

Woody Pepper: A Potential Spice Crop for Intercropping in Arecanut Gardens

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Abstract

Arecanut is one of the important plantation crops grown commercially in the Andaman and Nicobar Islands. However, mono-cropping is prevalent in most of the plantations, thereby resulting in underutilization of already scarce land resource. Intercropping using various annual and perennial crops could not only increase the income of farmers, but would also help in better utilization of available resources. Woody pepper is a novel spice of Piperaceae family, which grows taking support of perennial trees. The species is a potential candidate for commercial cultivation in the islands and present article highlights some important field observations, qualitative phytochemical analysis, model for arecanut based planting system and future prospects for exploitation of woody pepper as a novel intercrop for arecanut plantations of these islands.

Keywords: Bay islands, cropping model, plantation crop, underutilized spice

Introduction

Arecanut is one of the important plantation crops grown in many states such as Karnataka, Kerala, Tamil Nadu, North eastern parts of India and Andaman and Nicobar Islands. It is grown in about 3,500 ha in the Andaman and Nicobar islands. Due to low maintenance requirements, assured demand and better prices for fresh and dried nuts, cultivation of arecanut is popular among island farmers. Profitable intercrops for arecanut gardens of Andaman islands have been identified (Waman *et al.*, 2019). In Andaman and Nicobar islands, though a few farmers cultivate crops such as clove, ginger, black pepper, cinnamon, banana, pineapple *etc.* as intercrops in arecanut plantations (Waman, 2019), a large number of plantations are mono-cropped. It has been well established that growing intercrops in arecanut gardens with appropriate technological interventions such as green manuring, irrigation, mulching *etc.* would increase the yield of arecanut as well the system productivity (Bhat *et al.*, 1999, Bhat and Sujatha, 2007; Hussain *et al.*, 2008; Sujatha *et al.*, 2011).

The choice of intercrops is an important factor which depends on the local availability and requirement of resources. Considering scarcity of land in the islands and increasing competition from non-agricultural sectors,

adoption of high value intercrops is a key step to make island agriculture profitable. While searching for newer intercrops in a location, the local diversity and ethnic use of plants need to be considered for better adoption and ease of cultivation. Woody pepper (*Piper pendulispicum* C. DC.) is one such underutilized species in Andaman and Nicobar Islands, which is locally used by islanders as a spice for culinary purposes (Waman *et al.*, 2018).

Present article aims at identifying potential of this spice as a novel intercrop in arecanut gardens of these islands. Surveys were also conducted in Andaman islands to gather information about the species and results have also been presented. A model for arecanut- woody pepper based cropping system has been proposed. Further, the qualitative phytochemical analysis has also been presented hereunder.

Materials and Methods

Field surveys were carried out during 2016 to 2019 in North and Middle Andaman and Little Andaman islands to identify home gardens growing woody pepper as backyard crop. Standards used for growing the species were documented. Interviews were conducted with the farmers to know about the cultivation and marketing practices followed by them. A model was prepared for

utilizing the spice as intercrop in the arecanut plantations. Samples of stem were procured from a farmer's field in Little Andaman Island and brought to author's laboratory to conduct qualitative phytochemical analysis.

Stem pieces were scraped off to remove the outer bark layer. Stem was made into smaller pieces, dried using hot air oven at 50 °C and powdered. For analysis of phytochemical components, aqueous, ethanolic (95%, v/v), methanolic (95%, v/v) and acetone (95%, v/v) extracts were prepared. For this, 2.5g of powder was extracted with 25ml of the said solvents by cold percolation for 72 h. Extracts were then filtered through Whatman's filter paper and filtrate was collected in air tight container. Qualitative analysis was carried out using standard procedures. Various tests were conducted to detect the presence of phytochemicals *viz.* carbohydrates (Molish, Fehling's and Benedict's tests), glycosides (Keller-Kiliani test), tannins (catechin test), alkaloids (Wagner's test), amino acids (Ninhydrin test), phenolic compounds (ferric chloride test and gelatine test), proteins (Millon's test), volatile oils (Sudan III test), saponins (foam test) and flavonoids (alkaline reagent test).

Results and discussion

Woody pepper is commonly known as *Choi Jhaal* and is known to be used by settler Bengali community of the islands. Unlike black pepper, wherein berries are used as spice, stem pieces of this vine are used to impart pungency in culinary preparations. Earlier, the produce was known to be harvested destructively from the forests, thereby causing damage to natural populations. However, recently cultivation of woody pepper has been reportedly taken up by some farmers in the backyards to meet the local demand (Waman *et al.*, 2018). Promotion of this spice as a crop would not only assure income to the growers but would also reduce burden on the natural stocks, thereby assisting its conservation. In order to explore the possibility of promoting this species as a potential new crop, systematic surveys were undertaken during 2016 to 2019 in home gardens and local markets of Andaman Islands.

Surveys carried out in Little Andaman, Middle Andaman and North Andaman Islands resulted in

identification of ten locations of cultivation, all of which were in fields of Bengali farmers. A total of 67 vines were observed in these gardens (CIARI, 2019), of which 36% were trained on arecanut as standard followed by mango (27%), jackfruit (18%), forest trees (12%), coconut (4%) and drumstick (3%) (Fig. 1). The perception of farmers on cultivation practices, harvesting, utilization and marketing was documented. The choice of standard for growing the vine varied among the farms and mango tree standards were observed in six farms followed by forest trees (five farms), arecanut and coconut (two farms each), jackfruit and drumstick (one farm each). Number of vines per farm varied between 1 and 47. In local markets, the produce (*i.e.* the stem pieces) was sold at Rs. 300-400/- per kilogram in North and Middle Andaman, while the price was as high as Rs. 600/- to 1,000/- in Little Andaman (Fig. 2).

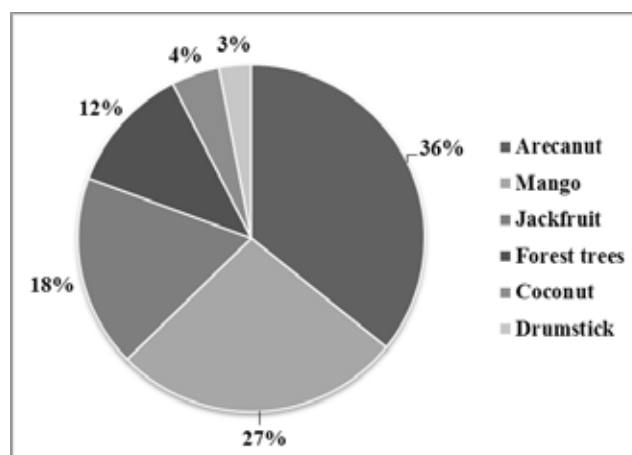


Fig. 1: Percentage share of different species used as standard for woody pepper



Fig. 2: Stem pieces of woody pepper sold in local market of Andaman Islands

Sufficiently thickened stems are one of the criteria for fetching higher rates and the vines are said to attain the desired thickness in about 5-6 years from planting. Subsequent harvesting could be done at 4-5 years intervals. Yield of fresh stem pieces of 8 to 10 kg/ harvest could be obtained, whereas yield of 16 kg from a vine of 5 years age was observed at a farmer's field in Middle Andaman. Realizing the profitability of its cultivation, many other arecanut farmers are showing interest to plant woody pepper in the surveyed areas.

Arecanut gardens of the islands could be used for undertaking large scale cultivation of this unique spice. For this, a hypothetical model with five year harvest cycle was proposed for an acre of arecanut garden (Table 1). In such gardens, woody pepper could be planted in staggered manner at the rate of 110 vines per year for five years,

covering the entire plantation. Considering yield of 10 kg stems/ vine and selling price of Rs. 250/- per kg, island farmers could get additional income of Rs. 2,75,000/- per year by cultivation of this newer spice. Ratooning of the crop will ensure regular supply of income to the island farmers and sufficient produce will be available to meet the demands from local islanders. This model is now being developed in an arecanut garden at ICAR-CIARI, Port Blair on experimental basis to test the feasibility. The prospects of the crop could be further increased if it is promoted by the tourism sector in sale as well as use in unique food preparations which will increase the consumption levels and demand. In a nutshell, woody pepper could be promoted as a profitable crop for the backyard and commercial scale cultivation in the arecanut plantations of the islands.

Table 1: Proposed model for systematic cultivation of woody pepper as an intercrop in arecanut

Area proposed for expansion	Arecanut gardens of hilly uplands
No. of plants per acre	550
System of planting the vines	Staggered planting of 110 vines/ year (for 5 years)
Expected yield per vine (5 years old)	10 kg
Projected yield/ acre/ year (after 5 years)	1.1 t
Selling price of produce (fresh)	Rs. 250/- per kg
Additional income per acre/ year	Rs. 2,75,000/-

Qualitative phytochemical analysis of the stem powder suggested presence of tested phytochemicals in variable proportions depending on the solvent employed (Table 2). High proportions of carbohydrates were observed in ethanolic extract using Molish and Benedict's tests, while very high levels in Methanolic extract using Benedict's test. Using Fehling's test, low carbohydrates were detected in all the extracts studied. No carbohydrates were detected in aqueous extract when tested using Molish test. Presence of glycosides in tested extracts was of the order: aqueous > acetone > ethanol > methanol. Low levels of tannins and phenolic compounds were detected in all the extracts using catechin and ferric chloride tests, respectively.

Very high proportions of alkaloids and phenolic compounds (gelatin test) were noticed in the aqueous extracts. Piperine is the dominant alkaloid in most of *Piper* species and hence, stem of this species could also contain this compound, which is known to impart the spicy taste. Flavonoids were in high proportion in ethanolic extract, while acetone extract did not show any traces of it. Irrespective of the solvents used, amino acids, proteins and saponins were not detected in the sample. *Piper* species are known to have considerable medicinal and antimicrobial properties owing to presence of bioactive compounds (Salehi *et al.*, 2019; Chinthamani *et al.*, 2020). Volatile oil in higher proportions was detected in acetone extracts. As acetone is a common solvent for recovery of oleoresins from spices (Singh *et al.*, 2007),

such results are justified. This preliminary information could help the researchers to carry out detailed studies in future.

Standardization of efficient propagation techniques, suitability of different soil types, growth and development under different canopy levels, water and nutrient requirements, occurrence of pests and diseases, harvesting and storage studies, biochemical estimation of

the economic products and quality aspects are suggested as the future line of works for full scale commercial exploitation of this vine crop under plantation based cropping systems of islands. Some of these works are in progress at ICAR- Central Island Agricultural research Institute, Port Blair. Simultaneous feasibility studies in other arecanut growing areas would help in hastening the process of information generation and further promotion of this spice as a suitable intercrop in more areas.

Table 2: Qualitative phytochemical analysis in dehydrated stem powder of woody pepper extracted using different solvents

Constituents	Test performed	Aqueous	Ethanol	Methanol	Acetone
Carbohydrates	Molish test	-	+++	++	+
	Fehling's test	+	+	+	+
	Benedict's test	+	+++	++++	++
Glycosides	Keller-Kiliani test	++++	++	+	+++
Tannins	Catechin test	+	+	+	+
Alkaloids	Wagner's test	++++	++	+	+++
Amino acids	Ninhydrin test	-	-	-	-
Phenolic compounds	Ferric chloride test	+	+	+	+
	Gelatine test	++++	-	+++	-
Proteins	Million's test	-	-	-	-
Volatile oil	Sudan III test	-	++	+	+++
Saponins	Foam test	-	-	-	-
Flavonoids	Alkaline reagent test	+	+++	++	-

-. Nil, +: low, ++: medium, +++: high, ++++: very high

It could be concluded from these findings that, woody pepper could be promoted as a potential intercrop in the existing arecanut gardens of Andaman and Nicobar Islands.

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