by well-differentiated conidiophores bearing dry conidial heads, composed of branched long chains of narrow, cylindrical one-celled easily detachable conidia.

During a survey of fungi colonizing leaf litter of *Eucalyptus* species in South India we have collected a fungus on *E. globulus* litter which was determined as belonging to *Haplographium heliocephalum* as it agreed with the type in essential features such as conidium ontogeny, morphology and size of conidia. However, in our collection we noticed the presence of setae associated with the conidiophores, a new feature not found in the type. In fact this is the first report on the occurrence of sterile setae in the genus as setae have not been reported in any species of *Haplographium* described so far. The setae are sterile, dark brown, thick-walled, 6–7 septate, smooth, up to 650 μm long and 5–7 μm thick at base tapering to 2–3 μm, (figure 1A–D).

Specimen examined: On leaf litter of *Eucalyptus globulus* collected from Botanical Garden, Ootacamund, Tamil Nadu, India, M. Dorai, 28.12.1984.

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EFFECT OF ONION AND GREENGRAM INTERCROPS ON PHOSPHORUS RELEASE AND ITS UPTAKE BY COTTON

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It is well known that phosphorus (P), an essential plant nutrient when applied to soil, gets fixed and its availability is reduced. Since P is available in the pH range of 5.5–7 and most of the cotton-growing soils have pH around 8 the crop response to P applications is meagre[1].

Low soil pH and high CO_2 content in the root zone caused by microbial breakdown of organic substances influence P availability[2]. The root exudates of many plant species are acidic and favour high microbial activity[3,4]. Intercropping of onion and greengram in cotton is gaining importance due to the higher yields obtained. But reasons for the synergism leading to higher yields[5] are not clear and it is presumed that sufficient P absorption by cotton due to the influence of the root exudates of these intercrops could result in better yields. So far no studies are available on the P solubilizing effect of the root exudates of onion and greengram plants. In this paper the results of an attempt made on this aspect are reported.

In plots of 18.5 m^2 with ridges thrown at 75 cm apart, four intercropping patterns, viz., (i) MCU 5 VT Cotton (*Gossypium hirsutum* L.) alone, (ii) cotton intercropped with CO 2 country onion (*Allium cepa* var. aggregatum), (iii) cotton intercropped with Bellary red onion (*Allium cepa* var. Cepa) and (iv) cotton intercropped with CO 4 greengram (*Vigna radiata* L.) were tried with RBD with 5 replications. Cotton and the intercrops were grown in alternate rows repectively at 30 and 15 cm within row spacing. The experimental soil was red loam with pH 8.5, available P_2O_5 10.5 kg/ha and P fixation capacity 50% as estimated by the methods described by Hasan and Velayutham[6]. All plots received 60, 30, 30 kg/ha of N, P_2O_5 and K_2O respectively.

Samples of cotton plant and intercrops were removed on 60th and 90th day after germination and the samples after drying and weighing were analysed for P content and total uptake calculated[7]. At maturity the yields of seed cotton and greengram grain yields were recorded on dry weight basis and that of onion bulbs on fresh weight basis. Statistical analysis within the crop was done according to the experimental design.

The P content in cotton plants in pure as well as in the greengram intercropped environment was less than that in onion environment (table 1). Due to high P fixation the total uptake was low resulting in lower dry matter and seen cotton yields. Cotton with the two types of onion intercropping absorbed more P and produced more dry matter and seed cotton yields. Eaton[8] made similar observations. The P content on the 90th day got diluted due to accumulation of more dry matter and so was lower than that found on the 60th day (table 1). In intercrops the P content and dry matter production were lower than in cotton but were in agreement with the normal uptake and yield values observed in their respective pure cropping[9]. Statistical comparison of these parameters between the intercrops could not be

Table 1 *Effect of intercropping onion and greengram on P uptake, dry matter production and seed cotton yielding var. MCU 5 VT (G. hirsutum L.)*

Intercropping pattern	Plant P content %				Total P uptake g/plant				Total Dry matter yield g/plant				Yields of seed cotton g/plant	Yields of inter-crops g/plant
	Cotton		Intercrop		Cotton		Intercrop		Cotton		Intercrop			
	a	b	a	b	a	b	a	b	a	b	a	b		
Cotton alone	1.13	1.11	–	–	0.50	0.62	–	–	44.20	56.50	–	–	41.6	–
Cotton with country onion	1.68**	1.61**	0.93	0.91	0.86**	1.13**	0.15	0.24	51.20**	70.10*	16.2	26.9	51.9	19.4
Cotton with Bellary onion	1.62**	1.56**	0.79	0.81	0.79**	0.97**	0.14	0.24	48.70**	62.00*	17.8	30.0	45.1NS	22.5
Cotton with greengram	1.16NS	1.14NS	0.98	0.93	0.50NS	0.63NS	0.20	0.34	44.90NS	55.30NS	21.0	36.4	41.2NS	15.6

a, 60 day; b, 90th day; * Significant at 0.05%; ** Significant at 0.01%; NS, not significant.

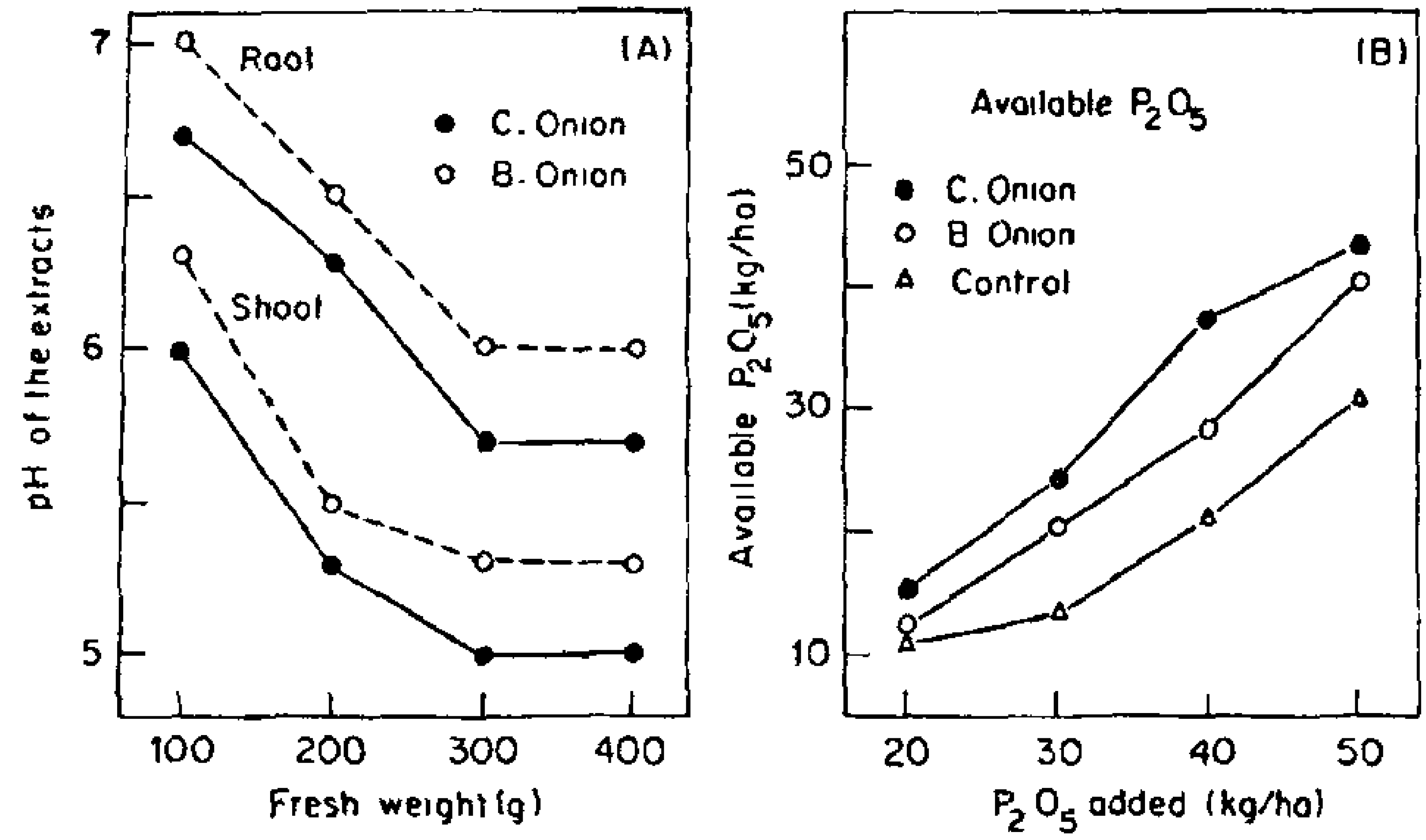

Figure 1. pH of the shoot and root extracts of onion and influence of root exudates on P solubility.

done because the crops differed in their growth habit and maturity duration.

The organic compounds of chelating character exuded by the plants of onion roots probably helped the release of a greater amount of P in soil making it available to cotton plants. The net exudation of H^+ ions by the root also could have contributed to the release of fixed P from the soil. Earlier investigations indicated similar possibilities of P release by onion roots[10]. The roots of country onion plants appeared to be more efficient in releasing P than the Bellary onion samples.

To confirm this observation, the two onion types were grown in sufficiently bigger pots without P supply. On the 40th day, the plants were removed and the roots were washed free of soil with distilled water. Plants with roots weighing 1, 2, 3 and 4×100 g were soaked in 500 ml of cold distilled water for 15 min in such a way that only the roots were immersed. Similarly, shoots were cut and soaked. The extracts were filtered and the pH and P content determined[7]. In two sets of four glass beakers of 250 ml volume, 25 g of soil was taken and the P as superphosphate was added to give 20, 30, 40 and 50 kg P_2O_5/ha and allowed to equilibrate at field moisture for 96 h. In one set, 50 ml of the root exudates obtained from 400 g sample was added and available P determined[11].

The shoot and root extracts were distinctly acidic in reaction and contained no P (figure 1A). The shoot extracts were more acidic than those of the roots. The pH tended to decrease with soaking of more fresh roots and shoots. The root and shoot extracts of the country onion plants were more acidic than those of Bellary onion plants. Variations in the available P content indicated favourable influence of root exudates. Increasing P additions alone did not improve the available P content in soil. But soaking these soil samples with onion root extracts released 13.6–26.8% more P (figure 1B). Under field conditions both the root exudates and shoot washings by fairly long spell of rains might contribute to a greater P availability from the soil.

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