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Growing black pepper high-tech way

Traditionally, ground runners produced from basal nodes of disease-free, stable yielding black pepper plant are collected after pre-monsoon showers and planted directly in field at a distance of 30 cm away from the support. In some countries, farmers use top shoots (orthotrope) for establishing plantation as it has advantage of producing lateral branch from basal portion of support. The success of establishment of directly field planted cuttings depends on prevailing climatic conditions. The success rate of establishment in the main field can be enhanced by planting rooted cuttings. For which, runners are cut into two or three node cuttings and kept for rooting in the nursery. On its establishment, rooted cuttings are transplanted in the main field. In traditional method, only limited numbers of cutting could be made and success rate is less. The sprouting success can be increased by treating it with growth hormones and keeping in low cost humid chambers.

BLACK pepper (*Piper nigrum*), popularly called as 'king of spices', is cultivated in more than 25 countries. It is cultivated in 5,39,688 ha with total production of 4,61,452 tonnes in the world (2012). Brazil, China, India, Indonesia, Madagascar, Malaysia, Thailand, Sri Lanka and Vietnam are major producers. Vietnam is leading producer. India's share in area is 34.3% and in production only 11.7% of the world. In 2012-13, India exported 15,363 tonnes of pepper to more than 33 countries. In India, Kerala, Karnataka, Tamil Nadu, Asom, Meghalaya, Goa and Tripura are producing black pepper, Maharashtra, Orissa, Andhra Pradesh, West Bengal, Andaman and Nicobar Islands and other North-Eastern states are also having small acreage.

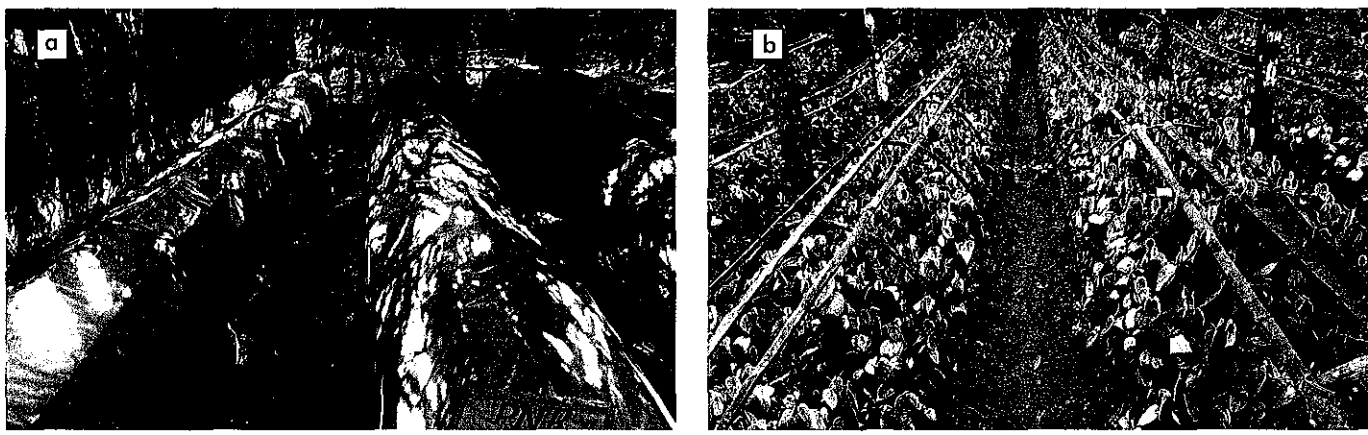
Major producers are Kerala, Karnataka and Tamil Nadu. India was the leader for several years in black pepper production, due to several reasons now it is trailing. Government of India and state Governments have initiated many programmes to augment its production for addressing production constraints, especially on planting material availability.

Black pepper is usually propagated by cuttings. Propagation through seeds is practised only in breeding programmes. Seedlings take much longer to come to bearing than cuttings or layers and show genetic segregation. The availability of quality planting material assumes paramount importance either for area expansion or replanting programmes. Therefore, new methods have been discovered. They are:

CULTIVATION

Rapid Multiplication

To meet the large-scale demand, a rapid method has been developed and popularized. Levelled area having good drainage is essential for establishing rapid multiplication nursery. The semi-permanent shed (24 m × 6 m) with overhead shade using 50% shade net or white polythene sheet for roofing is needed. Four trenches of 30 cm wide, 45 cm deep along the length of nursery-shed are made and filled with soil, sand and farmyard manure (1:1:1) proportion. Bamboos of 8-10



Rooted cutting production in traditional method raised from runner shoots: *(a)* stem cuttings covered with polythene sheet, *(b)* rooted cuttings ready for planting

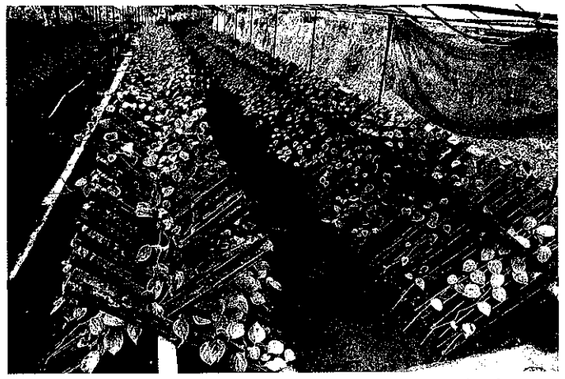
Table 1 Area (ha) and production (tonnes) of black pepper in India

State	2008-09		2009-10		2010-11 (P)		2011-12 (P)	
	Area	Production	Area	Production	Area	Production	Area	Production
Karnataka	18,847	6,236	19,706	15,000	21,061	18,240	21,061	16,000
Kerala	153,711	33,991	171,489	27,500	172,182	20,640	172,182	16,500
Tamil Nadu	3,117	716	2,786	7,500	3,009	9,120	3,009	10,500
Total	181,299	50,000	198,986	50,000	201,381	48,000	201,381	43,000

Source: Spices Board, Cochin

cm diameter is selected and cut into 1.25-1.50 m long pieces and split into halves keeping the septa intact.

Coal tar is smeared to prolong life of bamboo splits. The split bamboos are arranged at an angle of 45°C alternatively either side on straight wooden poles or strong supports fixed on small supports from ground and tied each other with coir rope at the free end. Rooted cuttings are planted in trench, one for each bamboo split. As the cuttings start growing, bamboo filled with rooting mixture composed of farmyard manure, coir dust and sand in equal proportions. Each tender node is carefully tied to bamboo using banana fibre, so that every node is in contact with rooting medium. For rapid growth, daily irrigation through rose can is essential or with sprinklers.



Rapid multiplication through 'bamboo method'

Nutrient solution consisting of urea (1 kg), superphosphate (0.75 kg), muriate of potash (0.5 kg) and magnesium sulphate (0.25 kg) in 250 litres of water prepared and drenched each vine once in a month with 250 ml of this solution for better growth. When the vines reach to top of bamboo, the tip nipped off and crushed the vine at the base of 3rd or 4th node from the ground, to activate the buds. After 7-10 days, the vines are cut at the crushed point and removed from the bamboo with the roots intact and with the adhering soil. The cut vines are separated into single nodded pieces. Plant each cutting in a polythene bag or pro-trays filled with fortified potting mixture consisting of soil, sand and farmyard manure (1:1:1) or solarized soil enriched with biocontrol agents.

After planting in the bamboo, the first harvest of cuttings can be done after 3-3½ months and the subsequent harvest at every 2½–3 months. Each rooted vine can give about 10 cutting in one harvest and about 40 cuttings are obtained in a year. Multiplication rate is 1:40. A shed of 24 m × 6 m would accommodate 600 bamboo splits. On an average 20,000 cuttings can be produced annually by this method. The method is thus advantageous for producing a large number of rooted cuttings within a short period. The cuttings are also vigorous with good root system leading to more than 90% establishment in the field.

Serpentine Method

Another novel propagation technique in black pepper planting material production is the 'serpentine method'. Here, rooted cuttings with 4-5 leaves planted in polythene bags are arranged on ground lengthwise on either side of the nursery shed. The cuttings are trailed horizontally, as and when it grows, below each node polythene bags are kept with potting mixture and shoot is pressed into the mixture with 'V' shaped midribs of coconut leaves. Once twenty nodes get rooted in the bag, first 10 nodes with leave are cut individually at the inter nodes.

Serpentine method of nursery

Fixing node with potting mixture

The cut end are pushed back into the potting mixture. The cut end also produces new roots and cuttings with 4–5 leaves would be ready after three months for field planting. On an average 60 cuttings could be obtained in a year by this method. Serpentine method is simple, cheap and quick, and suited to small and marginal farmers. Recovery percentage is higher compared to rapid multiplication technique and no initial cost of making trench and purchase of bamboo.

Modified Serpentine Method

Further study revealed that allowing the vine to creep on the bed made of suitable potting mixture (we used composted coir pith and vermicompost) to the height of 10-15 cm at 1.5-2.0 m width and convenient length. The bed is treated with biocontrol agent *Trichoderma.* Here, vines are allowed to strike root and when it reaches the end of the bed, entire strip is harvested and each node with a leaf and root are separated individually and planted in protray or ploybags for further establishment. The separation of each node could be done when the entire vine is trailing on

Modified serpentine method *(a)* and rooted cuttings in pro-tray *(b)*

the bed. After a week when the bud is activated, it can be taken out and planted in portrays.

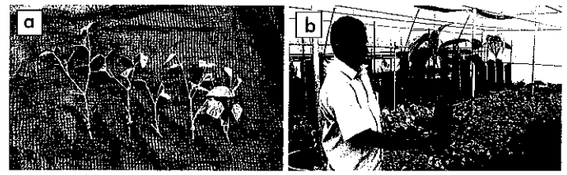
Vertical Column Method

The continuous demand for quality planting material created a novel idea of producing orthotrope on vertical 2m column having one feet diameter made with half an inch plastic coated welded wire mesh filled with composted pasteurised cocopeat and vermicompost in a 3:1 ratio fortified with biocontrol agent *Trichoderma harzianum* in hi-tech polyhouse of fan and pad system maintaining temperature of 25-28°C and relative humidity 75%-80% with misting units. Eight to ten cuttings can be planted around the each vertical column. The cuttings are allowed to trail on the column and it take four to five months to reach the top and produce more than 20 nodes.

Each vine invariably produce lateral reproductive branches within four to five months time at 12th–15th node, whereas vines allowed to grow horizontally on the bed with same medium also produce similar number of nodes but do not have lateral fruit bearing branch. The top 5-7 nodes have lateral branches also.

Growing the vine on vertical column can be effectively utilized for the production of three types of planting material, i.e. single node cuttings, top shoots with lateral branch (use

Black pepper on vertical column *(a)* and with lateral branch *(b)*



Bush pepper, *(a)* laterals harvested from vertical column; *(b)* rooted bush pepper

of top shoots for field planting is having advantage of producing fruit bearing branch from the base of the support and start yielding early) and reproductive branch (laterals or plagiotropes) which can be used for production of bush pepper kept in the house or gardens. In four to five months time, on an average 150 single nodes (15 cuttings per vine ×10 vines around the vertical column) per column, one or two laterals and 10 top shoots can be harvested. In a polyhouse size of 320 (20 m×16 m), one can accommodate 300 such columns. In a year, three harvests can be made. These cuttings can be rooted further for field planting using protrays. The advantage of vertical column method is one can get three types of cuttings, viz. normal single node cutting, laterals and top shoots.

Grown-up bush pepper

Growing black pepper plants on columns makes the cling roots also take up the role of absorption and the rate of growth is enhanced. Since it is in the polyhouse with misting to control temperature and humidity growth is fast in hot humid climate. The misting units switched on periodically gives adequate moisture and separate irrigation is avoided. As the lateral production undertaken in column after about 10 nodes, one produce three types of planting material. Each column can give 10 orthortropic shoots of 5 nodes each; 20-30 lateral branches that can be made into bush pepper and 100-120 single node cuttings in four months time. As the process is repeated one can harvest minimum of three cycles or maximum of four cycles. The lateral cuttings needed for bush pepper can be developed without sacrificing fruiting laterals from the field and the nursery itself laterals can be produced. This rapid method of production of single node cuttings has evolved from bamboo to serpentine to column methods. Vertical column are faster and efficient as it produces three types of cuttings.

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