Short Scientific Report

Journal of Plantation Crops, 2014, 42(2): 238-240

Performance of medicinal and aromatic plants as intercrops in coconut garden

S. Thiruvarassan and H.P. Maheswarappa[1]

Coconut Research Station, Veppankulam - 614 906, Tamil Nadu, India
[1]Central Plantation Crops Research Institute, Kasaragod, Kerala, India

(Manuscript Received: 03-10-13, Revised: 04-03-14, Accepted: 25-03-14)

Keywords: Coconut, intercropping, medicinal and aromatic plants, performance

Coconut (*Cocous nucifera* L.) is a perennial palm and survives for more than 60 years. Nearly 60 per cent of space in 7.5 x 7.5 m spaced adult coconut gardens and 40 per cent of sunlight are left unutilized, which provides ample scope for raising soil, climate and market specific intercrops with additional revenue and synergistic effect on coconut (Nelliat, 1979). Earlier research efforts had revealed that tuber crops, fruit crops, rhizomes, pulses and vegetables can be grown well under coconut garden (Rathinam, 2001). Intercropping of citronella increased the land use efficiency from 21-46 per cent with additional yield of main crop (Prakash Rao *et al*., 1988). The possible intercrops in coconut garden include perennial, biennial and seasonals including medicinal and aromatic plants. In the present scenario of fluctuation in coconut price and high production cost, the pure crop of coconut is no more economical. Hence, intercropping in coconut garden becomes indispensable for augmenting the income of the coconut farmers. The coconut based cropping system involves cultivation of compatible crops in the interspace of coconut by increasing the cropping intensity through efficient utilization of sunlight, soil, water and labour leading to considerable increase in the production and productivity per unit area. Skaria *et al*. (2005) reported that ginger, sitharathai, turmeric, kasthurimanjal and patchouli are the medicinal plants suited for inter cultivation in coconut gardens of Kerala. The present investigation was carried out to evaluate the performance of medicinal and aromatic plants as intercrops in coconut gardens for augmenting the income of coconut farmers.

The study was conducted in 36 years old east coast tall (ECT) coconut garden at Coconut Research Station, Veppankulam to study the medicinal and aromatic plants as intercrops in coconut garden. The herbal plants chosen for this experiment were three medicinal plants *viz*., *Alpinia galanga* (Sitharathai), *Aloe vera*, (Chotrukathalai), *Ocimum sanctum* (Tulsi), and two aromatic plants *viz*., *Cymbopogon flexuosus* (Lemon grass) and *Pogostemon* sp. (Patchouli). The experimental soil was sandy loam in texture with available NPK of 199, 4.9 and 79 kg ha^{-1} respectively and pH 7.03, EC 0.13 with organic carbon content of 0.22 per cent. The experiment was non-replicated with a plot size of 15 x 4 m leaving 8 ft from the base of palms. The intercrop received organic manure *viz*., FYM @ 25 tonnes ha^{-1} and other intercultural operations as per the package for herbal plants. No serious pest and disease was noticed in the experimental crops. For minor seasonal pests, neem oil was sprayed based on need. The yield of economic parts of each herbal plant was recorded after processing and finally the economics of intercropping herbal plants in coconut garden was worked out. The essential oil content and the soil available NPK content was estimated by adopting standard procedures.

The selected medicinal and aromatic plants performed well and recorded better yield as intercrop in adult coconut garden. The Sitharathai

Corresponding Author: thiruvarassan@rediffmail.com

Table1. Yield of medicinal and aromatic plant intercrops in coconut

Common name	Scientific name	Duration	Yield (kg ha^{-1})	
			(2009-10)	(2010 -11)
Medicinal plants				
Sitharathai	*Alpinia galanga*	18 months	2740	3260
Chotrukathalai	*Aloe vera*	6 - 7 months	12350	12750
Tulsi	*Ocimum sanctum*	12 months	13400	16000
Aromatic plants				
Lemon grass	*Cymbopogon flexuosus*	4 years	7250	7342
Patchouli	*Pogostemon* sp.	3 years	1210	1240

recorded an yield of 2740 kg 2009-10 and 3260 kg in 2010-11 dry tuber ha^{-1} while, *Aloe vera* recorded 12350 kg and 12750 kg and Tulsi recorded 13400 kg and 12750 kg of fresh leaf ha^{-1} during 2009-10 and 2010-11 respectively.

In case of lemon grass, the yield was 7250 kg (2009-10) and 7342 kg (2010-11) of dried leaf ha^{-1} and for Patchouli, it was 1210 kg during 2009-10 and 1240 kg during 2010-11of dried leaf ha^{-1}.

The selected medicinal and aromatic plants recorded better net return and B:C ratio as intercrop in coconut garden (Table 2). *Alpinia galanga* recorded net return of ₹ 81,021 ha^{-1} B:C ratio of 1:3.1 while, *Alove vera* and *Ocimum sanctum* recorded net return of ₹ 46,363 ha^{-1}, ₹ 91,796 ha^{-1} with B:C ratio of 1:4.0 and 1:3.084, 1:3.0 during 2009-11 respectively. With regard to aromatic plants, *Cymbopogon flexuosus* recorded a net return of ₹ 31,050 ha^{-1}, with B:C ratio of 1:2.2 and *Pogostemon* sp. recorded net return of ₹ 20,292 and B:C ratio of 1:2.3 during 2009-11 respectively.

The mean nut yield of coconut before experimentation showed that it varied from 98-110 nuts pam^{-1} year^{-1}. The effect of different medicinal and aromatic plants as intercrops on mean nut yield of coconut after the experimentation showed that due to *Alpinia galanga* as intercrop, the nut yield was 131 to 153 nuts palm^{-1} year^{-1} during 2009-11 while, *Aloe vera* as inter crop, the nut yield of coconut was 132 and 152 nuts palm^{-1} year^{-1} 2009-10 and 2010-11 respectively. Intercrops of *Ocimum sanctum* recorded the nut yield of 137 and 157 nuts palm^{-1} year^{-1} during 2009-10 and 2010-11 respectively. The *Pogostemon* sp. as intercrop

Table 2. Economics of medicinal and aromatic plant intercrops in coconut (2009-11)

Particulars	Yield (kg)	Gross return (₹)	Cost of cultivation (₹)	Net return (₹)	B:C Ratio
Alpinia galanga	3000	120000	38978	81021	1:3.1
Aloe vera	12550	126500	34703	46363	1:4.0
Ocimum sanctum	14700	58800	19770	91796	1:3.0
Cymbopogon flexuosus	7296	29500	13195	31050	1:2.2
Pogostemon sp.	1225	36025	15732	20292	1:2.3

Table 3. Effect of medicinal and aromatic plant intercrops on nut yield of coconut

Treatments	Mean nut yield (before experimentation) 2004-2009	Nut yield palm^{-1} year^{-1}		Mean nut yield (after experimentation)
		2009-10	2010-11	
Alpinia galanga	98	126	138	131
Aloe vera	102	132	152	142
Ocimum sanctum	110	137	157	147
Cymbopogon lexuosus	110	140	167	153
Pogostemon sp.	100	134	134	134

Table 4. Essential oil content of medicinal and aromatic plants

Name of herbal plant	Essential oil percentage	
	Mono-crop	Inter-crop
Medicinal plants		
Alpinia galanga	0.85	0.72
Aloe vera	-	-
Ocimum sanctum	0.85	0.65
Aromatic plants		
Cymbopogon flexuosus	1.00	0.85
Pogostemon sp.	0.60	0.45

recorded the nut yield of 134 and 134 nuts palm^{-1} year^{-1} during 2009-10 and 2010-11 respectively. In general, intercropping herbal plants in coconut enhanced the annual nut yield to the tune of 18 per cent (145 nuts palm^{-1} year^{-1}) than coconut without intercrop (123 nuts palm^{-1} year^{-1}). Maheswari *et al*. (1995) reported profitable cultivation of patchouli in irrigated coconut orchard of Kerala, wherein the shade intensity was between 25-50 per cent.

The active principles (essential oil) of medicinal plants showed that *Alpinia galanga* recorded 0.72 per cent essential oil as intercrop in coconut compared to monocrop 0.85 per cent. In *Ocimum sanctum,* the essential oil was 0.65 per cent as intercrop and 0.85 per cent as monocrop. Regarding *Cymbopogon flexuosus,* when grown as monocrop recorded the essential oil of 1.0 per cent compared to 0.85 per cent under intercrop *Pogostemon* sp. as intercrop recorded the essential oil of 0.45 per cent as against 0.60 per cent in monocrop. Probably shade effect reduced the active principles in medicinal and aromatic plants grown as intercrop in coconut than under monocrop.

Table 5. Effect of medicinal and aromatic plants on soil nutritional status in coconut garden

Name of the plant	Soil nutrient status (before experimentation)			Soil nutrient status (after experimentation)		
	N	P	K	N	P	K
Alpinia galanga	241	14	122	249	15	124
Aloe vera	240	15	131	258	16	133
Ocimum sanctum	241	13	121	240	14	125
Cymbopogon flexuosus	240	16	122	256	18	135
Pogostemon sp.	242	14	120	248	15	124

The available NPK content of soil was analyzed before and after the experimentation (Table 5). The NPK content before experimentation recorded was low where it was increased after experimentation. The N content ranged between 249 to 258 kg ha^{-1}. The highest N content was recorded in *Aloe vera* intercropping. Whereas, the P content ranged from 15 to 18 kg ha^{-1} and *Cymbopogon flexuosus* intercropping recorded the highest P content in soil. Regarding K content of soil, it ranged from 124-135 kg ha^{-1} and the highest K content of 135 kg ha^{-1} was registered under *Cymbopogon flexuosus* intercropping in coconut.

Based on the performance and economics of chosen herbal plants, all the selected plants *viz*., *Aloe vera*, Sitharathai, Tulsi, Lemon grass, and Patchouli were found to be best suited intercrop in adult coconut garden. Based on the marketability and soil suitability, coconut farmers can choose any one of them and grow profitability. Thereby the farmers can generate additional revenue from their coconut garden with a synergistic effect on main crop.

References

Skaria, B.P., Mathew, G., Joy, P.P. and Mathew, S. 2005. Aromatic and medicinal plants research station. *Indian Coconut Journal* **36**: 12-18.

Maheswari, S.K., Dhantonde, B.N., Yadav, S. and Gangrade, S.K. 1995. Intercropping of *Rauvolfia serpentina* for higher monetary return. *Indian Journal of Agricultural Science* **58**: 487-488.

Nelliat, E.V. 1979. Prospects of multiple cropping in coconut based farming system- The Indian experience. *Indian Coconut Journal* **32**: 3-11.

Prakash Rao, E.V.S., Singh, M. and Ganesh Rao, R.S. 1988. Intercropping studies in Java citronella (*Cymbopogon winterianus*). *Field Crop Research* **18**: 279-286.

Rathinam, P. 2001. Research output and farmers adoption of technology on coconut based farming system- The Indian experience. *Indian Coconut Journal* **32**: 3-11.