

Short communication

Intercropping medicinal plants in black pepper

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ABSTRACT

Different intercropping composing several medicinal plants in black pepper was studied. Black pepper var. Panniyar-1 planted with *Asparagus* gave maximum yield (1998 kg/ha) followed by *Alpinia* (1,700 kg/ha). Highest income was obtained with *Crysopogon* intercropping (B:C ratio = 2:3:1).

Key words: Black pepper, intercropping, medicinal plants.

Black pepper (*Piper nigrum* L.), known as 'King of spices' and 'Black gold' is one of the important foreign exchange earner for the country. India accounts for around 90% of the area under cultivation and production but our productivity is low. Pepper is widely spaced crop and considerable inter-spaces remain unutilized during early years of planting. This inter-space could be effectively utilized for growing intercrops. Newly planted gardens are often subjected to soil erosion, when it is devoid of vegetation, or heavy weed growth as a result more labor is required for weeding. The studies conducted by Thankamani *et al.* (7) has shown that cultivation of tuber and fodder crops in juvenile black pepper garden is remunerative. Present study was conducted at experimental farm of IISR (Indian Institute of Spices Research, Kozhikode) during 2007-2009. The station lies between 11°26' and 11°59' North latitudes and 76°26' and 75°46' E longitudes. It is situated at an altitude of 974 above msl and enjoys a tropical climate. The station receives an annual rainfall of around 3000 mm, maximum and minimum temperature is of 36°C and 21°C respectively. The soil of experimental site is forest loam, with a pH of 4.6, available nitrogen 189 ppm, available phosphorous 0.20 ppm and available potassium 221 ppm, respectively.

The standard used for the experiment was *Glyricidia sepium*, planted at a spacing 3 m × 3 m, one year ago in the experimental site. Pits of 50 cm × 50 cm × 50 cm size were taken at the basin of the standard and planting of the variety Panniyur-1 was done during June 2007. Medicinal plants namely *Aadhatoda beddomei* (Chittadalodakam), *Desmodium gangeticum* (Orila), *Pseudarthria viscida* (Moovila), *Plumbago rosea* (Chethikoduveli), *Niligirianthus ciliatus* (Karimkurunji), *Alpinia calcarata* (Chittaratha),

Crysopogon zizanioides (Ramacham) and *Asparagus racemosus* (*Shathaveri*) were selected and treatments were laid out in RBD with three replications. Recommended package of practices of Anon (1) were followed for these crops. The intercrops were planted during April-July in the interspaces of four black pepper plants on *Glyricidia* as standard. The schedule followed for cultivation of different crops is given in Table 1. Soil samples were collected after the completion of the experiment and soil nutrient status was estimated by standard procedure (Jackson, 2). Availability of solar radiation received in the garden was measured using portable photosynthesis system (LCA 4). Solar radiation received in open condition varied from 1800 - 1900 μ mol and the filtered light varied from 1300-1500 μ mol where different inter crops were grown. Main crop as well as inter crops were supplied with recommended fertilizers and other operations were carried out as and when required.

The economic produce were harvested and quantified per hectare of black pepper garden and their cost of cultivation was worked out. Local market rates were considered for computing gross and net returns (Table 1). Benefit: cost ratio was calculated by dividing net income by cost of cultivation. Data statistically analyzed for analysis of variance by the procedure given by Panse and Sukhatme (5).

With regard to intercrop in black pepper + *Asparagus racemosus* recorded maximum yield (1,998 kg/ha) followed by *Alpinia calcarata* (1,700 kg/ha) and the lowest yield was recorded by *Plumbago rosea* (500 kg/ha). Regarding economics it could be seen that the net income was the highest in crop combination consisting of black pepper + *Crysopogon zizanioides* (Rs 46,215) followed by black pepper + *Alpinia calcarata* (Rs. 44,600). This could be due to higher inter crop yield. Wide variation in net return among intercrops was noted due to variation in the cost of cultivation. With regard to benefit-cost

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Table 1. Agro-techniques adopted for medicinal plants raised in juvenile black pepper garden.

Crop	Spacing (cm)	Planting material	Crop duration (month)	Price of economic produce (Rs/kg)
<i>Adhatoda beddomei</i>	45 × 30	Rooted cuttings	18	31
<i>Desmodium gangeticum</i>	45 × 30	Seedlings	18	55
<i>Pseudarthria viscida</i>	45 × 30	Seedlings	18	55
<i>Alpinia calcarata</i>	45 × 30	Rhizomes	18	38
<i>Plumbago rosea</i>	45 × 45	Rooted cuttings	18	100
<i>Crysopegon zizanioides</i>	60 × 30	Slips	18	85
<i>Asparagus racemosus</i>	45 × 30	Rooted cuttings	18	30
<i>Niligirianthus ciliatus</i>	45 × 30	Rooted cuttings	18	65
Black pepper (sole crop)	3 × 3 m	Rooted cuttings	-	-

ratio *Crysopegon zizanioids* recorded maximum (2.3) followed by *Alpinia calcarata* (2.2) and then *Asparagus racemosus* (2.0). The better performance may be due to congenial microclimate prevailed in the black pepper garden, better utilization of natural resources like light (medium shade), space, nutrients etc than that of sole crop of black pepper. The research findings by Thankamani *et al.* (7) also revealed congenial microclimate in juvenile black pepper garden for the cultivation of *Amorphophallus* (Gajendra), greater yam (Sree Keerthi), ginger (Varada), turmeric (Prathiba), hybrid Napier grass Co 3, Guinea grass and Congo signal grass. The result was in agreement with the findings of Sujatha *et al.*, (6) who reported that profitable cultivation of *Crysopegon zizanioids* and *Asparagus racemosus* in arecanut garden. Profitable cultivation of *Aadhatoda beddomei*, *Desmodium gangeticum*, *Pseudarthria viscida*, *Niligirianthus ciliatus* in coconut garden was reported (Maheswarappa, 4). Net income obtained from black pepper + *Asparagus racemosus* was also high (Rs. 40,944). *Asparagus racemosus* performed

well as inter crop in coconut plantation and recorded high root yield (Kurien *et al.*, 3).

Growth of black pepper plants was not affected by intercrops. Intercropping of *Crysopegon zizanioids* increased black pepper height by 20% over control. Increased height in black pepper over control suggested that the crop have not competed with the main crop and acted synergistically, which may be due to the additional input black pepper received in terms of fertilizer and better weed control. Better utilization of nutrients by black pepper might have resulted in increased growth. Increased height by 14% was observed for black pepper plants inter cropped with congo signal grass (Thankamani *et al.*, 7).

Intercropping of medicinal plants influenced the soil nutrient status in black pepper garden (Table 3). Nitrogen content was higher in intercropped plots compared to sole crop of black pepper. Maximum nitrogen content was observed in the treatment Black pepper + *Plumbago rosea* (209 ppm) followed by black pepper + *Pseudarthria viscida* (184 ppm). Intercropped plots had significantly higher potash content than sole

Table 2. Economics of raising medicinal crops in black pepper garden.

Crop	Yield (kg/ha)	Height (cm)	Gross income (Rs./ha)	Cost (Rs./ha)	Net income (Rs./ha)	B:C ratio
<i>Crysopegon zizanioides</i>	779	154.5	66,215	20,000	46,215	2.3
<i>Asparagus racemosus</i>	1,998	153.0	60,944	20,000	40,944	2.0
<i>Adhatoda beddomei</i>	1,100	153.7	34,100	16,000	18,100	1.1
<i>Niligirianthus ciliatus</i>	584	149.3	37,960	16,000	21,960	1.4
<i>Alpinia calcarata</i>	1,700	140.0	64,600	20,000	44,600	2.2
<i>Desmodium gangeticum</i>	575	151.0	31,625	15,000	16,625	1.1
<i>Pseudarthria viscida</i>	600	134.0	33,000	15,000	18,000	1.2
<i>Plumbago rosea</i>	500	130.0	50,000	20,000	30,000	1.5
Black pepper	-	128.5	-	-	-	-
CD _{0.05}	1.15	1.72	-	-	-	-

Table 3. Post harvest nutrient status in black pepper garden intercropped with medicinal plants.

Crop	pH	N (mg/kg)	P (mg/kg)	K (mg/kg)
<i>Cryspogon zizanioides</i>	4.8	176	0.50	110
<i>Asparagus racemosus</i>	5.2	174	0.50	177
<i>Adhatoda bedomei</i>	4.4	180	0.50	175
<i>Niligirianthus ciliatus</i>	4.5	179	1.0	178
<i>Alpinia calcarata</i>	4.2	177	1.00	174
<i>Desmodium gangeticum</i>	4.7	179	0.37	156
<i>Pseudarthria viscida</i>	4.5	184	0.38	190
<i>Plumbago rosea</i>	4.5	209	0.53	164
Black pepper	4.2	173	0.35	152
CD _{0.05}	0.20	2.7	NS	28.0

crop of black pepper. Maximum potassium content was observed in the crop combination black pepper + *Pseudarthria viscida* followed by black pepper + *Niligirianthus ciliatus* that was on par with *Adhatoda beddomei* and *Asparagus racemosus*. This result corroborate the findings by Thankamani *et al.*, (7) who observed high nutrient status in intercropped black pepper garden with tuber and fodder crops. In the present experiment fertilizer was given to main as well as inters crops that would have helped to avoid competition between the crops.

The present investigation indicated that intercropping medicinal plants provided income during establishment phase of black pepper. Inter-cropping enhanced height of black pepper. All crops tested are suitable; however, better returns obtained from intercrops like *Cryspogon zizanioids*, *Alpinia calcarata* and *Asparagus racemosus*.

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