

ASSISTED AND NATURAL REGENERATION OF EUCALYPTUS IN ARID TRACT OF RAJASTHAN

N. Bala, G. Singh, N. K. Bohra, N. K. Limba and S. R. Baloch

Division of Forest Ecology
Arid Forest Research Institute
Jodhpur

Introduction

Eucalyptus camaldulensis Dehnh., commonly known as river red gum, has been introduced from Australia to India long back and is growing in most parts of the country. In the arid zones of Rajasthan *E. camaldulensis* has been planted by providing irrigation in the first two years because the sites are sandy and characterized by frequent droughts, high temperatures and desiccating winds. The trees are usually planted alongside canals and roads and in blocks with irrigation facilities (Handa *et al.*, 2002). The Eucalyptus trees have difficulties to regenerate naturally in regions outside their homeland (www.celso-foelkel.com). In Australia it is recognized that natural regeneration in *Eucalyptus* can be secured by cutting the undergrowth and passing fire over the area. Dense stands of young plants appear over extensive areas after floods, at times forming impenetrable thickets (Cunningham *et al.*, 1981). Regeneration of river red gum was recorded at several channel edge localities, especially where the channel bank was not far elevated from the anabranch creek level (O'Malley and Sheldon, 1990). Spring-summer floods followed by summer recession provide suitable germination conditions for *E. camaldulensis* in Murray floodplain (Roberts and Marston, 2000). High seed fall in spring may have adaptive significance as floods usually recede during this period in the area (Dexter, 1978).

Natural regeneration of *Eucalyptus* species is very rare in India and there is hardly any information available about this phenomenon (Nautiyal *et al.* 1994). Though good regeneration of native species was observed in 25 and 40 year old Eucalyptus plantation in southern western Ghats, interestingly there was no seedlings of eucalyptus in the plantation (Selwyn and Ganesan, 2009). To a limited extent natural seedlings have been observed in and around the blue gum plantations of Nilgiris and the essential conditions appear to be bare soil free of weeds and sufficient light. Nautiyal *et al.* (1994) has reported regeneration of *Eucalyptus camaldulensis* near canal rest house, Suratgarh, Rajasthan. Regeneration of *E. citriodora* and an unidentified hybrid was observed after felling of matured trees in Mysore (Gowd, 1960). Various methods of soil working and other field techniques are known to overcome the problem of regeneration (Gautam *et al.* 2007).

Assisted regeneration

Soil working in a waterlogged area in Indira Gandhi Nahar Pariyojana (IGNP) was found to trigger profuse regeneration of *E. camaldulensis*. The study site is situated at 1357 RD (27°26' 9" N Latitude and 71° 24' 18.2" E Longitude) of the main canal, near Ghantiali village, 32 km from Nachna towards Mohangarh, on the left side of the canal road in Jaisalmer district. The canal at this place is at higher elevation and seepage water from the canal is accumulated in a depression covering an area of 3 ha. Depth of inundation at the lowest depression was 100 cm, which varied seasonally being maximum in winter months. Soil is deep sandy in nature with pH ranging from 8.4 to 9.1, electrical conductivity (EC) ranging between 0.25 dSm⁻¹ and 2.30 dSm⁻¹ and soil organic carbon (SOC) range between 0.03% and 0.37% at different soil depths. The climate of Jaisalmer is very hot and dry in the summer season. Lasting from April to October, summers experience an average temperature in the range of 41.6° C (max) to 25° C (min), maximum temperature reaching up to 49.2 °C. The climatic conditions in winters are windy and chilly. The average temperature varies between 23.6° C (max) and 7.9° C (min) with lowest temperature in the range of 1 °C. Annual average rainfall of Jaisalmer is 164 mm (Gol, 1991).

Photo plate 2.



Dense regeneration of *E. camaldulensis*



Spatial distribution of regenerated plants

There were few old trees of Eucalyptus (22 year old) away from the inundated area. In spite of heavy fruiting and seed fall no regeneration was observed. The soils in the vicinity of those trees were tractor ploughed in the month of July 2003. After the monsoon season, heavy regeneration took place (Photo plate 2). Number of seedlings was about 36 per m² at the canopy edge (8 m away from the main stem). Improved soil aeration and good contact of seeds with soil might have resulted in such regeneration. Because of high density the growth of seedlings varied widely. Maximum height of 785 cm was recorded at the age of 40 month. Ground water table in the regeneration block has receded from 25 cm to 145 cm depth.

Natural regeneration

The authors observed good regeneration of *E. camaldulensis* in the PWD Guest house, Barmer, Rajasthan during a soil and vegetation survey. Seedlings of 15 cm to 50 cm height (Plate 2) were seen growing under a mother tree in the Guest house premises. Soil of the area was loamy sand in nature with good moisture regime and conducive sunlight.

Plate 2. Natural regeneration of *Eucalyptus camaldulensis* at different places



Natural regeneration at PWD Guest house,
Barmer



Regeneration at Forest Ecology experimental
field, AFRI, Jodhpur

Few regenerated seedlings of *E. camaldulensis* were observed in 2 x 2 x 2 m³ non weighing type of lysimeters at Forest Ecology experimental field, Arid Forest Research Institute, Jodhpur. The regeneration was observed after the monsoon of 2010 in a lysimeter tank that was used in an experiment on waterlogging and salinity in the previous year. The seed source was a 12 year old tree standing near the lysimeters. Unlike other lysimeter tanks, which were covered by polythene sheet to check evaporation from the soil, this particular tank had no cover. Sufficient soil moisture and sunlight was available to favour seed germination.

Natural regeneration of any species is a remarkable indication of its establishment in nature (Nautiyal *et al.* 1994). These evidences of regeneration of *E. camaldulensis* in the arid tracts of Rajasthan may be an indication of its naturalization in the area.

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