

# **Guidelines for Recognition of Spices Nursery**

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# **Guidelines for Establishment and Management of Spices Nurseries**

(For raising high quality planting materials of Spices)

## **1. Introduction**

The Directorate of Arecanut and Spices Development (DASD) has the mandate for development of spices in the country. For the successful cultivation of spices, quality of planting material plays an important role. At present the planting material requirement is met by nurseries established under State Department of Horticulture/Agriculture, the State Agriculture Universities (SAUs) and ICAR Institutes. However, these nurseries in public domain provide only 30-40% of the demand for planting material. The major part of the demand is met by the unregulated private nurseries, which lacks modern infrastructure such as green house, mist chamber, efficient nursery tools and gadget, implements and machinery. Establishment of a network of Spice Nursery to ensure the availability of good quality, disease free, certified planting material of desired high yielding variety will have a tremendous impact on production, productivity and quality of the spices produced. This is particularly so in perennial spice crops which have a long gestation period and its production potential is revealed only in later stages.

A good Nursery has three important aspects to look into: a) the Nursery Infrastructure; b) Production System and Quality Parameter of Planting Material adopted; and c) Adoption of Good Nursery Management Practices. The National Horticulture Mission (NHM) has specified the infrastructure required for setting up of Model Horticulture Nursery. The “Handbook of Seed and Planting Material Testing Manual for Horticultural Crops” published by ICAR, provides technical specification for planting material in spices and its production procedure. The existing Rules framed under Horticulture Nursery (Regulation) Acts, provide for record keeping part for such nurseries.

With these three aspects put together, a Model Nursery can be defined in terms of Nursery Infrastructure, Production System and Quality Parameter of Planting Material and Good Nursery Management Practices in a Comprehensive Manner.

The Department of Agriculture & Cooperation (DAC), Government of India, has entrusted the DASD to put in place a Nursery Recognition Regime for Spices so that a network of recognized Model Nursery is established across the Nation which could function as a reliable source of supply of quality planting materials for spice crops.

## **2. Scope**

The scope of this scheme is to establish a network of quality nurseries across the country for the purpose of propagation and distribution of quality planting materials of Spice crops.

2.1 The recognition shall be accorded to the nurseries for:

a. Production of quality planting material of one or more specified spices crops by adopting Good Nursery Management Practices,

b. Nursery Premise only where sale of specified quality planting material of recognized source are being carried out by creating necessary infrastructure facilities and proper record keeping.

**Note:** If different premises are being used for nursery, recognition of all these are required to be obtained separately and individually.

2.2. The recognition shall be accorded to the nurseries for the crops specified in the Document of recognition.

2.3. Recognition shall be granted as such or after upgradation as per requirement.

2.4. Nursery Farms licensed under State Act by Competent Authority shall be given Provisional Recognition for a period of one year under the purview of this scheme but their Final Recognition will be subject to assessment by Technical committee.

2.5. Recognition of Nursery with DASD shall be period specific.

### **3. Procedure for recognition**

The spices nursery seeking DASD Recognition shall apply in Form- I attached to this guideline.

Each such application shall be accompanied by following details:

- a. Lay out of Nursery showing location of infrastructure components and land utilization plan.
- b. Details of technically qualified staff in the nursery.
- c. Major farm machineries and equipments in use.
- d. Operational Manual of procedures followed for selection and maintenance of mother plants, nursery production techniques and management of planting materials.
- e. Details regarding source of Mother Plants used for propagation of each spice crops.
- f. Processing fee @ Rs.3,000/- in the form of a Demand Draft in favour of Pay and Accounts Officer, Department of Agriculture & Cooperation payable at Kochi is also to be enclosed along with the application. No processing fee is required for State/Central Government Institutes.

The nurseries should also maintain separate registers for production (stock), sale of seedlings and attendance of staff. Duly filled applications with processing fee in the form of a demand draft should be submitted to the Director, Directorate of Arecanut and Spices Development, Calicut 673 005. Each application will be considered by DASD based on criteria specified for recognition of nursery. The recognition of nursery by DASD shall generally be considered product wise/aspect wise as required.

On receipt of the application for recognition, inspection and assessment will be done by the Technical Committee appointed by DASD. On the basis of this assessment report recognition will be given. The decision of DASD shall be conveyed to the concerned nursery. In case of recognition, the period of validity of recognition with other terms and conditions shall be indicated. In case of any deficiency, the nursery shall be given time frame for compliance; failing which, the application shall be rejected. In case of requirement, additional assessment visits may be undertaken.

#### **4. Assessment committee**

DASD shall nominate one Assessment Committee with a Consultant as head, which may have Representatives from:

- i. State Agricultural University in the State concerned
- ii. Apex Horticulture Institute, NRC or Regional Station of ICAR
- iii. Nursery Men Association
- iv. DASD
- v. State Directorate of Horticulture/ Agriculture

Assessment Committee shall conduct pre-assessment, final assessment and periodic / surveillance of the nurseries. The committee shall submit report and their recommendations to DASD.

#### **5. Assessment Criteria**

The criteria have been aligned with Infrastructural requirement of Model Nursery and Product specific technical requirement and adoption of Good Nursery Practices for propagation of good quality planting materials as detailed below:

- a) Product specific criteria to assess for capability and competence of nursery to follow technical programme for specific spice crop as laid down in "Handbook of Seed and Planting Material Testing Manual for Horticulture Crops" prepared by ICAR.
- b) Prescribed Nursery Management Practices and Adoption of Model layout plan.

The assessment will be based on the continuous evaluation of source of parent material, propagation in disease free condition by adoption of technically prescribed method, adoption of Good Nursery Management Practices, reliable record keeping and training of staff. Each parameter will be critically examined by assessment team as per laid down criteria.

## **6. Procedures for application to higher grade**

On receipt of an application for recognition, to higher grade from existing lower grade, the application will be considered to register the nursery, for fresh assessment. On the basis of the report submitted and the recommendations of the pre-assessment of the Committee, the Competent Authority will decide on the need to proceed with processing the case of the nursery for upgradation and subsequent recognition or otherwise.

## **7. Validity period of recognition**

In case of approval, initially, recognition shall be granted for a period of two years. The effective date of recognition shall be considered from the date of issuance of certificate.

## **8. Surveillance / monitoring**

Surveillance visit shall be carried out at least once in a year or as and when required depending on the performance of the nursery. The assessment team will conduct surveillance visit during validity of recognition.

## **9. Issue of recognition certificate**

In case, Technical Committee satisfies that the Nursery conforms to the requirements of this recognition, it will recommend for recognition of the nursery. The recognition shall bear an identification number. The Recognized Nursery shall have to sign a Memorandum of Understanding (MoU) with DASD for terms and conditions of recognition. Any change in the location, layout, design or capacity of the nursery shall be intimated to DASD. The date of validity of the nursery recognition shall be specified on the recognition certificate. The recognition certificate once issued shall continue to be in force till the date specified in the certificate unless suspended or cancelled at earlier date by Competent Authority. The issuing Authority may institute surprise checks through its officers in order to ensure that the nursery has maintained the standard as required for issue of the recognition certificate.

## **10. Renewal of recognition**

The Nursery seeking renewal of recognition shall apply in prescribed form. The renewal of recognition shall be done based on the satisfactory performance reported as per the surveillance/ periodic inspection carried out during the validity period and fresh assessment if felt necessary by the Directorate (DASD). A processing fee of Rs.1000/- is required for nurseries accredited by DASD.

## **11. Refusal/cancellation of nursery recognition**

Issue of recognition certificate may be refused or, if issued, may be cancelled or suspended.

- i. If the nursery does not conform/fail to perform as per requirements of this scheme.
- ii. If there are adverse reports from the farmers/users or any other complaints made to DASD by any other entity and upon enquiry duly conducted it is established that the Nursery has breached any of the conditions of recognition.
- iii. On expiry of the recognition date specified in the Recognition Certificate the recognition ceases to be valid unless renewed.

## **12. Appeal against refusal / cancellation of recognition**

Appeal against refusal/cancellation of recognition should reach to the Director, DASD within 30 days from the receipt of such order. In case of cancellation of recognition, the appeal shall accompany the original certificate. Director, DASD will consider the application on merit, and in case, found necessary, order re-assessment of the nursery.

## General Guidelines for nursery Production

### 1. Establishment of nursery

The nursery area should be selected at a place linked with road, having assured water source

#### Different features of a model nursery

**Mother block:** - with elite plants of recommended varieties closely planted and managed for regular supply of scion shoots / shoots for propagation. Trees showing consistently good performance over a period of time should be mother plants need to be established by grafting/budding on appropriate rootstock at a spacing of 3-4 m. After establishment and initiation of bearing, these plants are severely pruned to keep them in vegetative phase for getting enough vigorous scion shoots. These plants are maintained carefully for remaining healthy and free of pest and diseases.

**Seed garden:** - Trees of local /recommended varieties of various crops are grown in a block / boundaries to act as a source for regular supply of seeds for raising rootstock seedlings.

**Poly house:** - A structure created with the help of polyethylene sheets with humidity and temperature control mechanism primarily used for keeping freshly grafted/budded plants so as to get early union and high success rate.

**Shade net:** - Simple structure stretched for providing partial shade to mother plants and for keeping young plants for hardening.

**Net house:** - Insect proof structure stretched over mother plants to avoid insect attack and viral contamination

**Wind break:** - A group of fast growing fruit and forest plants raised along the boundaries of the field. Such grown up trees can minimize the wind velocity and reduce level of harshness during the extreme conditions of high and low temperature.

### 2. Preparation of media and containerization

Root media /potting mixture has most important role in multiplication of healthy and disease free plants.

**Composition of root media** - Soil :Sand: Cow dung manure: Coco peat @ 1:1:1:1

#### Root media sterilization:

Soil Solarisation/Chemical solarisation can be done to make the media free from contamination.



### Containerisation:

Plastic pots / polybags of appropriate size are to be used. Root trainers of proper size are well suited in air layering and cuttings.

### 3. Propagation techniques:

Number of propagation techniques have been standardized in various Spices. Runners are multiplied through serpentine layering, rapid multiplication method etc in black pepper. Orthotropic/ plagiotropic shoots are grafted in nutmeg plants. Ginger and Turmeric is multiplied through rhizomes and tillers are used in cardamom. Some tree spices are multiplied through seedlings.

### 4. Promising varieties of Major Spices:

| S.No | Crop         | Popular / Released variety  |
|------|--------------|---|
| 1    | Black pepper | Panniyur 1 to panniyur 8, IISR Thevam , IISR Sakthi, Sreekara, Subhakara, Karimunda , Kottanadan  |
| 2    | Cardamom     | Njallani, ICRI 1 to 4, IISR Avinash, IISR Vijetha   |
| 3    | Ginger       | Himachal, Gorubathan, Maran , Nadia , Rio-de-Janeiro, Suprabha,Varada                             |
| 4    | Turmeric     | BSR 1&2, Rajendra Sonia, Lakhadong, Erode local, Salem local, Prabha, Parathibha, Roma, Duggirala |
| 5    | Nutmeg       | Konkan Sugandha, Konkan Swad, IISR Viswasree, IIR Kera sree                                       |
| 6    | Cinnamon     | Konkan Tej, Sugandhini, IISR Nithyasree   |

### 5. Sanitation and quality of planting material

- The mother block needs to be kept disease free especially for virus infection and quick rot in black pepper.
- rootstocks used should be vigorous, healthy seedlings free from any infection.
- Scions should be selected from *elite* mother plants at right maturity.
- The tools used (grafting knife/blade etc) must be sterilized before and after use and a footbath having powdered CuSO<sub>4</sub> must be kept at the entrance of the nursery/ green house/poly house.
- Potting mixture/media should be sterilized before use.
- Finally the plants must be healthy and free from pest and diseases

## **Good nursery practices for production of quality planting material**

### **Preliminary considerations:**

There are several key steps to initiate a quality control programme for planting material production. The first step would be to;

1. Identify the potential for planting material production and set realistic production targets based on the resource availability. Availability of sufficient resources, particularly the genuine and certified scion /bud wood and rootstock according to the scientific recommendations in vogue as well as that of skilled manpower for the propagation methods to be followed should be the major considerations for setting realistic targets, from a quality control point of view.

2. Site selected for targeted planting material production should be with access to modern communication and transport facilities, good water source, electricity, skilled and unskilled labour availability though out the season as well as professionally qualified and competent manpower to oversee the production and quality control. Places with a mild climate, long growing season and even distribution of rainfall is most suitable for planting material production. Areas with extreme temperature, dry winds, frequent flooding, hail, storms or known to be frost pockets are better avoided. Soil should be light to medium in texture with good fertility, water holding capacity and drainage, ideally with a pH range of 6.0 to 7.0. Topography should preferably be plain with gentle slop (1-2%) and in very sloppy areas terracing need to be done.

3. Develop a simple flow chart with time scale for the production process to meet the production target, with major considerations to the propagation method and its seasonal variations for success and quality of the final produce.

4. Identify the inputs necessary for each stage of production and develop specifications and requirements for each input . These generally include containers , growing medium , fertilizer , irrigation water , plant growth regulators , pesticides , herbicides etc.

4. Develop procedures to verify that each input meets the specification standards.

5. Proper nursery records may be maintained incorporating all the information either in registers and or in computers using suitable software. At every step continuous and effective coordination with research organizations on the latest technology development regarding nursery management aspects would be helpful to upgrade and perfect the quality control measures.

7. Labeling of each planting material produced properly as per records , with necessary details such as crop , variety , rootstock used date of production , name of the nursery

etc and each batch may be certified by the competent authority for compliance with the quality control programme.

### **Use of biofertilizers in Nursery management**

Use of biofertilizers in combination with organic manure/inorganic fertilizers in a balanced proportion yields good results.

Media preparation with nitrogen fixing organism like *Azotobacter*, *Azospirillum* can save nitrogen fertilizer usage and improves vegetative growth of the seedlings.

Phosphorus solubilising bacterias inoculation helps in converting insoluble phosphates to soluble forms.

Biofertilizers can be inoculated by seed treatment / soil treatment/ seedling treatment before transplanting.

### **Management of plants after propagation:**

The propagated plants need to be hardened in shadenet houses or climate controlled houses. Need based spraying should be done for controlling pest and disease. Micro nutrient sprays can be given for maintaining plants in healthy condition. Plants need to be labeled properly so that variety is not mixed up.

# Standards of planting material production in Spice crops

## 1. BLACK PEPPER

**Name of the Crop** – Black pepper

**Botanical Name** - *Piper nigrum* L.

### Information regarding parent material

#### Age of the elite mother vine :

Seven years and above,  
should be a stable yielder and free from pest diseases.

**Type of planting material used for propagation**- Runner vines.

**Method of propagation** - Vegetatively propagated by Cutting

### Vegetative propagation

Age of runner vines : one year old.

Diameter of runner vines : >0.6 cm

Height of three node cutting(runner) : 15 cm

Age of rooted cutting : 3 months from the date of planting in polythene bags.

Height of the rooted cutting : 25 cm

Number of leaves : 5 Nos.

Diameter of the rooted cutting : > 0.8 cm

Growth of the plant : Vigorous.

Root system : fibrous and profusely grown.

Condition of the earth ball : Intact and moist.

Varietal purity should be maintained.

### Disease incidence

**i)** Name of disease – *Phytophthora* infections

Causal organism – *Phytophthora capsici*

#### Detection and diagnosis

Based on the propagule formation in water

Based on selective isolation and culture characteristics

**ii)** Name of the disease - Anthracnose

Causal organism - *Colletotrichum gloeosporioides*

**Detection and diagnosis** - Visual.

**iii)** Name of the disease – Leaf rot

Causal organism - *Rhizoctonia solani*

**Detection and diagnosis** – Visual.

**iv)** Name of the disease - Basal wilt  
Causal organism - *Sclerotium rolfsii*  
**Detection and diagnosis** - Visual.

**v)** Name of the disease - Viral infections  
Causal organism - *Cucumber mosaic virus* (CMV) and  
*Piper yellow mottle virus* (PYMV).  
**Detection and diagnosis**  
Direct Antibody Sandwich ELISA (DAS-ELISA) and by  
Polymerase chain reaction (PCR)

#### **Insect pest incidence**

**i)** Causal organism - Leaf gallthrips (*Liothrips karnyi*)  
Detection and diagnosis - Visual

**ii)** Causal organism - Root mealybug (*Planococcus spp.*)  
Detection and diagnosis - Visual.

**iii)** Causal organism - Scale insects (*Lepidosaphes piperis* and *Marsipococcus marsupiale*)  
Detection and diagnosis - Visual

**iv)** Causal organism - Top shoot borer (*Cydia hemidoxa*)  
Detection and diagnosis - Visual

#### **Nematode incidence**

Causal organism - Root-knot nematodes (*Meloidogyne spp.*) and the burrowing nematode (*Radopholus similis*).  
Nature of damage - Poor growth, foliar yellowing and inter-veinal chlorosis of leaves.  
**Detection and diagnosis** - Direct examination of plant material and extraction of nematodes from roots and soil

#### **Nutrient deficiency Observed in Nursery.**

##### **Detection and Diagnosis- Magnesium**

Interveinal chlorosis of older black pepper leaves, greening of veins, necrosis and defoliation.

**Iron** : Interveinal chlorosis of younger leaves and papery whitening at severe stage.

## 2. Name of the Crop – Cardamom

**Botanical Name** - *Elaterium cardamom*

### Information regarding parent material

Method of propagation – Seed

### Capsule standard

| Standards                          | Foundation       | Certified        |
|------------------------------------|------------------|------------------|
| Appearance                         | Bold and healthy | Bold and healthy |
| Uniformity                         | >95%             | >85%             |
| Deformed capsules                  | <5%              | <10%             |
| Contamination with other varieties | <1%              | <5%              |
| Colour of the seed                 | brownish black   | brownish black   |
| Germination percent                |                  |                  |
| a. Without acid treatment          | 60%              | 60%              |
| b. With acid treatment             | 80%              | 70%              |

### Seedling propagation

**Seed treatment** - Acid scarification with 25% nitric acid for 10 minutes helps in early and uniform germination.

| Standards                | Foundation  | Certified   |
|--------------------------|-------------|-------------|
| 1. Height                | 60-75 cm    | 60-75 cm    |
| 2. Age of the seedling   | 8-10 months | 8-10 months |
| 3. No. of tillers        | 3           | 3           |
| 4. Number of leaves      | 5           | 5           |
| 5. Undesirable seedlings | <5          | <10         |

### Vegetative propagation

#### Standards of the planting material

Minimum planting requirement - One grown up sucker and a growing young shoot.

Height of the main tiller - One meter

### Disease incidence

i) Name of disease - Rhizome rot

Causal organism - *Pythium vexans* and *Rhizoctonia solani*

Nature of damage - Yellowing of leaves, leaf blades and withering of leaves.

Detection and diagnosis – Baiting the infected material.

ii) Name of disease - Viral (Katte) disease, mosaic or marble disease.

Causal organism - *Cardamom mosaic virus* (CdMV).

Nature of damage – New leaves has mosaic symptoms and green stripes.

ii) Name of disease - Cardamom vein clearing (Kokke kandu) disease

Causal organism - virus, transmitted semi persistently by *Pentalonia nigronervosa* f. *caladii*.

Detection and diagnosis for viral disease -

Visual, ELISA and PCR tests.

### **Insect pest incidence**

i) Causal organism - Shoot and capsule borer (*Conogethes punctiferalis*)

Detection and diagnosis - Visual.

ii) Causal organism - Root grubs (*Basilepta fulvicorn*)

Detection and diagnosis – Visual

iii) Causal organism - Shoot fly (*Formosina flavipes*)

Detection and Diagnosis – Visual

### **Nematode incidence**

Causal organism - *Meloidogyne incognita*

Nature of damage - Poor germination, establishment , yellowing and drying of leaf tips and margins, stunting and poor growth of the plants, shedding of immature capsules in the main field, heavy galling (root-knots) and abnormal branching of roots.

### **Detection and diagnosis**

Direct examination of plant material

Extraction of nematodes from roots and soil

### 3. Name of the Crop – Ginger

**Botanical Name** - *Zingiber officinale* Rosc.

#### **Information regarding parent material**

Method of propagation - Vegetative

#### **Preservation of seed ginger**

Seed treatment with Quinalphos 0.075% and Mancozeb 0.3% for 30 minutes, drain the solution, dry the rhizomes under shade and rhizomes are being stored in a pit.

#### **Standards of the planting material**

Ginger Rhizome standards

| <b>Standards</b> | <b>Foundation</b>  | <b>Certified</b>   |
|------------------|--------------------|--------------------|
| 1. Appearance    | Healthy and Plumpy | Healthy and Plumpy |
| 2. Uniformity    | 95-100%            | 85-90%             |
| 3. Germination   | 98                 | 95                 |

#### **Disease incidence**

i) Name of the disease - Soft rot or rhizome rot disease.

Causal organism - *Pythium* species.

Nature of damage - Foul smell of the rhizomes.

Detection and diagnosis - By plating.

ii) Name of disease - Bacterial wilt

Causal organism - *Ralstonia solanacearum* Biovar-3

Detection and diagnosis - Microbiological, Serological, DAS-ELISA, NCM-ELISA and PCR tests

iii) Name of disease - Nematode incidence

Causal organism - Root knot (*Meloidogyne* spp.), burrowing (*Radopholus similis*) and lesion (*Pratylenchus* spp.)

Nature of damage - Stunting, chlorosis, poor tillering and necrosis of leaves.

Detection and diagnosis – Visual

#### **Insect pest incidence**

i) Causal organism - Rhizome scale (*Aspideilla hartii*)

Detection and Diagnosis – Visual



#### **4. Name of the Crop – Turmeric**

**Botanical Name** - *Curcuma longa* L.

#### **Information regarding parent material**

Method of propagation – Vegetative

**Preservation of seed rhizome** - Seed treatment with Quinalphos 0.075% and mancozeb 0.3% for 30 minutes, drain the solution, dry the rhizomes under shade and rhizomes are being stored in a pit.

#### **Standards for planting material**

Turmeric Rhizome standards

| <b>Standards</b> | <b>Foundation</b>  | <b>Certified</b>   |
|------------------|--------------------|--------------------|
| 1. Appearance    | Healthy and Plumpy | Healthy and Plumpy |
| 2. Uniformity    | 95-100%            | 85-90%             |
| 3. Germination   | 98                 | 95                 |

#### **Disease incidence**

Name of disease - Rhizome rot

Causal organism - *Pythium* species

Detection and diagnosis - Microbiological, Serological, DAS-ELISA, NCM-ELISA, PCR.

#### **Insect pest incidence**

Causal organism - Rhizomes scale (*Aspideilla hartii*)

Detection and diagnosis - Visual

## **5. Name of the crop - Nutmeg**

**Botanical Name** - *Myristica fragrans*

### **Information regarding parental material**

**Method of propagation** – vegetative , Epicotyl grafting.

### **Scion Preparation**

Age of scion shoots - 3-4 month old.

Number of leaves - 2-3 leaves

Diameter of scion shoots - 0.5 cm

### **Root stock preparation**

Name of the root stock - *Myristica fragrans* (seed sprout/seedlings.)

Age of the root stock - 20 days after germination at the first leaf stage.

Diameter of the rootstock - Diameter of 0.5 cm or more

Root stock propagation - Fresh Seed- undried.

### **Standards of the planting material**

Height of the plant -> 15 cm

Height and condition of the union - > 15 cm, strongly united.

Scion and root diameters at the union - > 0.6 cm and above

Growth of the plant – Vigorous.

Root system of the plant - Tap root.

Condition of the earth ball - Intact and moist

### **Disease incidence.**

i) Name of disease - Die back,

Causal organism - *Diplodia* sp.

Detection and Diagnosis - The disease is characterized by drying up of mature and immature branches from the tip down wards.

ii) Name of disease - Shot hole

Causal organism - *Colletotrichum gloeosporioides*.

Detection and Diagnosis – Visual

### **Insect pest incidence**

**i) Causal organism** - Black scale (*Saissetia nigra*)

Detection and Diagnosis - Visual.

**Nematode incidence** – Nil

## **6.Name of the crop-CLOVE**

**Botanical name - *Syzygium armaticum (L.)***

### **Information regarding parental material**

**Method of propagation – Seeds**

#### **Parent tree requirements:**

Seeds are collected from healthy and regular bearing trees.

### **Nursery requirements**

In order to select elite mother clove tree, minimum two inspection shall be made. One before flowering second at the time of flowering

In the nursery, only one check at the time of distribution shall be made to assess the quality of seedlings

### **Field standards**

#### A. General requirements

##### 1. Isolation

AS there is no distinct varieties isolation is not required. However, in nursery clove seedlings kept 2 meter away from other crop seedlings to avoid pest infestation.

#### B. Specific requirements

Healthy and regular bearing mother clove tree with following characters:

- |                                   |                           |
|-----------------------------------|---------------------------|
| 1. Number of terminals per branch | >10 First inspection      |
| 2. Number of clusters per branch  | >14 First inspection      |
| 3. Number of flower branch        | >100 Second inspection    |
| 4. Length of flowers              | >1.5 cm Second inspection |

### **Seedlings standard**

Height -50 cm

- To reach sufficient height it will take 9-24 months depending upon management
- First, seed will be sown in sand beds, after germination seedlings will be transferred to poly bags
- Normally no pest and diseases infests clove seedlings in the nursery

## **7.Name of the crop-Cinnamon**

**Botanical name - *Cinnamomum verum***

### **Information regarding parental material**

**Method of propagation** – vegetative propagation by rooted cuttings

#### **Parent tree requirements:**

The parent trees must have a very good regeneration capacity, high quality bark with good yield.

#### **Nursery requirements**

- a) A nursery shed which can allow 75% sunlight
- b) IBA or IAA 2000 ppm or Seradise-B
- c) Polythene bags of 30x22 cm size and 300gz thickness for rooting
- d) Coir dust and sand mixture (1:1 ratio)
- e) Potting mixture made up of well powdered garden/forest soil, pure fine sand and well powdered dried cow dung (3:3:1 ratio)

#### **Planting material (rooted cuttings) production:**

- Age of shoot cuttings: Six-month-old shoot cuttings with 2-3 nodes
- Half leaf only has to be retained at each node.
- The lower cut end of the cutting (up to 2 cm) has to be dipped in 2000 ppm solution of IBA or IAA for few seconds (quick dip method).
- The shoot cuttings which were kept in the polythene bags could be taken 2 to 3 months later, when roots were found through the polythene bag. The rooted cuttings must be carefully lifted and separately planted in polythene bag containing 3:3:1 garden soil, sand and farm yard manure (dried and well powdered).
- One year old such bagged cuttings must be used for planting.
- It should have attained a minimum height of 25 to 30 cm.

**8. Name of the crop- Garcinia**  
**Botanical name - *Garcinia gummi-gutta***

**Information regarding parental material**

**Method of propagation** –soft wood grafting or approach grafting or patch budding .

**Rootstock**

Root Stock-plants having 3-4 mm stem thickness

**Scion preparation**

Select straight growing, healthy, young shoots emerging from the primary branches with whorled leaf arrangement.

Cut them to a length of 6-10 cm and store in polybags under humid condition.

Remove leaves partly and shape the cut end to a wedge of 3-4 cm length by giving slanting cuts on two opposite sides.

Three months after grafting the plants will be ready for planting.

**Standards of the Planting material.**

1. The diameter of the stock should range from 3.0-4.0 mm
2. The height of the grafting should range from 15-20 cm.
3. The diameter of the grafts at 10 cm above the graft union should range from 3.0-5mm and height of the graft 20 cm – 30 cm.
4. The diameter of **the inarched grafts** at 10 cm above the ground level shall range from 5.0-8.0 mm and height of the graft 30-50 cm.
5. The grafted planting material should be free from sprouts from rootstock.