Influence of Mulches on Soil Microflora with Different Levels of Irrigation in Areca Garden

Arecanut *(Areca catechu* L.) is an intensively cultivated tropical palm. It is an irrigated crop in most parts of its cultivation. Mulching in areca gardens helps to decrease the frequency of irrigation by conserving soil moisture and reducing the evaporation rate. Organic mulches are known to influence the soil microflora (Hankins, Hill and Stephens, 1982) and soil fertility status (Norstadt and Mc Galla, 1960; Black, 1973; Othieno, 1978; Gaur and Mukherjee, 1980). In the present investigation, the influence of mulches with different irrigation schedules on the soil microflora and soil fertility status was studied and reported in this paper.

A field experiment on the depth of irrigation water in relation to cumulative pan evaporation (CPE) with or without mulching was undertaken at Central Plantation Crops Research Institute, Regional Station, Vittal, Karnataka during 1979 and 1980 seasons. An experiment was conducted adopting split plot design with five replications and four levels of irrigation (Table I) as main treatments and mulching of garden with arecanut husk; 6 kg per palm, white polythene sheet of 600 gauge and unmulched control as sub-plot treatments. The soil is lateritic in origin and slightly acidic with a pH range of 5.16–5.24.

The palms were irrigated from January to May as per the treatment schedule. Mulches were applied during September in both the years. During the following years the organic mulches were ploughed in and incorporated in the soil.

At the end of the experimental period soil samples were collected from the basin of areca palms at 0–30 cm depth using soil auger. The enumeration of microflora were carried out by following the soil dilution and plate count method (Allen, 1957). The bacteria, fungi and actinomycetes population were counted using Thornton's Standard agar, Martin's rose-bengal agar and Kustar's agar medium respectively. The dominent fungi were identified based on the colony morphology and sporulation. The chemical properties of soil such as organic carbon (%), pH and total nitrogen (%) were determined (Jackson, 1958).

The population of bacteria, actinomycetes and fungi were augmented in the arecanut husk mulched treatments as compared to control (Table 1). The population of bacteria was significantly more in the plots mulched with arecanut husk, while no significant difference was observed between unmulched control and polythene mulched treatments. Arecanut husk had significantly increased the actinomycetes as compared to polythene mulch and control treatments. However, polythene mulched soil had significantly more actinomycetes compared to unmulched

Table 1. *Root region microflora of arecanut as influenced by different mulches and irrigation levels in areca garden*

Treatment*	Bacteria x10 5/g dry soil	Actinomycetes x10 5/g dry soil	Fungi x10 4/g dry soil
Mulches			
M_0	60.82	4.32	0.969
M_1	113.57	8.96	1.537
M_2	60.80	5.49	0.944
Irrigation			
I_1	84.41	6.60	1.425
I_2	77.89	6.65	0.978
I_3	77.11	6.19	1.089
I_4	74.26	5.58	1.108
CD = irrigation (0.05%)	3.41	NS	0.23
CD = mulches (0.05%)	8.46	0.71	0.11

* Mulches : M_0 = Unmulched (control)
M_1 = Arecanut husk
M_2 = Polythene sheet

* Irrigation levels:
I_1 = IW/CPE ratio = 1 (30 mm with 30 mm of evaporation)
I_2 = IW/CPE ratio = 0.5 (30 mm with 60 mm of evaporation)
I_3 = IW/CPE ratio = 1 (30 mm with 60 mm of evaporation)
I_4 = IW/CPE ratio 0.5 (60 mm with 120 mm of evaporation)

control. Similarly, fungi was significantly more in the plots mulched with arecanut husk. Hankin et al. (1982) reported that mulching with organic matter had increased the microflora in the soil. The beneficial effect of mulching on soil microflora could be due to the improved soil fertility.

The observations on the qualitative fungal flora revealed that *Trichoderma* sp., *Aspergillus* sp., *Penicillium* sp., *Mucor* sp. and *Rhizopus* sp. were the dominating fungi in the root region. However, the occurrence of different fungi did not follow any definite trend with respect to different mulches and levels of irrigation.

The total nitrogen and organic carbon content of the soil were significantly increased by using arecanut husk as a mulch as compared to polythene sheet and unmulched control (Table II). However, there was no significant difference in organic carbon and total nitrogen content between polythene mulch and unmulched control. Irrigation with 30 mm of water with a cumulative pan evaporation of 30 mm (IW/CPE ratio = 1.0) had significantly increased the organic carbon content compared to irrigation of 60 mm with a cumulative pan evaporation of 120 mm (IW/CPE ratio = 0.5). No significant change was noticed in respect of soil pH under different mul-

Table II. *Organic carbon, total nitrogen content and pH of the soil as influenced by mulches with different levels of irrigation*

Treatments*	Total nitrogen content (%)	Organic carbon (%)	pH
Mulches			
M_0	0.057	0.606	5.26
M_1	0.086	0.745	5.55
M_2	0.058	0.553	5.01
Irrigation			
I_1	0.073	0.741	5.42
I_2	0.068	0.696	5.30
I_3	0.067	0.678	4.96
I_4	0.060	0.618	5.41
CD = irrigation (0.05%)	NS	0.072	NS
CD = mulches (0.05%)	0.007	0.027	NS

* As in Table 1

ching as well as irrigation treatments. The incorporation of organic mulches (arecanut husk) gets degraded slowly in the soil and it improves the fertility status of the soil. Black (1973) reported that wheat straw mulch increased organic matter, total N and C : N ratio of soil.

The above results clearly showed the positive effect of arecanut husk mulching on the soil fertility status and increased microbial activity. This method of recycling the arecanut husk as a mulch and subsequent *in situ* incorporation can easily be adopted by the areca growers.

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Bio-chemical Basis for Root-regeneration in Ringed Shoot Cuttings of Cashew *(Anacardium occidentale* L.) Plants of Different Ages - Cofactor Activity and Total Phenol Content

The ringed shoot cuttings of cashew with 90 days of post-ringing period obtained from 4-year old cashew plants found to root better than those of 8-and 16-year old plants (Rao et al, 1988). The cofactor activity and total phenol content in these cuttings were estimated and presented below in order to find out their relationship with rootability of cuttings.