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Research Notes

Root activity pattern of *Gliricidia sepium* (Jacq.) using tracer techniques

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Roots anchor the tree and absorb and transport water and nutrients to the above ground parts. They influence soil profile development and, upon drying, roots contribute to soil organic matter.

Though the extent and gross morphology of root system of a few tree species have been described (Friend *et al.* 1991) information on roots of tree crops is generally scanty because of the great difficulties encountered in extracting these large underground organs without destroying or modifying them (Vose, 1980). However, with radioactive tracers, it has been possible to precisely determine the extent of root activity pattern of tree crops without actually having to excavate the roots (IAEA, 1975).

Gliricidia sepium is a small, elegant and quick growing tree with arching branches and feathery foliage. It is strikingly beautiful in bloom when its branches for the greater part of their length are covered with masses of pinkish purple or pale pink flowers. The flowers grow in clusters. The rapid growth of the tree and its long leafy branches recommend it as a useful shade tree for crops and for green manuring. The whole tree is rich in nitrogen. Using the radiotracer ^{32}P, the root activity of *Gliricidia* was studied.

The experiment was conducted during June, 1999 at Forest College and Research Institute, Mettupalayam, Coimbatore district, Tamil Nadu. The trees in the plantation had been raised at an espacement of 2m x 2m. The soil in the experimental site was red sandy loam type. The important characteristics of soil are furnished in Table 1.

Single trees were used as experimental units. The trees selected were 3 years old and had uniform vegetative characteristics (girth and foliage). Four untreated guard trees surrounded each experimental tree. Calculated quantity of ^{32}P orthophosphoric acid was mixed with requied quantity of the filler activated clay, dried, ground to a fine powder and filled in gelatin capsules at the rate of 250 mg per capsule. Each capsule carried on activity 18.5 MBq. These capsules were then placed in soil using an auger to bore holes at three radial distances (25, 50 and 75 cm) from the base of the tree and at four vertical depths (30, 60, 90 and 120 cm) from soil surface. Twenty four trees were thus tagged, representing 12 treatment combinations of lateral distances and vertical depths, each replicated twice. For each factorial combination of lateral distance and vertical distance, the capsules were placed at 8 equidistant holes around the tree, such that the total radioactivity applied for tree was 148 MBq.

Table 1. Characteristics of soil under 3-year-old *Gliricidia sepium*

Physical Properties		
a)	Bulk density (g cm^{-3})	1.58
b)	Particle density (g cm^{-3})	2.40
c)	Maximum water holding capacity (%)	23.16
d)	Pore space (%)	35.63
e)	Volume expansion (%)	2.82
f)	Texture	Loamy sand
Chemical properties		
a)	pH	6.60
b)	EC (dSm^{-1})	0.98
c)	Organic carbon (%)	0.62
d)	Available $KMnO_4$-nitrogen (kg ha^{-1})	169
e)	Available Olsen-phosphorus (kg ha^{-1})	5.80
f)	Available potassium (kg ha^{-1})	312

Table 2. Root distribution pattern *Gliricidia sepium*

(Mean of 2 replications, in %)

Lateral distance / Vertical depth	25 cm	50 cm	75 cm	Total
0 cm	5.62	33.06	14.00	52.68
0 cm	6.10	26.99	3.34	38.43
0 cm	1.77	2.54	2.51	6.82
20 cm	0.36	0.88	1.33	2.07
Total	13.85	62.97	23.18	100.00

Ten days after placement of capsules, leaves of similar age and morphological position were drawn from the trees, dried in an oven and ground to pass through a 60 mesh sieve. A subsample of 5 g of the ground material was dry-ashed in a muffle furnace and counted in a Geiger Muller Counter. Based on the radio assay data the root activity of *Gliricida sepium* was expressed as percentage (Table 2).

Nearly 91 per cent of the roots of trees were confined to the top 60 cm layer of soil. The intensity of roots decreased down the soil profile significantly, from 52.68 per cent at top 30 cm layer to 2.07 per cent at 120 cm. Laterally, nearly 77 per cent of the roots were confined to the 50 cm radial distance from the base of the tree. The roots were fairly spread, with around 86 per cent of the roots being concentrated in the 50-75 cm radial distance from the tree. Thus, it could be concluded that the roots of *Gliricidia sepium* were shallow, but spreading in proliferation.

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