

BIODRAINAGE FOR RESTORATION OF CANAL COMMAND WATERLOGGED AREA IN INDIAN DESERT

N. BALA, G. SINGH, N.K. BOHRA, N.K. LIMBA AND S.R. BALOCH

Division of Forest Ecology
Arid Forest Research Institute, New Pali Road, Jodhpur – 342005, India

ABSTRACT

An attempt was made to remove excess water from the land through bio-drainage and to increase vegetation cover and productivity of a waterlogged area in Indian desert. Area protection, soil working and plantation of *Eucalyptus camaldulensis*, *E. fastigata*, *E. rudis* and *Corymbia tessellaris* on raised bunds, improved vegetation cover with simultaneous decrease in water table. Performance of *E. rudis* was best with respect to growth, biomass, transpiration rate and overall bio-drainage potential. *E. rudis* maintained uniform transpiration and photosynthesis rate throughout the year. Ground water level receded by 145 cm in *E. rudis* plot compared to 90 cm, 70 cm and 60 cm in *C. tessellaris*, *E. camaldulensis* and *E. fastigata* respectively within a period of four and half year. Soil organic carbon, electrical conductivity, NH_4 and $\text{NO}_3 - \text{N}$ were high in *E. rudis* and low in *E. fastigata*. The results suggests that *E. rudis* has high potential to be used as an efficient bio-drainage species in canal command waterlogged area of Indian desert. Apart from the planted species, *Prosopis juliflora*, *Tamarix dioica* and *Saccharum munja* also have come up in the area with recession of ground water table as natural succession and contributed significantly for further lowering of ground water table and increasing productivity.

Key words: Biodrainage, Biomass, *Eucalyptus rudis*, Transpiration, Waterlogging.

Introduction

Indira Gandhi Nahar Pariyojana (IGNP) is one of the most gigantic projects in the world aiming to check desertification and to transform desert wastelands of western Rajasthan into agriculturally productive area. In the canal command area, water logging and consequently salinity problems are increasing at an alarming rate. Kapoor and Denecke (2001) estimated 55,000 ha water logged area out of the total 1,860,000 ha command area in IGNP. Water logging has been a major problem in the irrigated belts. Canal command areas are increasingly being rendered unproductive and barren through water logging and consequent secondary salinization. Engineering solutions such as ground water pumping and surface drainage are too expensive. The best way is seen as an effective utilization of plants (in particular tree plantation), which remove the excess water through transpiration. Potential of using trees to control water logging and salinity is now a well-established fact. However, it is important to find out suitable tree species for a particular set of surroundings.

A number of species have been tried for the purpose of bio-drainage and their suitability for salt tolerance under water logged conditions. *Eucalyptus* was found to be the most useful for the purpose along with few other species (Hussain and Gul, 1991; Moezel *et al.*,

1991). Karajeh *et al.* (1994) recommended cultivation of *Eucalyptus camaldulensis* tree as a management option for lowering water table. Thakur and Chhabra (1999) have recommended plantation of eucalyptus and bamboo to prevent water logging and salinity caused due to seepage in canal command area. Improvement in soil properties is observed in such plantations (Dass and Ahuja, 1998) along with other environmental benefits. Prudent strip plantation of trees in Agroforestry system on farmer's field bunds was found to lower water table (Toky *et al.*, 2011). An overall 20 cm decline in water table was observed on entire site making the field arable. It has been demonstrated that under ideal conditions, a tree canopy may lower water table by 1-2 m over a period of 3-5 years (Angrish *et al.*, 2006). However, information pertaining to canal command area particularly in arid zone of northwestern India is very few, compared to the gravity of the problem. An attempt was made to increase vegetation cover and productivity of waterlogged area in IGNP and to remove excess water from the land through bio-drainage, by planting some tree species. The area was rendered barren due to prolonged water logging (stagnant water up to 1m at places). The present paper describes the performance of the tree species growing under the influence of water-logging conditions with particular reference to the growth, biomass, physiology and soil characteristics.

***Eucalyptus rudis* was found to have high potential to be used as an efficient bio-drainage species in canal command water logged area of Indian desert.**