COMPARATIVE STUDY OF ALLELOPATHY AS EXHIBITED BY Prosopis juliflora SWARTZ AND Prosopis cineraria (L) DRUCE

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Abstract—The allelopathic effects of Prosopis juliflora were studied both in the laboratory and in nature and compared with that of Prosopis cineraria to understand the chemical nature of allelochemics. Both species occupy the same habitats but P. cineraria does not appear to have any toxic effect on other plants under its canopy. P. juliflora is highly allelopathic and does not allow the growth of any other species. Leaf extracts and leaf leachates of P. juliflora were inhibitory. Decaying leaves were also inhibitory at early stages of decomposition. Live roots were not found to be inhibitory in cogermination and interplanting of seeds. Chemical investigation of the extracts showed the allelopathic compounds to be phenolic in nature in both the species. Slow decomposition and heavy accumulation of leaf litter below P. juliflora may possibly result in accumulation of toxic substances in soil layers, inhibiting growth of other species.

Key Words—Allelopathy, Prosopis juliflora, Prosopis cineraria, Cassia occidentalis, radish.

INTRODUCTION

Prosopis juliflora Swartz and Prosopis cineraria (Linn.) Druce are two common trees of arid and semiarid zones in India. P. cineraria is a native slow-growing tree and is beneficial for the growth and development of other species. P. juliflora, on the other hand, is an exotic species and grows luxuriantly on sandy soils and is being introduced on a large scale in arid zones because of its
faster growth and soil-binding capacity. It has been realized for some time that *P. juliflora* does not allow the establishment of ground vegetation (Lahiri and Gaur, 1969; Sankhla et al., 1965). Earlier studies on *P. juliflora* suggest that the leaves and the soil below this tree contain inhibitory chemical substances (U. Goel, and G.S. Nathawat, unpublished observations). Allelopathic patterning is clearly visible in the area with heavy accumulation of leaf litter in the case of *P. juliflora*, but *P. cineraria*, despite heavy litter fall, supports much ground vegetation. In earlier studies on the comparative nature of the two species, *P. cineraria* was not found to be allelopathic in laboratory bioassays. In view of this, a comparative study of *P. juliflora* and *P. cineraria* was undertaken to understand the allelopathic effects of the former and to characterize the active principles.

**METHODS AND MATERIALS**

*Species Selection.* Field observations revealed that the understory vegetation in the study area is mainly dominated by *Brachiaria ramosa*, *Dactyloctenium sindicum*, *Crotolaria medicagenia*, *Corchorum tridens*, *Indigofera linnaei*, and *Cassia occidentalis*. The growth of the herbaceous species was observed to be better under *P. cineraria* than under *P. juliflora*. Saxena (1978) recorded the above-ground biomass to be 234.8 g/m$^2$ below *P. cineraria*, and bare areas were observed under *P. juliflora*.

*Effect of Pericarp, Bark, and Leaves.* To determine the most toxic part of *P. juliflora* and *P. cineraria*, pericarp, bark, and leaves were collected from trees in the field and aqueous extracts of 1% and 10% concentrations were obtained by soaking the pericarp, bark, and leaves in hot distilled water for 1 hr, which was considered to be sufficient for extraction. The extracts were suction-filtered through Whatman No. 1 filter paper. Control was maintained by using distilled water.

Twenty-five seeds of radish were planted for germination on moistened filter papers in Petri dishes. The treatments were replicated five times. Germination in this experiment and all subsequent experiments was recorded daily, and radicle and plumule lengths were measured after 10 days. Seedlings were dried for 24 hr at 80°C.

*Effect of Field Soil.* To determine the stability of toxic compounds in the soil, soil was sampled to a depth of only 10 cm below the canopy of the tree, as most biological activity is encountered close to the surface. The soil was air dried and sieved. Five and ten grams of soil collected from under each tree species was used to make a thin layer under moistened filter papers. Twenty-five seeds of radish and *Indigofera linnaei* were planted for germination in each of the Petri dishes (replicated five times).