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PHOSPHOROUS CONTENT AND OCCURRENCE OF *GLOMUS FASCICULATUM* IN TOBACCO SOILS

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Among different tobacco types, FCV tobacco is grown in an area of 2.0 lakh ha in Andhra Pradesh and Karnataka with a production of 300 m kg. FCV tobacco is cultivated in different soils ranging from sandy loams to clay soils and available P content in the soils varies from low to high. The fertility of soils greatly influence tobacco plant growth, physical, chemical, manufacturing and smoking properties of tobacco leaf. Balanced nutrition is a prerequisite to get quality leaf. Phosphorus is one of the important nutrients for tobacco crop and the concentration in leaf ranges from 0.20 to 0.40%. A good supply of phosphorus in the early stages promotes root development, growth and establishment of seedlings leading to proper crop maturity at later stages.

Arbuscular mycorrhizal fungi (AMF) are being promoted as a biofertilizer to enhance phosphorus availability (Bhagyaraj and Varma 1995). Infected plants are able to enhance P nutrient uptake and water (Dickson *et al.,* 1999). The main benefit of mycorrhiza is to improve the uptake of nutrients especially phosphorus (Manjunath *et al.,* 1983). Endomycorrhizal fungi have been shown to enhance the ability of roots to absorb more nutrients than non-mycorrhizal plants. Mycorrhizal fungi are present in soil as spores and hyphae in colonized roots (Bolan, 1991). The symbiosis of root and fungi is so well balanced that, although many of the host cells are invaded by the fungal endophytes there is neither visible tissue damage nor any degree of pathogencity towards its host.

Hence, the present study was carried out during 2003-2006 at CTRI Rajahmundry on the prevalence and infection of *Glomus fasciculatum* (Thaxter senses Gerdemann) in different tobacco soils with varying phosphorus content. Soil samples were collected from research farm of CTRI, processed and analysed by standard methods. (Bray and Kurtz, 1945 and Olsen *et al.,* 1954).

Fields which were planted with tobacco for the past 10 years were selected for the study. Total of ten soil samples were selected under each textural group to estimate the distribution of spores in each group under varied soil P availability and relationship of spores to available P in each soil group was studied (Table 1). Five plants were selected randomly from each site. Soil samples were collected before 60 days of planting and 90 days after planting from tobacco rhizosphere. The number of chlamydospores from soil was estimated (Gerdemann and Nicolson, 1963). Roots were stained with acid-tryptopan blue in lactophenol. Root infection was estimated from 75 segments of 1.0 cm length from randomly selected plants of 60 and 90 days old. The proportion of the length of each root segment which contained vesicles, arbuscules or hyphae was estimated (Biermann and Linderman, 1983). The number of chlamydospores recovered before and after planting tobacco was higher from SLS soils with low phosphorus content (4.5 kg/ha) than from other soils (Table 1). The recovery of chlamydospores increased with the age of plant (60 and 90 days) after planting tobacco in all the tobacco growing soils. The recovery of chlamydospores was higher at 60 and 90 days after planting in sandy loam soils of KLS and NLS (P content 25 kg/ha and 21 kg/ha, respectively) followed by clay soil of CBS (P content 18 kg/ha) and sandy loams of chewing tobacco soils of Vedasandur (P content 22 kg/ha). However, in clay soils of NBS which contained high P content (33.6 kg/ha), the recovery of chlamydospores was poor. Ninety days after planting, the recovery of

chlamydopsores increased in all the soils. The infection of tobacco roots with *G. fasciculatum* was relatively high in low P soils (Table I). Similar observation on recovery of chlamydospores from different soil types could be attributed to the intensity of root infection associated with soil phosphorus status and root growth (Harley and Smith, 1983). VA mycorrhizal fungi exhibit mutually beneficial symbiosis or partnership with host plants. In this symbiosis plant gets the soil nutrients and in exchange the fungus gets the carbon. Low phosphorus content in soil increases the amount of carbohydrates in roots, resulting in greater infection of roots, when compared with plants grown in soils containing high phosphorus content. Phosphorus stress in soil could also change the root exudates pattern with an increased amount of amino acid content and this in turn could stimulate chlamydospore germination and infection of roots. Soil could also change the root exudates pattern with an increased amount of amino acid content and this in turn could stimulate chlamydospore germination and infection of roots (Smith and Gianinazzi – Pearson, 1988).

The mycorrhizal fungi once established on the root system radiate out from the roots to form a dense network of filaments. These filaments form an extensive system of hyphae that grow into the surrounding soil and provide a variety of benefits for the plant (Smith and Read, 1997). High phosphorus application reduced the recovery of chlamydospores from soil (Harrison,1997). Decrease in soil pH has been correlated with reduction of AMF in soil (Entry *et al.*, 2002) Karnataka light soils recorded low pH followed by northern light soils and southern light soils and showed corresponding recovery of chlamydospores and AMF infection. The mechanism may be a function of the pH tolerance of AMF or alteration of phosphatic availability. The differences in recovery of chlamydospores from different tobacco soil types could be attributed to the intensity of root infection associated with soil phosphorus status and root growth. The higher spore population coincided with higher percent colonization of roots in southern light soils of tobacco.

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Table 1: Prevalence of *Glomus fasciculatum* and root infection of tobacco plants in different soil types with varying pH

Soil type	Soil texture	Available P	pH	No. of chlamydospores/ 100 g soil			Root length infection (%)		Total root infection (%)	
				0 days	60 days	90 days	60 days	90 days	60 days	90 days
KLS	Sandy loam	25	5.5	120	162	184	20	31	40	53
NLS	Sandy loam	21	5.8	94	133	164	19	24	31	35
SLS	Sandy loam	4.5	6.6	147	166	218	43	46	57	66
CBS	Clay	18	7.8	63	77	102	25	30	31	42
NBS	Clay	33	8.2	41	83	103	20	24	40	41

Low phosphate soil - less than 10 kg P/ha. Medium phosphate soil -10-25 kg P/ha High phosphate soil – more than 25 kg P/ha

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