



Seed certification standards for quality planting material production in spices

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Introduction

In India, horticultural crops comprises of Fruits, Vegetables, Flowers, Aromatic crops, Spices, Plantation Crops and Honey, occupies 24.19848 million ha with a production of 277.352 million tones during 2013-14, out of which spices crop occupies 13.0% area and 2.1% production. India - a 'Home of spices' grows as many as 70 spices. However, under the act of Parliament, a total of 52 spices are brought under the purview of Spices Board out of 109 spices notified by the ISO. ICAR- Indian Institute of Spices Research(IISR), Kozhikode has mandated to work on black pepper (*Piper nigrum* L.), cardamom (*Elettaria cardamomum* Maton), ginger (*Zingiber officinale* Roscoe), turmeric (*Curcuma longa* L.), cinnamon (*Cinnamomum verum* J.S. Presl), clove (*Syzygium aromaticum* (L.) Merr. & L.M. Perry), nutmeg (*Myristica fragrans* Houtt), vanilla (*Vanilla planifolia* Andrews), paprika (*Capsicum annuum* L.), garcinia (*Garcinia gummi-gutta* L.) Roxb. and *Garcinia cambogia* (Gaertn.) Desr. The chilli (*Capsicum annuum* L.) works is under taken at ICAR institutes like ICAR-Indian Horticulture Research Institute(IIHR), Bengaluru; ICAR-Indian Agricultural Research Institute(IARI), New Delhi and many SAU's and SHU's are working on various spices as each state grow one or other spices. Presently spices are grown in 3.16 million ha with production of 5.91million tones.

The General Seed Certification Standards are applicable to all crops which are eligible for certification, and with field and seed standards for the individual crops, shall constitute the Minimum Seed Certification Standards. The word 'Seed' or 'seeds' as used in these standards shall include all propagating materials.

I. Purpose of Seed Certification

The purpose of seed certification is to maintain and make available to the public, through certification, high quality seeds and propagating materials of notified kind and varieties so grown and distributed as to ensure genetic identity and genetic purity. Seed certification is also designed to achieve prescribed standards.

II. Certification Agency

Certification shall be conducted by the Certification Agency notified under Section 8 of the Seeds Act, 1966.



III. Certified Seed Producer

Certified seed producer means a person/organization who grows or distributes certified seed in accordance with the procedures and standards of the certification.

IV. Eligibility Requirements for Certification of Crop Varieties

Seed of only those varieties which are notified under Section 5 of the Seeds Act, 1966 shall be eligible for certification.

V. Classes and Sources of Seed

A. Breeder Seed

Breeder seed is seed or vegetative propagating material directly controlled by the originating or sponsoring plant breeder of the breeding programme or institution and/or seed whose production is personally supervised by a qualified plant breeder and which provides the source for the initial and recurring increase of Foundation seed.

Breeder seed shall be genetically so pure as to guarantee that in the subsequent generation i.e. certified Foundation seed class shall conform to the prescribed standards of genetic purity. The other quality factors of Breeder seed such as physical purity, inert matter, germination etc. shall be indicated on the label on actual basis.

B. Certified Seed

Certified seed shall be the seed certified by Certification Agency notified under Section 8 of the Seeds Act, 1966 or seed certified by any Certification Agency established in any foreign country provided the Certification Agency has been reorganized by the Central Government through notification in the Official Gazette. Certified seed shall consist of two classes, namely, Foundation and Certified seed and each class shall conform to the following description:

1. Certified Foundation seed shall be the progeny of Breeder seed, or be produced from Foundation seed which can be clearly traced to Breeder seed. Thus, Foundation seed can even be produced from Foundation seed. During the production of certified Foundation seed, the following guidelines shall be observed:
 - (a) Certified Foundation seed produced directly from Breeder seed shall be designated as Foundation seed stage-I;
 - (b) Certified Foundation seed produced from Foundation seed stage-I shall be designated as Foundation seed stage-II;
 - (c) Certified Foundation seed stage-II will not be used for further increase of Foundation seed and shall be used only for production of Certified seed class;
 - (d) Minimum Seed Certification Standards shall be the same for both Foundation seed stage-I and II unless otherwise prescribed;
 - (e) Certification tag shall be of white colour for both Foundation seed stage-I and II and shall contain the information as to its stage;
 - (f) Production of Foundation seed stage-II shall ordinarily be adopted in respect of such crop varieties provided, when it is expressly felt by the Certification Agency that Breeder seed is in short supply;



(g) Production of Foundation seed stage-II may be adopted for the following group of crops:

- vegetatively propagated crops;
- apomictically reproduced crops;
- self-pollinated crops;
- often cross-pollinated and cross-pollinated crops, these being gene – pools should not lose their genetic identity and purity if measures to safeguard the same are adequately taken;
- composite and synthetics;
- parental line increase of hybrids.

2. Production of Foundation seed stage-I and II shall be supervised and approved by the Certification Agency and be so handled as to maintain specific genetic identity and genetic purity and shall be required to conform to certification standards specified for the crop/ variety being certified.

3. (a) Certified seed shall be the progeny of Foundation seed and its production shall be so handled as to maintain specific genetic identity and purity according to standards prescribed for the crop being certified;

(b) Certified seed may be the progeny of Certified seed provided this reproduction does not exceed three generations beyond Foundation seed stage-I and

- It is determined by the Certification Agency that genetic identity and genetic purity will not be significantly altered; and
- When the Certification Agency is satisfied that there is genuine shortage of Foundation seed despite all the reasonable efforts made by the seed producer.

(c) Certification tag shall be of blue colour (shade ISI No. 104 AZURE BLUE) for Certified seed class.

(d) Certified seed produced from Certified seed shall not be eligible for further seed increase under certification. Certification tags for such production which is not eligible for further seed increase under certification shall be super scribed with, "not eligible for further seed increase under certification".

VI. Phases of Seed Certification

Certification shall be completed in six broad phases listed as under:

- (a) receipt and scrutiny of application
- (b) verification of seed source, class and other requirements of the seed used for raising the seed crop;
- (c) field inspections to verify conformity to the prescribed field standards;
- (d) supervision at post-harvest stages including processing and packing;
- (e) seed sampling and analysis, including genetic purity test and/or seed health test, if any, in order to verify conformity to the prescribed standards; and
- (f) grant of certificate and certification tags, tagging and sealing.

The Indian Minimum Seed Certification Standards is available for around 191 crops and eight Tissue Culture Raised Propagule (Table 1). Only Ginger, Turmeric, Onion, Garlic, Chilli, Ajawain, Cumin, Coriander, Fennel, Suwa (Indian Dill), Tamarind are notified in spices for certification. However, certification standards are formulated for black pepper, cardamom, nutmeg, clove, cinnamon, vanilla also presented here.

Table 1 Group of crops eligible for Seed Certification

Sl No	Seed Certification Standards	Nos.
1.	Cereals	7
2.	Millets	14
3.	Pulses	12
4.	Oilseeds	13
5.	Fiber Crops	3
6.	Forage Crops	16
7.	Green manures	3
8.	Sugar crops	1
9.	Narcotics	2
10.	Fruit Vegetables	7
11.	Cucurbits	29
12.	Cole crops	6
13.	Green/Leafy Vegetables	7
14.	Bulb Crops	4
15.	Tubers & Rhizomes	6
16.	Root Crops	12
17.	Spices	*6
18.	Fruit Crops	32
19.	Flower Crops	11
20.	Tissue Culture Raised Propagule	8
Total		199

*Ajawain, Cumin, Coriander, Fennel, Suwa, Tamarind



1. BLACK PEPPER (*Piper nigrum* L.)

In black pepper, the rooted cuttings constitute the planting material. Hence the standards are for the production of quality rooted cuttings.

Phase of certificate

1. Field Inspection for selection of the field (for single season certified nursery – conventional method – three noded cuttings).

1.1. Selection of mother vines:

The material meant for multiplication should be selected only from an uniformly established gardens free from diseases/inoculants of diseases such as Phytophthora foot rot, Stunt and Phyllody diseases. Elite mother vines are to be identified at such gardens with the following characteristics.

- Age of the elite mother vines should at least be not less than 7 years.
- The vine should have given stable yield of at least 2 kg dry pepper/vine/year for 4 consecutive years.
- Management practices followed for those vines during the last five years should be noted.
- These selected vines should be monitored at least once in a year for a possible infection of the disease and continuously monitored for future use.

Vines with above characters are identified, labeled and runner shoots from such lines only should be used for large scale multiplication. In any such selection, varietal purity should be maintained. Close examination is essential to avoid physical mixing of varieties. To avoid such mixing, support trees and vines should be examined carefully so that if more than one variety of pepper vines are growing on the same tree support, such vines should be rejected.

1.2 Field inspection team:

The field from which planting material are to be collected should be inspected by a team consisting of a breeder, pathologist, entomologist and nematologist besides an agronomist.

1.2.1. Minimum specific number of field inspection:

Two inspections are to be carried out; one during October-November for identifying mother vines with the specifications of the crop field as mentioned in para 1.1 and the other during January-February to inspect field for the incidence of pests and diseases if any particularly to locate *Phytophthora* foot rot and stunt/phyllody diseases. A certificate to the effect the vines selected meet the standards para 1.1. It is mandatory for any commercial nursery to obtain this certificate annually.

2. Standards for planting material production methods

2.1 Nursery inspection – standards

The area in which nursery is to be established in a well drained preferably in a slightly elevated place. This surface soil (0-15 cm depth) in this area should be tested for the present/absence of disease causing fungi/bacteria/nematodes particularly for the fungus *Phytophthora capsici*, nematode viz., *Radopholus similis* and *Meloidogyne incognita*. These tests should be carried out by the qualified personnel.



2.2 Method

Collect the runner shoots from the mother vines selected as per the criteria in the para 1.1. Keep the vines to prevent them from striking roots in the soil. Separate the runner shoots from the vines during February-march. The middle one third portion of runner shoots are preferred for planting. Avoid very tender and too hard portions for the shoot. Cut the shoots into pieces of 2-3 nodes. Clip the leaves, if any leaving a small portion of the petiole on the stem. Dip the lower cut end (up to 2 cm) of the cuttings in 1000 ppm solution of 3 Indol Butyric Acid (IBA) for 45 seconds will substantially increase root formation and development (This solution can be prepared by dissolving 1 g of IBA in one litre of water containing 3-5 g of sodium carbonate (Washing soda). Adhere to the dipping period of 45 seconds as any deviation from this may be injurious.

Treating the cuttings with Seradix B2 is equally effective. But IBA treatment is cheaper and hence is recommended for large nurseries where technical supervision. Seradix B2 can be conveniently used by the farmers and small scale nurseries.

Plant the treated cuttings in polythene bags (20 x 10 cm size with 300 gauge thickness) filled with potting mixture. The potting mixture is prepared by mixing two parts of fertile top soil, one part of river sand and one part of well decomposed Farm Yard Manure or Compost. When polythene bags are used sufficient number of holes about 20) may be provided at the base to ensure good drainage. The cutting should be planted at least on node deep in the soil.

In large commercial nurseries, where the soil contains more than 200 nematodes per gram of soil, the potting mixture should be fumigated with methyl bromide @ 500g per tonne of soil to destroy the nematodes (to be used only by pest control operators under the supervision of Govt. experts or experts approved by the Plant Protection Advisor to Govt. of India). Planting of cuttings in such a potting mixture is to be taken up only after 21 days of fumigation. The cuttings after planting should be kept under good shade. The cuttings are to be well protected from direct sun light. Light and frequent watering in recommended in the nursery to maintain a humid and cool atmosphere around the cuttings. Heavy watering which makes the soil slushy and cause water logging is to be avoided.

2.3. Minimum specifications for the rooted cuttings of black pepper

- The age of the rooted cutting should be 2½ months old from the date of planting in the polythene bags.
- A minimum of five leaves should be present with vigorous growth without exhibiting any nutrient deficiency symptoms
- Profusely developed roots with the absence *Phytophthora capsici* spores and nematodes viz., *Radopholus similis* and *Meloidogyne incognita* on the cuttings as well as in the potting mixture
- Maintaining varietal purity.
- Each such bag may contain a minimum of two such rooted cuttings

Black pepper rooted cuttings fail to meet above requirements should not be considered as a quality planting material of black pepper.

3. Multi-season Nurseries

These nurseries are based on the bamboo method of rapid multiplication.



3.1. Nursery inspection

The nurseries should be inspected by an expert team consisting of a plant pathologist, nematologist, entomologist and an agronomist and certify that the nursery plants are free from sources of inoculums specifically for the fungi *Phytophthora capsici*, nematodes *Meloidogyne incognita* and *Radopholus similis*, viral disease symptoms, Stunt and Phyllody disease. This expert should inspect the nursery at least once in six months and issue certificate as the case may be.

3.2. Minimum specifications for the rooted cuttings of black pepper

The standards prescribed as in para 2.3 are applicable here.

- The age of the rooted cutting should be 2½ months old from the date of planting in the polythene bags.
- A minimum of five leaves should be present with vigorous growth without exhibiting any nutrient deficiency symptoms
- Profusely developed roots with the absence *Phytophthora capsici* spores and nematodes viz., *Radopholus similis* and *Meloidogyne incognita*.
- Maintaining varietal purity
- Each such bag may contain a minimum of two such rooted cuttings

Black pepper rooted cuttings fail to meet above requirements should not be considered as a quality planting material of black pepper.

II. Land requirement/Nursery requirement

- Nursery shed to be used for propagation of black pepper shall be of convenient size e.g., 24 m x 6m. Roof should allow sufficient light to pass through it 50-75% light).
- Rooting medium made of forest soil, sand, compost (or powdered cattle manure @ 2:1:1)
- Poly bag 20 x 10cms size.

III Field inspection / Nursery Inspection

Minimum of two inspections shall be made as follows:

- The first inspection shall be made about 30-35 days after planting the cuttings in the poly bag to check the sprouting.
- The second inspection shall be made about 75-90 days to verify cutting growth *Phytophthora*, mealy bugs and scales infestation.

IV Field standards

A. General Requirements

1. Isolation

The cuttings of particular variety shall be isolated from contaminants (1m distance).

2. CAPSICUM (SWEET PEPPER) (*Capsicum annuum*L.) var. *grossum* Bailey) AND CHILLI (HOT PEPPER) (*Capsicum frutescens* L.)

I. Application and Amplification of General Seed Certification Standards

The General Seed Certification Standards are basic and, together with the following specific standards constitute the standards for certification of Capsicum and Chilli seed.

II. Land Requirements

Land to be used for seed production of Capsicum and Chilli shall be free of volunteer plants.

III. Field Inspection

A minimum of three inspections shall be made, the first before flowering, the second at the flowering and fruiting stage and the third at mature fruit stage and prior to harvesting.

IV. Field Standards

A. General requirements

1. Isolation

Seed fields offered for certification shall be isolated from the contaminants shown in the column 1 of the Table below by the distances specified in columns 2 and 3 of the said table:

Contaminants	Minimum distance (meters)	
	Foundation	Certified
1	2	3
Fields of other varieties	500	250
Fields of the same variety not conforming to varietal purity requirements for certification.	500	250
Fields of Capsicum from Chilli and vice versa	500	250

B. Specific requirements

Factor	Maximum permitted (%)*	
	Foundation	Certified
1	2	3
Off types	0.10	0.20
** Plants infected seed borne diseases.	0.10	0.50

*Maximum permitted at and after flowering in the case of off-types and at the final inspection in the case of seed borne diseases.

**Seed borne disease shall be:

Leaf blight: (*Alternaria solani* Sorauer.);

Anthraxnose (Ripe rot, Die back) : *Colletotrichum capsici* (Syd.) Butler & Bisby)

V. Seed standards

Factor	Standard for each class	
	Foundation	Certified
1	2	3
Pure Seed (minimum)	98.0%	98.0%
Inert matter (maximum)	2.0%	2.0%
Other crops seeds (maximum)	5/kg	10/kg
Weed seeds (maximum)	5/kg	10/kg
Germination (minimum)	60%	60%
Moisture (maximum)	8.0%	8.0%
For vapour-proof containers (maximum)	6.0%	6.0%

3. TAMARIND (*Tamarindus indica* L.)

I. Application and Amplification of General Clone Certification Standards

- A. The General Clone Certification Standards are basic and, together with the following specific standards constitute the standards for certification of Tamarind Clone.
- B. The General Standards are amplified as follows to apply specifically to Tamarind. All certified clones shall be produced by asexual methods like air Layering or Patch budding or Ring budding.

II. Land Requirements

Land to be used for clone propagation of Tamarind shall be free from volunteer plants.

III. Field Inspection

A. Rootstock

A minimum of one inspection shall be made before budding when the rootstock has attained buddable stage.

B. Mother Plant/Scion

Mother plant should be healthy, true to type and free from pests and diseases. The trees should be certified for the desirable characters by the certifying agency and a certificate to this effect shall be given to the nurseries. A minimum of one inspection shall be made at the time of fruit maturity for health and fruit quality of the mother tree.

C. Clones (Budded/Air Layers)

A minimum of one inspection shall be made before the sale of the clones after attaining the specified size to verify relevant factors.

IV. Field Standards

A. General requirements

1. Isolation

The clone propagation plots of Tamarind shall be isolated from the contaminants as shown in the following table:

Contaminants	Minimum distance (meters)	
	Foundation	Certified
1	2	3
Fields of other varieties	3	3
Fields of same variety not conforming to varietal purity requirements for certification	3	3

2. Spacing: the spacing between plants in clone propagation plots should be 25 cm and between row 40 cm.

3. Rotation: Nursery should be rotated to other plots after raising line Tamarind three times in the same plot.

B. Specific requirements

A. Foundation clones

Foundation clones being a group of common ancestry shall be genetically pure in absolute terms. Off types should be discarded under the supervision of Certification Agency.

B. Certified Class

Factor	Maximum permitted (%)	Certified
Off-type	0.10	

* Standards for off-types shall be met at final inspection.

V. Clone Specifications

The specification in respect of size of clones for foundation and certified classes shall be as follows:

1. The diameter of the stock should range from 0.75-1.0 cm
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 1.0-1.25 cm and height of the graft 50 cm – 100 cm.
4. The diameter of the Air layer at 10 cm above the ground level should range from 1.0-1.25 cm and height of the Air layer 50-100 cm.
5. The grafted clone should be free from suckers
6. In the clone lot, clones not conforming to specified size shall not exceed 5.0% (by number)

VI. Clone Standards

Factor	Standards for each class	
	Foundation	Certified
Pure living clones (minimum)	99.5% (by number)	98.0% (by number)
Other living plants including rootstocks (maximum)	0.5% (by number)	2.0% (by number)

7. GINGER (*Zingiber officinale* Rosc.)

I. Application and Amplification of General Seed Certification Standards

- A. The General Seed Certification Standards are basic and, together with the following specific standards constitute the standards for certification of seed ginger.
- B. The general standards are amplified as follows to apply specifically to ginger
- C. All certified classes shall be produced by vegetative propagation of underground rhizome, whose source and identity may be assured and approved by the certification agency.

II. Land Requirements

- Partial shade with gentle sloppy landscape
- Soil should be loose, friable and offer minimum resistance to rhizome development. Soil depth 30 cm or more, high organic matter and pH of 6-6.5 are favourable. Virgin forest soil particularly after disinfection is ideal.
- Planting should be avoided if soil is infested with *Pythium* sp., *Pseudomonas solanacearum*, and *Meloidogyne incognita*.
- Land to be used for seed/planting material production of ginger shall be free from volunteer plants.

III. Field Inspection

A minimum of four inspections shall be made as follows:

- A. The first inspection shall be made at the time of planting variety isolation, rhizome rot, seed piece weight and spacing.
- B. The second inspection shall be made about 45-125 days after planting to check germination, sprouting, rhizome rot and shoot borer incidence.
- C. The third inspection shall be made about 180-190 days after planting to check off types, rhizome rot and *Phyllosticta* leaf spot.
- D. The fourth inspection shall be made before harvest of or between 240-250 days after planting to verify rhizome rot, scale insect and mealy bug infestation.

IV. Field Standards

A. General requirements

1. Isolation

The fields/blocks of seed ginger shall be isolated from the contaminants shown in the column 1 of the table below by the distances specified in columns 2 and 3 of the said Table:

Contaminants	Minimum distance (meters)	
	Foundation	Certified
1	2	3
Fields of other varieties	3	3
Fields of the same variety not conforming to varietal purity requirements for certification	3	3

B. Specific requirements

Factor	Inspection stage	Foundation	Certified (Maximum)
1. Spacing	I	45 x30 cm	45x30cm
2. Seed piece weight	I	20-25 g	20-25 g
3. Rhizome rot	I	0	0
4. Shoot borer	II to IV II to III	01.0%	05.0%
5. Off-types	III	0.5%	1.0%
6. <i>Phyllosticta</i> Leaf spot: Bacterial wilt (<i>Rhizoctonia solanacearum</i>)	III	1.0%	1.0%
7. Scale insect	IV	1.0%	5.0%
8. Mealy bugs	IV	1.0%	5.0%

Note:

- 1. All off-types and diseased plants should be rogued out along with rhizomes and destroyed.
- 2. Gaps in the seed plot should not be more than 10.0%

V. Seed Standards

Factor	Foundation	Certified
1. Appearance	Healthy & Plumpy	Healthy & Plumpy
2. Uniformity (Minimum)	95.0%	85.0-95.0%
3. Dry rot (Maximum)	1.0%	5.0%
4. <i>Phyllosticta</i> (Maximum)	5.0%	10.0%
5. Scales (Maximum)	1.0%	5.0%
6. Mealy bugs (Maximum)	1.0%	5.0%

Note:

- 1. In a seed lot, rhizomes not conforming to specific characteristics of a variety shall not exceed 0.5% and 1.0% (by number - maximum) for foundation and certified seed classes, respectively.
- 2. The seed material shall be reasonably clean healthy and firm.
- 3. Cut, bruised, or those damaged by insects shall not exceed more than 1.0% (by weight)



8. TURMERIC (*Curcuma longa* L.)

I. Application and Amplification of General Seed Certification Standards

- A. The General Seed Certification Standards are basic and, together with the following specific standards constitute the standards for certification of seed turmeric.
- B. The general standards are amplified as follows to apply specifically to turmeric.
- C. All certified classes shall be produced by vegetative propagation of underground rhizome, whose source and identity may be assured and approved by the Certification Agency.

II. Land Requirements

- Soil should be loose, aerable and offer minimum resistance to rhizome development.
- Soil depth 30 cm or more, high organic matter of acidic soil.
- The crop of seed turmeric shall not be eligible for certification if grown on the land infested with *Pythium* sp., *Pseudomonas solanacearum*, and *Meloidogyne incognita*.

III. Field Inspection

A minimum of four inspections shall be made as follows:

- A. The first inspection shall be made at the time of planting to verify isolation, rhizome rot, seed piece weight and spacing.
- B. The second inspection shall be made about 45-50 days after planting to check germination, sprouting, rhizome rot and shoot borer incidence.
- C. The third inspection shall be made about 120-180 days after planting in order to verify off types, shoot borer and rhizome rot.
- D. The fourth inspection shall be made before harvest or between 240-250 days after planting to verify rhizome rot, scale insect and meal bug infestation.

IV. Field Standards

A. General requirements

1. Isolation

The fields/blocks of seed turmeric shall be isolated from the contaminants shown in column 1 of the table below by the distances specified in columns 2 and 3 of the said Table:

Contaminants	Minimum distance (meters)	
	Foundation	Certified
1	2	3
Fields of other varieties	3	3
Fields of the same variety not conforming to varietal purity requirements for certification	3	3



C. Specific requirements

Factor	Inspection stage	Foundation	Certified (Maximum)
1. Spacing	I	45 x30 cm	45x30cm
2. Seed piece weight	I	20-25g	20-25 g
3. Rhizome rot	I	0	0
4. Shoot borer	II to III	1.0%	5.0%
5. Off-types	III	0.5%	1.0%
6. Scale-insect	IV	1.0%	5.0%
7. Mealy bugs	IV	1.0%	5.0%

Note:

- 1. All Off-types and diseased plants should be rogued out along with rhizomes and destroyed.
- 2. Gaps in the seed plot should not be more than 10.0%
- 3. Land should be free from volunteers

V. Seed Standards

Factor	Foundation	Certified
1. Appearance	Healthy & Plumpy	Healthy & Plumpy
2. Uniformity (Minimum)	95.0-100.0%	85.0%
3. Dry rot (Maximum)	1.0%	5.0%
4. Scales (Maximum)	1.0%	5.0%
5. Mealy bugs (Maximum)	1.0%	5.0%

Note:

- 1. In a seed lot, rhizomes not conforming to specific characteristics of a variety shall not exceed 0.5% and 1.0% (by number – maximum) for foundation and certified seed classes, respectively.
- 2. The seed material shall be reasonably clean healthy and firm.
- 3. Cut, bruised, or those damaged by insects shall not exceed more than 1.0% (by weight)

9. CARDAMOM (*Elettaria cardamomum* Maton)

I. Application and amplification of general seed certification standards

- a. The general seed certification standards are basic and together with the following specific standards constitute the standards for certification of cardamom.



b. The general standards are amplified as follows to apply specifically to cardamom.

All certified classed shall be produced by seedlings raised from field collected open pollinated seeds, seedlings, from hybrid seeds produced in clonal seed production gardens and vegetative through suckers (slips).

II . Nursery requirement/ land requirement

The nurseries should be established as far as possible only in virgin soils or in soil where cardamom/ other related zingiberaceous crops were not planted earlier.

- avoid soil infected with *Pythium*, *Phytophthora*, *Rhizoctonia*, nematodes and soil borne insect pests
- the land after preparation can be subjected to soil solarization.

III Field inspection/ Nursery inspection

- For selection of mother plants for collection of open pollinated seeds minimum two visits are needed. The first inspection should be at time of the full bearing stage in the previous season (August- September) for marking the plants having high yield parameters. The second inspection shall be made just before the harvesting season of the current year (September) for assessing the performance of the selected plants and also for pest and disease incidence.
- For hybrid seeds from clonal crossing blocks minimum three inspection shall be made i.e. before flowering, during flowering to rogue off unsuitable plants if any, and also to ascertain the freedom from pests and diseased, third inspection shall be at harvest to assess the quality of seed capsules.
- In case of nursery, minimum three inspection shall be made, first at 3 months after sowing and second at 6 months to check off types, pest and disease and seedlings shall be transferred to poly bags and final inspection made before/ at the time of distribution (9-10 months) to assess the quality of seedlings and pest and disease incidence.

IV Field standards

A. General requirements

1. Isolation

The clonal crossing blocks of cardamom shall be isolated from the contaminants

Contaminants	Foundation	Certified
Fields/blocks of general cultivation	200m	100m

Note: In nursery minimum 3 m isolation distance is required between varieties



B. Specific requirements

Standards	Foundation	Certified
1. Uniformity of the crop	0	0
2. Presence of diseases		
a) katte virus	0	0
b) Clump rot	0	0
c) Azhukal (capsule rot)	0	0
d) Kokke kandu	0	0
3. Presence of pests		
a) Thrips	0	0
b) Capsule/ shoot/ panicle borer	<5%	<10%
c) Root grubs	0	0
d) White flies	<5%	<10%

V Capsule/ seedling standard

A. Capsule Standard

Standards	Foundation	Certified
1. Appearance	Bold and Healthy	Bold and Healthy
2. Uniformity	>95%	>85%
3. Thrips affected capsules	<5%	<10%
4. Borer affected capsules	<5%	<10%
5. Deformed capsules	<5%	<10%
6. Contamination with other varieties	<1%	<5%
7. Colour of the seed	Brownish Black	Brownish Black
8. Germination percent		
a) Without acid treatment	60%	50%
b) With acid treatment	80%	70%

B. Seedlings standard

Standards	Foundation	Certified
1. Height	60-75 cm	60-75 cm
2. No of leaves	5-7	5-7
3. No. of suckers	-	-
4. Presence of diseases		
a) katte virus	0	0
b) kokke kandu	0	0
c) Fungal diseases	0	0
5. Insect pest	<1%	<5%
6. Undesirable seedlings	<5%	<10%

Note: The seedlings are first sown in raised beds of convenient size and at 6 months seedlings are transferred to secondary nursery i.e in poly bags of 25 x 10 cm size filled with nursery mixture.

**10. CLOVE (*Syzygium aromaticum* L. Merrill & Perry)****I. Application and amplification of general seed certification standards**

A. The general seed certification standards are basic and together with the following specific standards constitute the standards for certification of clove.

B. The general standards are amplified as follows to apply specifically to clove

No distinct varieties are recognized in India. The common method of propagation is through seeds collected from healthy and regular bearing trees.

II. 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

III Field standards**A. General requirements****1. Isolation**

As there are 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

IV. Seedlings standard

Height -50 cm

Note:

- 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

11. CINNAMON (*Cinnamomum verum* Bercht. & Prest.)

In cinnamon, the rooted cuttings constitute the planting material. Hence the standards are for the production of quality rooted cuttings.

1. Nursery requirements

- a) A nursery shed which can allow 75% sunlight
- b) IBA or IAA 2000 ppm or Seradix-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)

2. Parent tree requirements

The parent trees must have a very good regeneration capacity, high quality bark with good yield. IISR Navashree and IISR Nithyashree are the national varieties released recently.

3. Planting material (rooted cuttings) production

Six month old shoot cuttings with 2-3 nodes are to be made from the present tree. 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). This will substantially increase root formation and development. This solution can be prepared by dissolving 1g of IBA or IAA in 2 l. of water containing 3 to 5 g of Sodium Carbonate (washing soda). Treating the cutting with Seradix B2 is equally effective. But IBA or IAA treatment is cheaper and hence recommended for large nurseries where technical supervision is feasible. Seradix B-2 can be conveniently used by farmers and small scale nurserymen. 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). At the time of planting, care has to be taken that primary root is well developed (minimum 25 cm) with lot of lateral roots (about 20). One year old such bagged cuttings must be used for planting. It should have attained a minimum height of 25 to 30 cm.

12. NUTMEG (*Myristica fragrans*)

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.

13. VANILLA (*Vanilla planifolia* Andr.)

Information regarding parent material

Method of propagation - Vegetative (Cutting)

Standards of planting material

Height of cuttings - 60-120 cm in length,

Number of internodes - 15-20

Diameter - 0.8 cm.

Number of leaves - 13-15 nos

Disease incidence

i) Name of disease - Stem rot

Causal organism - *Fusarium oxysporum* f.sp.*vanillae* and *Phytophthora meadii*

Detection and diagnosis - Visual

ii) Name of disease - Root rot

Causal organism - *Phytophthora meadii* and *Sclerotium rolfsii*

Detection and diagnosis - Visual

iii) Name of disease - Tip rot and die back

Causal organism - *Cucumber mosaic virus*, *Cymbidium mosaic virus*, *Vanilla mosaic virus*.

Detection and diagnosis Visual, ELISA, Polymerase chain reaction (PCR) tests

14. Certification standards for protray nursery of turmeric and ginger

The technology of transplanting ginger and turmeric is become popular and many farmers or nurseryman commercially producing and selling using this technique nurseries. The Tamil Nadu Agricultural University (TNAU), Coimbatore is a leading Institution has standardised portray technique for turmeric, ICAR-Indian Institute of Spices Research (IISR), Kozhikode, Kerala has standardised similar technique for ginger.



The following standard is recommended for protray raised.

Sl No	Parameter	Standard
1	Planting material	Finger rhizome with single bud weighing approximately 4-6 g
2	Seed treatment	Treat the single bud sprouts (Mancozeb 0.3%) for 30 min before planting
3	Seed rhizome rate	600 – 750 kg / ha
4	Media	Cocopeat + <i>Pseudomonas fluorescens</i> or partially decomposed coir pith and vermicompost (75:25), enriched with PGPR/ <i>Trichoderma</i> 10g/kg of mixture
5	Growing condition	50% Shade net with micro irrigation
6	Age of the seedling	30 - 35 days
7	Shoot length during transplanting	20 – 25 cm
8	Number of leaves/shoot	3 - 4
9	Root structure	Coiled root mat
10	Root length during transplanting	10 – 12 cm

Conclusion

Spices are important group of horticultural crops, human always in need of them for day-to-day uses. Spices are having different life span and mode of propagation. Most of the perennial spices propagate through vegetative method. The quality planting material plays very important role in establishment of good spice gardens/fields. Hence, they should be produced with utmost care by following all possible recommended technologies. Nursery and planting material produced should be approved by authorised accreditation agency for propagating quality material. The seed certification standards are available for spices have to be adopted for production quality planting material to achieve the objective of spreading good quality seed in Indian Agriculture.

Source and Further Readings

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