting (10g biochar/10g seeds)
(3) Biochar pelleting 15g (biochar/10g seeds)
(4) Hydropriming for 18 hours plus Biochar pelleting (15g biochar/10g seeds)
(5) Hydropriming for 18 hours Biochar pelleting (20g biochar/10 g seeds)
(6) Hydropriming for 18 hours plus Biochar pelleting (25g biochar/10g seeds)
(7) Hydropriming for 18 hours plus Biochar pelleting (30g biochar/10g seeds)
(8) Hydropriming for 18 hours plus Biochar pelleting (35g biochar/10g seeds)

**Procedures for recording data**

Procedures to record data on various characteristics are given as under:

Final emergence percentage:

Final emergence percentage (FEP) was taken at the end of experiment. It represented the ratio in percentage of number of emerged seedlings to total seeds planted:

$$\text{FEP (\%)} = \frac{\text{Final number of seedlings emerged}}{\text{Total number of seeds sown}} \times 100$$

Mean emergence time (Days):

Mean emergence time (MET) was calculated according to Ellis and Roberts (1981).

Emergence index (EI):

According to formula suggested by Association of Official Seed Analysis (1990) emergence index was computed:

$$\text{Emergence Index} = \frac{\textit{No. of emerged seeds}}{\textit{Days of first count}} + \ldots\ldots\ldots\ldots + \frac{\textit{No. of seeds emerged}}{\textit{Days of final count}}$$

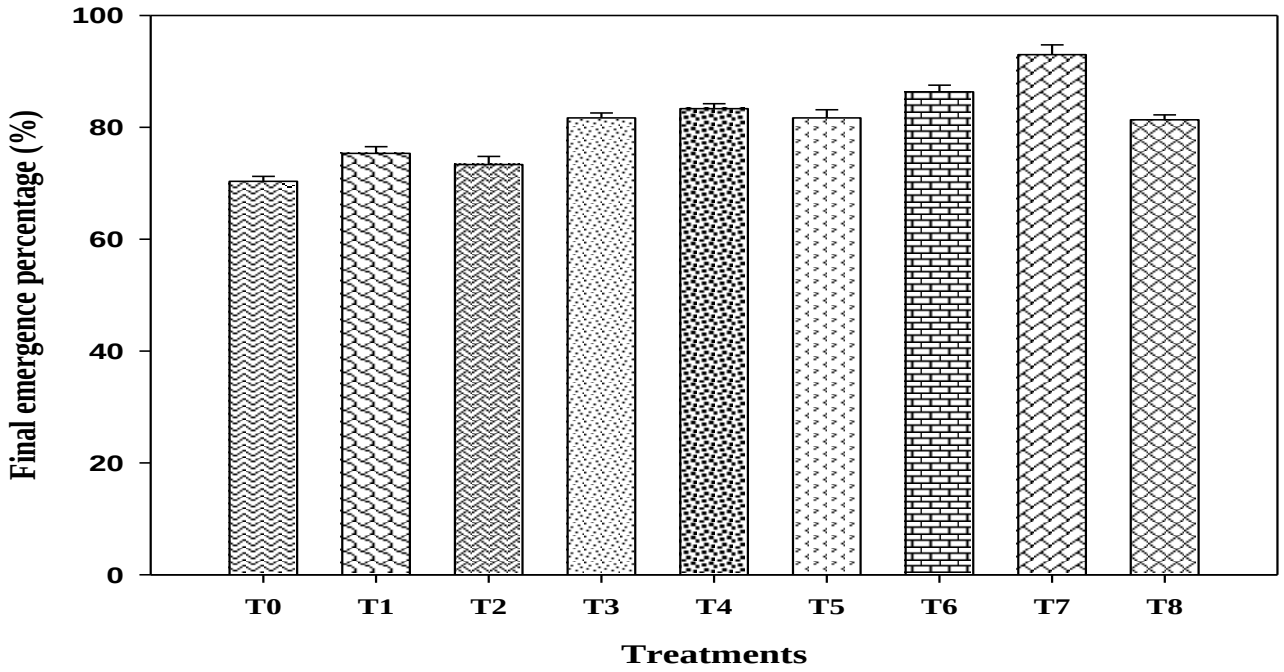
**RESULTS**

**Stand establishment**

Results shown in Fig. 1. depicts a significant improvement in emergence potential in all primed and pelleted seeds as compared to control however, maximum values for emergence percentage was linked with hydropriming for 18 hours plus Biochar pelleting 30g biochar/10g seeds followed by hydropriming for 18 hours plus Biochar pelleting 25g biochar/10g seed

**Fig. 1. Final emergence percentage of *Cedrus deodara*.**



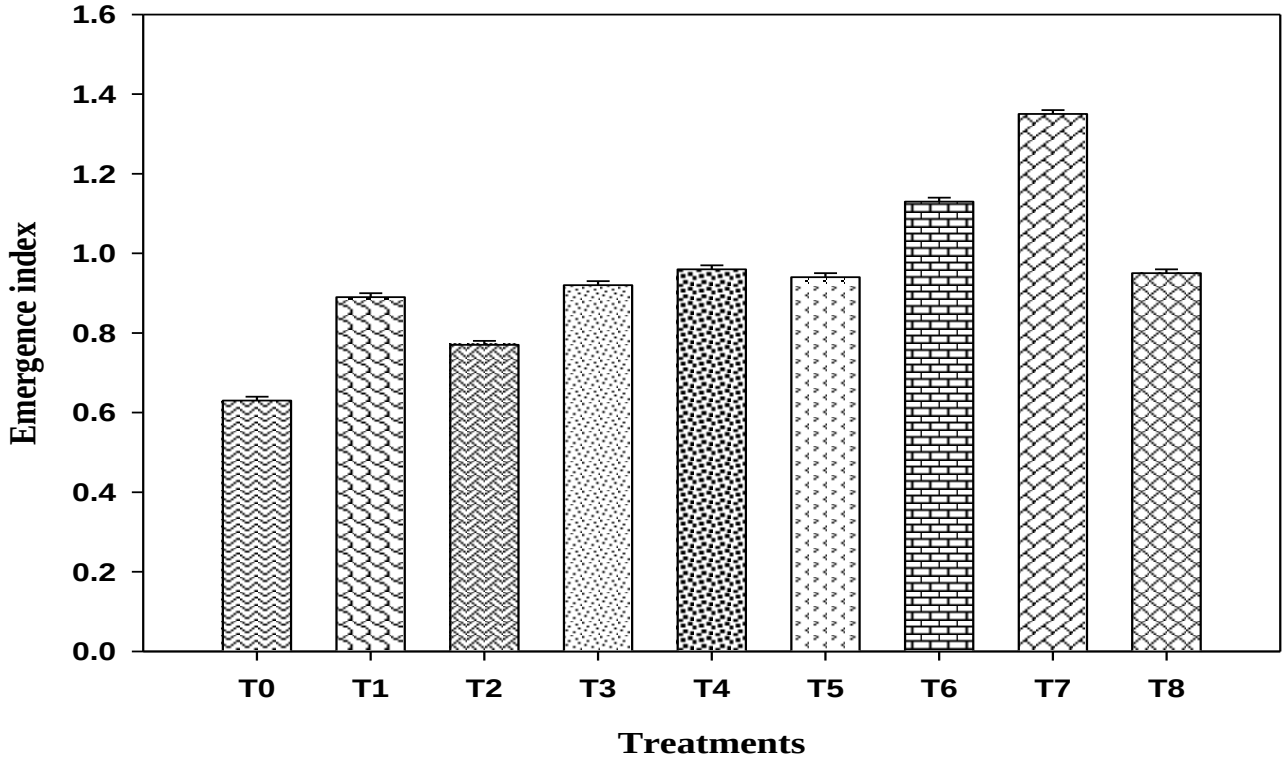




**Fig. 2. Emergence index of *Cedrus deodara*.**

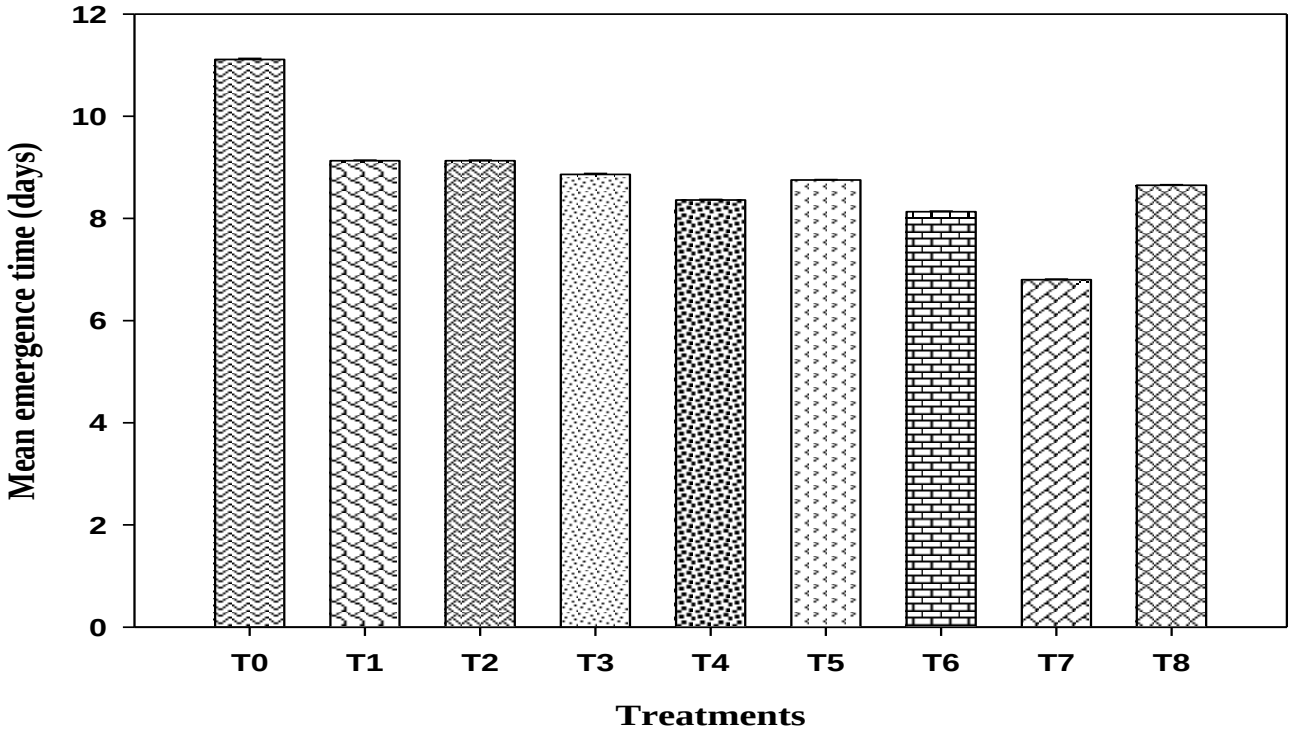



**Fig. 3. Mean emergence time (Days) of *Cedrus deodara*.**

**Vigour**

Results shown in Fig. 4. depicts a significant improvement in vigour of the plants. Seeds treated with hydropriming for 18 hours plus Biochar pelleting 30g biochar/10g seeds having a significantly improved seedlings length as compared to control. Lowest values for seedling length was linked with control followed by hydropriming for 18 hours and Biochar pelleting 10g biochar/10g seeds.

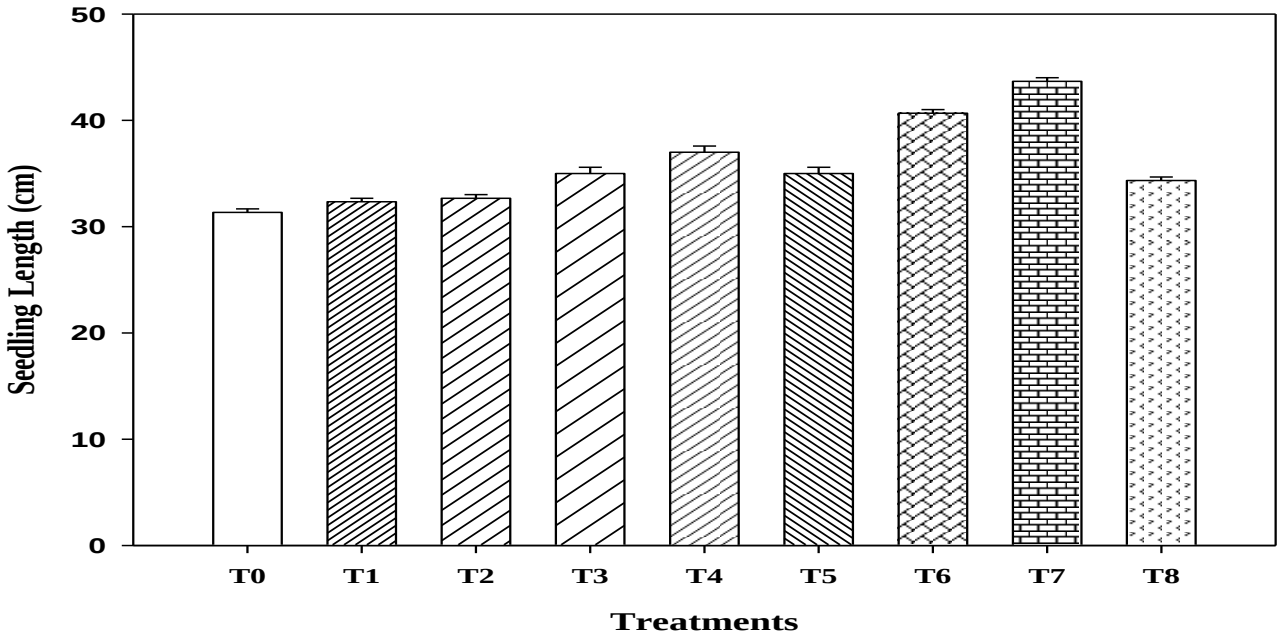



**Fig. 4. Seedling length (cm) of *Cedrus deodara***

## DISCUSSION

It is possible to obtain a satisfactory result in terms of emergence index and seedlings growth when pre-sowing seed enhancement technology was used. Though, all combinations of hydropriming and biochar pelleting improve final emergence percentage however a marked difference obtained with treatment "Hydropriming for 18 hours plus Biochar pelleting 30g biochar/10g seeds" as compared to control that is devoid of any priming and pelleting strategy. Results reveals a significant improvement in seedlings growth which is in direct line with early completion of imbibition and better and improved activation of growth related enzymes involved during lag phase. However, the results depict that combined effect of hydropriming and biochar coating can be a good adaptive approach under some circumstances. (Afzal 2008) showed a marked improvement in germination percentage and shows a synchronised and improved emergence, even under stressful conditions. Similar findings were presented in which emergence and seedlings growth is improved to many folds by pre-germination activities (Farooq *et al.,* 2008). Due to activation of germination related enzymes ATPase as well as acid phosphatase and RNA synthesis, improved germination and seedlings growth are the fate linked with pre-sowing soaking of seeds in water (Fu *et al.,* 1988). Also, activation of antioxidants (Farooq *et al.,* 2009), under stressed condition like low soil temperature improved germination and seedling growth takes place by hydropriming (Afzal *et al.,* 2008).

Due to availability of long lasting, rich from plant substances and decomposed organic material in Amazon in some soils, the improved growth of plants found in that batches of dark coloured soils due to availability of decomposed material from centuries hence fertility status of soil as well as plants is improved to a major extent (Thomas *et al.,* 2007). Vigorous seedlings growth due to application of biochar (Steiner *et al.,* 2008), soil physical status and chemical reactions improvement linked with porous biochar (Woolf *et al.,* 2010).

## CONCLUSION

Though, this was a small research trial but a satisfactory improvement in final emergence percentage and early seedlings growth linked with all combinations of hydropriming and biochar pelleting, maximum number of emerged plants were associated with treatment No. 7 as compared to all other treatments. Although a detailed and in-depth investigation is still required in seed enhancement technologies.

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