



Irrigation Scheduling of Teak (*Tectona grandis*) Seedlings at Nursery Stage

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ABSTRACT

An expenditure on nursery is a major component of plantation estimates. In nursery management, irrigation plays the vital role in the success of any nursery. To optimize production of seedlings, irrigation must be applied in appropriate quantity and proper time; as per the requirement of the plant. Hence, an experiment was designed to study the influence of irrigation scheduling on growth of teak seedling in nursery stage at Navsari, Gujarat. Treatments consisted of four different irrigation level (Daily irrigation, Alternate day irrigation, Irrigation every 2 day, Irrigation every 3 day). The biometric observation on 30, 60 and 90 days after transplanting (DAT) revealed that the height of teak seedlings was affected due to varying levels of irrigation after planting of seedlings. The per cent increase in plant height over initial height was remarkably more in irrigation every alternate day which was followed by irrigation every day but it was infested more by insects and pest than irrigation every alternate day. The per cent increase in plant height was reduced in irrigation every 3 days. Similar trend was observed in collar diameter at 30, 60 and 90 DAT, the highest increase in percentage diameter over initial was recorded from seedlings subjected to irrigation every alternate day, while lowest increase in diameter was observed in irrigation every 3 day. The data on percentage increase in number of leaves at 30, 60 and 90 DAT indicated that irrigation every alternate day increases the percentage of leaves over initial.

Keywords:

Biometric parameters, collar diameter, irrigation level, plant height, teak

INTRODUCTION

Teak is one of the most important timber species suitable for South Gujarat agro-climatic condition and is widely raised for plantation and afforestation in India. It requires relatively long nursery period. However, the species remain

poorly studied in relation to its management in plantation and its physiological responses to environmental stresses. Standardization of nursery techniques is necessary for any afforestation programme as expenditure on nursery consumes a major portion of plantation

cost. The cost can however, be reduced by evolving suitable nursery practices on scientific lines (Bahuguna and Lal 1992).

Water is an essential component of productivity. Even in humid climate, natural precipitation is not sufficient to meet plant water requirements, so additional water is provided by irrigation. To optimize production, irrigation must be provided at the proper rate to replenish the plant requirement. Over-irrigation can drown a plant, leach fertilizer out of the rooting zone, and waste water and energy while under irrigation may result in water stress and reduced growth. Irrigation plays a crucial role to boost the young seedlings for better establishment. Therefore, determining how much water the plant actually needs can save resources and improve irrigation efficiency. Vermeiren and Jobling (1980) and Bala et al. (2008) reported that small wetted rooting zone results in restricted root, spread and affect tree growth. Thus, quantity of water per irrigation is important than the total quantity of irrigation. Keeping above in view, the present investigation was designed to study the influence of irrigation scheduling on growth of teak seedlings in nursery.

MATERIALS AND METHODS

The study was conducted in net house at College of Forestry, ACHF, Navsari Agricultural University, Navsari, Gujarat (India) situated at 20° 55' 21.18" N and 72° 54' 29.24" E with an altitude of 9 meter above the mean sea level during 2015-16. Navsari is situated in a typical tropical warm climate characterized by fairly hot summer,

moderately cold winter and warm humid monsoon. Average annual rainfall is about 1116 mm. Soil of this region is locally known as deep black soil. Six months healthy and robust local teak seedlings were prepared as stump and transplanted into the 10 kg capacity poly bags. Treatments, consisting of four different irrigation level (*i.e.* Daily irrigation, Alternate day irrigation, Irrigation every 2 days and Irrigation every 3 days). The experiment was laid down in completely randomized design (CRD) with three replications. All the necessary plant protection measures were taken as and when required. The data on growth parameters *i.e.* plant height, collar diameter and number of leaves were periodically recorded at 30, 60, 90 DAT.

RESULTS AND DISCUSSION

Plant height

The height of teak seedlings were affected due to different levels of irrigation after planting of seedlings. (Fig. 1). Projected data revealed that the per cent increases in plant height over initial height was remarkably more in irrigation every alternate day which was followed by irrigation every day but it was more affected by insect and pest than irrigation every alternate day at 30, 60 and 90 DAT. The per cent increase in plant height reduced in irrigation every 3 days which indicates that irrigation every 3 days was not enough to provide sufficient water supply for the growth of seedlings. Many reports suggest the negative impact of water stress in plant growth (Anjum et al. 2003; Bhatt and Rao 2005; Kusaka et al. 2005 and Shao et al. 2008).

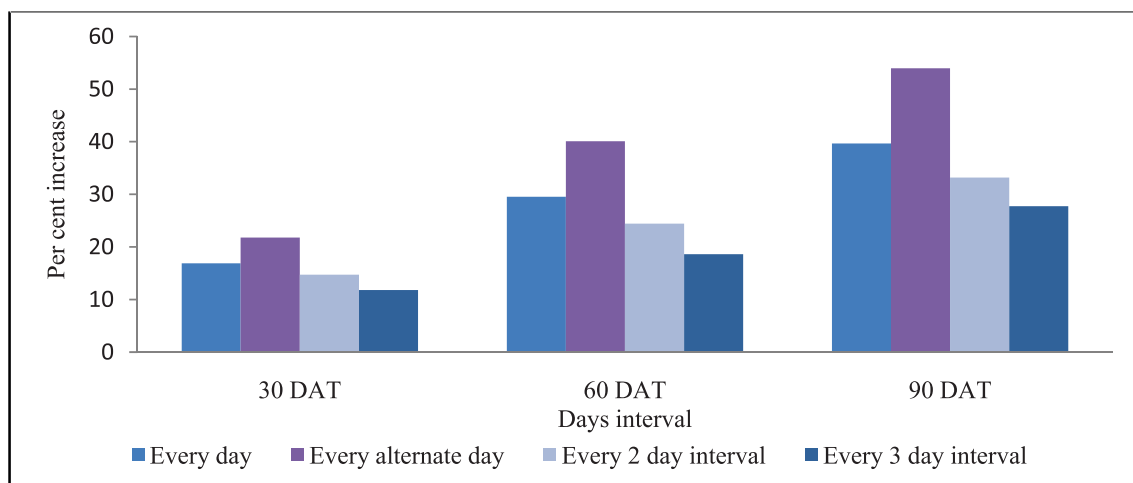


Fig. 1 Per cent increase in plant height (over initial) of teak seedling as influenced by different treatments

Collar diameter

The highest increase in percentage collar diameter over initial was recorded from seedlings subjected to irrigation every alternate day at 30, 60 and 90 DAT this may be due to more availability of water (Fig. 2). Lowest increase in diameter was observed in irrigation every 3 days which indicates that water stress in seedlings caused reduction in collar diameter. In treatment irrigation every 3 days, water stress may influence the physiological cycle and may result in poor performance of

seedlings (Sneha et al. 2012). Ceulemans et al.(1993) reported that high soil water availability facilitate nutrient concentration, leaf growth, leaf area and number of leaves which converted more solar energy and fixed more CO₂ to produce more photosynthates, and thus greater growth and biomass production. Sufficient soil water availability higher irrigation probably maintained cell turgidity and increased in leaf size and the overall biomass (Souch and Stephens 1998).

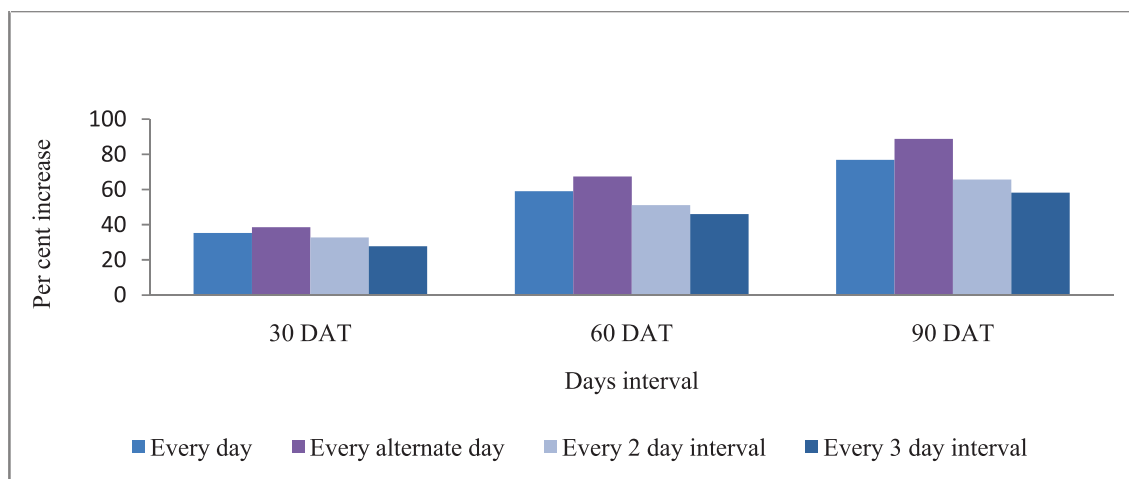


Fig. 2 Per cent increase in collar diameter (over initial) of teak seedling as influenced by different treatments

Number of leaves

The data on percentage increase in number of leaves over initial indicates that irrigation every alternate day increase the percentage of leaves over initial at 30, 60 and 90 DAT (Fig. 3). The increase

may be due to high soil water availability facilitating nutrient accumulation, leaf growth, leaf area and number of leaves(Ceulemans et al. 1993). Whereas, irrigation every 3 days decrease total number of leaves in teak seedling.

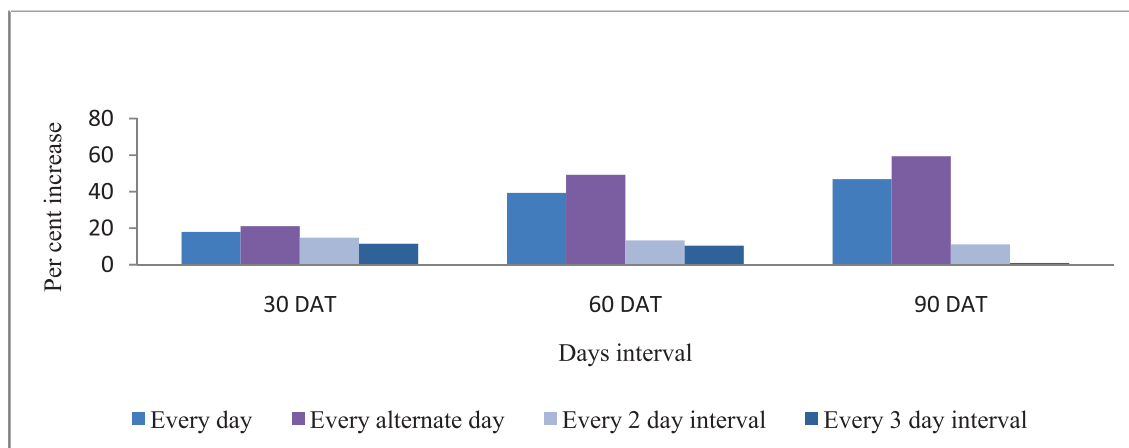


Fig. 3 Per cent increase in no. of leaves (over initial) of teak seedling as influenced by different treatments

CONCLUSION

Based on the findings it may be concluded that water stress cause reduction in growth and development in teak seedlings. Irrigation every 3 day is not enough to meet the water requirement of seedlings whereas irrigation every alternate day is sufficient. It is also concluded that there is no added advantage if we provide irrigation every day.

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