

Production and Decomposition of Litter in *Prosopis cineraria* Plantation Along Canal Banks in Indian Desert

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Abstract: Temporal dynamics of litter production and its decomposition in *Prosopis cineraria* plantation in IGNP command area has been studied. Annual litter production varied greatly with plantation age and stem density in *P. cineraria* being high in 17-year-old plantation (1240 kg ha⁻¹). Lowest litter production was recorded in 4-year-old plantation (384 kg ha⁻¹). Because of the prevailing climate in the area litter-fall is seen throughout the year. Lot of seasonal variation was observed in plantations of different age classes. Bimodal pattern of litter fall was observed where two peaks of varied intensity were recorded in summer and winter. Overall, litter production was more in winter months except Y11 plantation. Component wise, leaf litter accounted for the major part of the total litter production. It varied from 63% in 11-year-old plantations to 75% in 17-year-old plantations. Woody litter component varied from 25% to 37% in plantations of different age. Value of decomposition constant (k) was 0.7339, signifying moderate rate of decomposition. A significant positive relationship between annual total litter production and girth at breast height (GBH) as well as tree height was observed. Moderate rate of decomposition signified moderate rate of nutrient turnover in *P. cineraria* plantations.

Key words: Litter, *Prosopis cineraria*, decomposition, arid zone, plantation.

A phenomenal change in the land use scenario has taken place with the advent of canal irrigation through Indira Gandhi Nahar Pariyojna (IGNP) in hot arid ecosystem of northwestern Rajasthan (Ram and Chauhan, 2002). Afforestation on large scale was taken up in the project area to protect the canal systems from drifting sand (GoR, 2002). As envisaged, these plantations have brought about a radical change in the landscape and microclimate in the area. Establishment of new plantations provides an opportunity to improve vital ecosystem services such as: litter supply, nutrient cycling, water infiltration, control of erosion etc. (León and Osorio, 2014). A vital role of ecosystem function is the continuous flow of nutrients and energy through various components of ecosystem. Litterfall and litter decomposition represent a large and dynamic portion of the nutrient cycling in a forest ecosystem (Bray and Gorham, 1964; Kim *et al.*, 2003; You *et al.*, 2000; Khiewtam and Ramakrishnan, 1993) and transfer of nutrients from aboveground vegetation to soil (Berg and McClaugherty, 2014; Vitousek, 1982; Vitousek and Sanford, 1986). Significant amounts of organic matter and nutrients in the soils can be transferred during litter decomposition processes (Lisanewok and Michelsen, 1994).

Litterfall is a major component of net primary productivity also and may provide important information as a phenological indicator of climate change effects on forests (Hansen *et al.*, 2009). Many authors used litterfall as an index of NPP considering that annual leaf fall represents one-third of total Annual NPP (Bray and Gorham, 1964).

Several factors affect the litter-fall in plantation forests. Important among those are climate, latitude and altitude, site quality, tree species and stem density. Plenty of literatures are available with reference to the effect of these factors on litter production in tropical forest (Singh and Joshi, 1982; Proctor *et al.*, 1983; Bhat, 1990; Gupta and Rout, 1992; Khiewtam and Ramakrishnan, 1993; Jana, 1998; Pandit and Jana, 2000) but in the context of arid conditions like western Rajasthan very few references are available. Therefore, knowledge of litter and nutrient dynamics in the canal side plantation ecosystem is required for its sustainable management. This will broaden our understanding of the ecology of tree plantation and to provide ecologically sound criteria for selection and management of plantation in Indian desert. We have focused on temporal dynamics of litter production and its decomposition in *Prosopis cineraria* (the state tree of Rajasthan) plantation in IGNP command area.

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