

# *Black Pepper*

Piper Nigrum

Family- Piperaceae



Black pepper is a vine from the Piperaceae family. It is one of the mostly traded spices in the world thus name "The King of Spices".

Black pepper plant is a well-known spice plant that it is widely used for its spicy flavour in seasoning and flavouring cuisines all across the globe.

## **Components in black pepper and its uses**

Black pepper has a range of therapeutic potential against various disorders. Black pepper aids in stimulating digestion, relieves cough and cold and aids in weight loss, etc. These health effects are due to the chemical constituents present in the pepper. The most well-known component is piperine. Others include vitamins (A & K), essential oils, polyphenols and so on.

## **VARIETIES :**

Panniyur-1, Panniyur-2

## **CLIMATE :-**

Pepper is a plant of humid tropical climate. An annual rainfall of about 250cms. is required for its proper growth and successful cultivation. It tolerates a minimum of 10°C and a maximum of 40°C. Although pepper can be grown from almost sea level to an altitude of 1,200 meters, lower elevation may be preferable.

**SOIL :-**

Pepper can be grown in clay loams, red loams and sandy loams. However, it thrives best on well drained virgin soil rich in humus content and other plant nutrients.

**SELECTION OF SITE :-**

Sites with slight to moderate slope are ideal for pepper cultivation, as they promote drainage. Slopes facing south are to be avoided as far as possible. When such slopes are to be used for cultivation, the young plants may be sufficiently protected from the scorching sun during summer.

**SELECTION OF MOTHER PLANTS :-**

Cultivate varieties, which are proven to be highly productive. Select mother plants, which give regularly high yields and possess other desirable attributes such as vigorous growth, maximum number of spikes per unit area, long spikes, close setting of berries, disease tolerance, etc. selected mother plants should be in the age group of 5-12 years. Mark and label selected mother plants on October-November.

**RAISING OF ROOTED CUTTINGS :-**

Pepper is propagated vegetatively from cuttings. Select runner shoots produced at the base of mother plants and keep them coiled and raised to prevent from striking roots in the soil. Separate them from the vines in February-March. The middle one-third portion of runner shoot is preferred for planting. Very tender and too hard portions of the shoots are to be avoided. The shoots are cut into pieces with 2-3 nodes in each. Two node semi-hardwood cuttings are to be planted for rooting of pepper cuttings. Leaves, if any are to be clipped off leaving a small portion of the petioles on the stem. Satisfactory rooting and survival of cuttings (over 70%) could be achieved even without any hormone treatment. Plant the cuttings in polythene bags filled with potting mixture. The potting mixture is prepared by mixing two parts of fertile topsoil, one part of river sand and one part of well rotten cattle manure. When polythene bags are used, sufficient number of holes (16-20) may be provided at the base to ensure good drainage. The cuttings should be planted at least one node deep in the soil. The cutting after planting should be kept under good shade to protect them from direct sunlight. In large nurseries, pandals are to be constructed for this purpose. Watering 2-4 times a day is sufficient.

**SERPENTINE METHOD OF PROPAGATION :-**

Three node cuttings planted in polythene bags are kept in a corner of the nursery. When the plant develops two leaves, they are trailed horizontally in polythene bags containing potting mixture kept below each tender node. Each node will be pressed into the mixture with polythene bags. As new shoots arise these will be trailed horizontally in polythene bags containing potting mixture. Upward growth of cutting is not arrested. Once twenty nodes get rooted, first 10 bags in the rooted nodes will be separated by cutting at the inter nodes. The inter nodal stub will be pushed back into the potting mixture. These

stubs also produce a second root system. Daily irrigation is to given using a rose can. After three months, it will be ready for planting in the main field. On an average, 60 cuttings will be obtained in a year by this method from each mother cutting. This is recommended in black pepper nurseries for large scale multiplication.

#### **FIELD PLANTING:-**

- ❖ The pepper plant is a climber and hence it needs support of some other plant (called standard) to climb. Many of the existing trees in a garden such as arecanut, coconut, jackfruit, mango and other forest trees such as Indian Coral tree (*Erythrina indica*) and Silver Oak (*Grevillea robusta*) can be used as standards.
- ❖ For planting pepper, prepare pits on the northern side of standards, 15 cm away from it. The pit size should 50cm\*50cm\*50cm. Fill the pits with a mixture of topsoil and compost or well rotten cattle manure @ 5kg per pit.
- ❖ With the onset of monsoon, plant 2 rooted cuttings in the pits at a distance of about 30cm away from the standards. Press the soil around the cuttings and form a small mound sloping outward and away from the cuttings to prevent water stagnation around the plants. The growing portions of the cuttings are to be trailed and tied to the standards.

#### **MANAGEMENT AFTER PLANTING :-**

Rooted cuttings are to be tied up to the standard as and when required till the vines get established firmly on the standard. Carry out digging around the standards and vines at a radius of about 1m from the base once in the months of August - September and another in the months of October- November. Weeding around the plants is to be done according to necessity. Prune and train the standards in March-April every year to remove excessive overgrowth and to give them a proper shape. The effective height of the standard is to be limited to about 6m.

- ❖ Intercropping of pepper gardens with ginger, turmeric, colocasia and elephant foot yam is advantageous. Banana as an intercrop in yielding gardens reduces pepper yields. Therefore, this is not recommended beyond three to four years after planting of pepper vines. However, in the early years, banana provides shade to the young plants and protects them from drying up during summer months.

#### **MANURING :-**

Manuring for pepper vines is to be done in basins taken around the plant, 0-15 cm deep and 50-75 cm radius, depending upon the growth of the plants. Apply cattle manure/compost/green leaves @10 kg/plant/annum just at the onset of monsoon and cover lightly with soil. It is desirable to apply lime at the rate of 500g/vine in April-May, with the receipt of pre-monsoon showers, in alternate years.

#### **DISEASES OF BLACK PEPPER AND THEIR CONTROL :-**

Among the diseases reported on black pepper, blight, root rot and basal wilt in the nursery; foot rot, slow decline and anthracnose in the field are important.

## **DISEASES IN PLANTATIONS -**

### **1. Anthracnose /Pollu disease**

Causal Organism - **Colletotrichum gloeosporoides**

#### **Symptoms -**

The fungus affects leaves, spikes and berries. It can be distinguished from the "pollu" (hollow berry) caused by the flea beetle by the presence of the characteristic cracks on the infected berries. On young leaves and spikes it appears as small brown specks surrounded by a yellow halo. In severe form, defoliation and spike shedding occurs. Cracks develop on the berries due to infection by the fungus, thus reducing the quality of the produce besides damaging the berry.

### **2. Foot rot/Quick wilt**

Causal Organism - **Phytophthora capsici**

#### **Symptoms -**

The fungus infects all parts of the vine. The severity of the disease depends upon the plant part affected and the extent of damage. If the collar of the vine is affected the vine is killed within a few days and hence the term quick wilt. However, if the infection is confined to feeder roots, it leads to slow decline as long as the soil moisture remains high.

- One or more black spots appear on the leaves which have a characteristic fine fibre like projections at the advancing margins of the spots which rapidly enlarge and cause defoliation.
- The tender leaves and succulent shoot tips of freshly emerging runner shoots trailing on the soil turn black when infected. The disease spreads vertically to the entire vine, from these infected runner shoots and leaves, during intermittent showers due to rain splash.
- If the main stem at the ground level or the collar is damaged, the entire vine wilts followed by shedding of leaves and spikes with or without any black spots on leaves or tender stem. The branches of the affected vines break off at the nodes and the entire vine collapses within a month.

## **INTEGRATED DISEASE MANAGEMENT :-**

The following are the management strategies suggested for major diseases of black pepper.

#### **Phytosanitation -**

Reduction of initial inoculums and removing the source of inoculums are important steps in disease management. Vines killed due to foot rot or vines showing decline

symptoms must be uprooted and burned. Foot rot incidence is found to cluster around previously infected vines.

Hence reduction of initial source of inoculums is one of the important steps in disease management.

### **Cultural practices -**

Minimum tillage: *P. capsici* spreads through soil water and soil splashes. Presence of grass cover prevents splashing of soil containing the pathogen. It is suggested to keep the soil around the basin covered with mulch and have a grass cover in the interspaces to prevent the rapid spread of inoculum. A legume crop cover in the plantation should be ensured. Minimum tillage is an essential component of cultural practices.

### **Organic amendments -**

Soil amendments like neem cake, farm yard manure etc. favour the growth of antagonistic micro organisms and reduce pathogen build up. Neem oil cake application has a dual role as it suppresses nematodes and Phytophthora, supporting saprophytic growth of antagonistic micro flora, besides acting as a nutrient source for the vines.

Drench the soil with any of the formulations twice in a year (May-June and October-November)

- Neem cake ½ kg per vine up to 1m from the ground level
- Trichoderma viride@20g/vine + FYM @ 2g/lit

### **DISEASE MANAGEMENT STRATEGY FOR NURSERIES -**

Since healthy planting material is a pre-requisite to raise a healthy plantation, production of healthy material is imperative.

- *P. capsici* and nematodes are soil inhabitants. The soil must first be made healthy by soil solarisation. The method is simple and environmentally safe. After preparing the mixture it is moistened and covered with clear transparent polythene sheets and left in the sun. The temperature trapped inside kills all the organisms. After a month the mixture is used for raising cuttings.
- For the control of rotting disease of cuttings in the nursery, apply Trichoderma viride @ 1g/kg of pot mixture. Mulch the pot mixture with 150 gauge polythene sheet for 30 days and inoculate with Pseudomonas.

### **PESTS OF BLACK PEPPER AND THEIR CONTROL -**

#### 1. Scale insects-

- Scale insects appear as encrustations on stems, leaves and berries
- They feed on plant sap resulting in yellowing and drying of infested portions of the vines

## **CONTROL -**

- Removal of weeds
- Deep ploughing in the summer or raking the soil in vineyards help to destroy its nymphal stages and minimizing the incidence
- In nurseries, spraying neem oil 0.3% (or 3ml per litre of water) is also effective in controlling the pest infestation

## **2. Leaf gall thrips-**

- Infestation by leaf gall thrips is more serious at higher altitudes, especially in younger vines and also in nurseries
- The feeding of thrips on tender leaves causes the leaf margins to curl down and inwards resulting in the formation of marginal leaf galls
- The infested leaves become thick, malformed and crinkled

## **CONTROL-**

- Blue sticky traps: Set up blue pan traps 15 cm above the canopy for monitoring thrips @ 4-10 traps (15 X 7.5 cm)/acre. Locally available empty tins can be painted blue/coated with grease/Vaseline/castor oil on outer surface may also be used as blue pan trap. Count the number of thrips on the traps daily and take the appropriate decision regarding management practices
- Light traps: Set up light traps 1 trap/acre 15 cm above the crop canopy for monitoring and mass trapping of insects. Light traps with exit option for natural enemies of smaller size should be installed and operate around the dusk time (6 pm to 10 pm).
- Regulation of shade in the plantation reduces the population of the pest in the field
- Spraying neem gold 0.6% or 6ml per litre of water(neem based insecticide) during August, September and October is effective for the management of the pest. The underside of the leaves and spikes are to be sprayed thoroughly

## **3. Top shoot borer -**

- The top shoot borer is found more in younger plantations
- The caterpillars of the moth bore into tender shoots which turn black and dry up
- When successive new shoots are attacked, the growth of the vine is affected
- The pest infestation is higher during July-November when numerous new shoots are available on the vines.

## **CONTROL -**

- Spraying neem gold 0.6% (6ml per litre of water) (neem based insecticide) during August, September and October is effective for the management of the pest. The underside of the leaves and spikes are to be sprayed thoroughly.

## **ECOLOGICAL ENGINEERING FOR PEST MANAGEMENT**

Ecological engineering for pest management has recently emerged as a paradigm for considering pest management approaches that rely on the use of cultural techniques to effect habitat manipulation and to enhance biological control. The cultural practices are informed by ecological knowledge rather than on high technology approaches such as synthetic pesticides and genetically engineered crops. Natural enemies may require:

1. Food in the form of pollen and nectar for adult natural enemies.
2. Shelter such as overwintering sites, moderate microclimate etc.
3. Natural enemies may also require alternate host when primary host are not present.

### **Ecological engineering for pest management – Above ground:**

- Raise the flowering plants / compatible cash crops along the vineyard border by arranging shorter plants towards main crop and taller plants towards the border to attract natural enemies as well as to avoid immigrating pest population
- Grow flowering plants on the internal bunds inside the vineyard
- Not to uproot weed plants those are growing naturally like *Ageratum* sp, *Alternanthera* sp, which act as nectar source for natural enemies,
- Not to apply broad spectrum chemical pesticides.

### **Ecological engineering for pest management – Below ground:**

- Keep soils covered year-round with living vegetation and/or crop residue
- Add organic matter in the form of Farm yard manure (FYM), vermicompost, crop residue which enhance below ground biodiversity
- Reduce tillage intensity so that hibernating natural enemies can be saved
- Apply balanced dose of nutrients using biofertilizers.
- Apply mycorrhiza and plant growth promoting rhizobacteria (PGPR)
- Apply *Trichoderma viride/harzianum* and *Pseudomonas fluorescens* as seed/ cutting, and soil application (If Commercial products are used, check for label claim. However, biopesticides produced by farmers for own consumption in their fields, registration is not required).

### **List of attractant plants :-**

1. *Ageratum*
2. Carrot
3. Sunflower
4. Buckwheat
5. French bean
6. Alfalfa

7. Mustard
8. Cosmos
9. Anise
10. Chrysanthemum
11. Cowpea
12. Peppermint

The flowering plants suggested under Ecological Engineering for pest management strategy are known as attractant plants to the natural enemies of the selected pests.

Due to enhancement of biodiversity by the flowering plants, parasitoids and predators (natural enemies) number also will increase due to availability of nectar, pollen, fruits, insects, etc. The major predators are a wide variety of spiders, ladybird beetles, long horned grasshoppers, Chrysoperla, earwigs, etc.

#### **HARVESTING:-**

Black pepper berries will be ready for picking 6 to 7 months after planting. The harvesting season is from November to March. Harvest is done by hand picking the whole spikes when few berries in the spike start turning red. The berries are separated and dipped in hot water (80°C) for one minute and sun dried for 7 to 10 days.

#### **YIELD :-**

About 2 to 3kg of berries/vine/year or 275 kg per hectare in India. Yield again depends on the variety cultivated and crop management practices.

