Seed Certification Standards for Tubers & Rhizomes

1. Lesser Yam
2. Potato
3. True potato seed (TPS) hybrids
4. Taro (Arvi)
5. Sweet potato
6. Tapioca

LESSER YAM (*Dioscorea esculenta* (Lour.) Burkill)

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 lesser yam.

II. Land Requirements

Land to be used for seed production of lesser yam shall be free from volunteer plants. Swampy and shaded conditions may be avoided.

III. Field Inspection

A minimum of three inspections shall be made, the first after about 90 days, the second after about 150 days and the third after about 200 days of planting or at appropriate growth stage depending on the crop duration of the variety concerned to verify off types and other relevant factors.

IV. Field Standards

A. General requirements

1. Isolation

Seed fields 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	5	5
Fields of the same variety not conforming to varietal purity requirements for certification	5	5

B. Specific requirements

Factor	*Maximum permitted (%)**	
	Foundation	*Certified*
1	2	3
Off-types	0.050	0.10
Plants infested with scale insects	None	None

*Standards for Off-types shall be met at final inspection and for the designated insects at each inspection.

Note:

1. All Off-types and plants infested with scale insects shall be rogued out alongwith the tubers and destroyed
2. Gaps in the seed field shall not be more than 10.0%

V. Seed Standards

A. Specification for Foundation and Certified classes shall be as under:

1. Seed size (weight of the tuber): 100-150 gm.
2. In a seed lot, tubers not conforming to specific size shall not exceed more than 5.0% (by number).
3. The seed material shall be reasonably clean, healthy and shall conform to the characteristics of the variety. The tubers not conforming to the varietal characteristics

shall not exceed 0.050% and 0.10% (by number) for foundation and certified seed classes respectively.

4. Cut, bruised, unshapy, cracked tubers or tubers damaged by insects (other than scale insects) slugs or worms shall not exceed more than 1.0% (by weight).
5. Maximum tolerance limit of tubers showing visible symptoms of infestation caused by scale insects will be as follows:

Factor	*Standards for each class*	
	Foundation	*Certified*
Tubers infested with scale insects	None	None

POTATO (*Solanum tuberosum* 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 potato.

B. *Classification of seed potato on the basis of area of production*: There shall be two types of seed potatoes, namely the Hills and plains-grown and shall be designated as Hill seed (HS) and plains seed (PS) respectively. Hill Seed (HS) shall be grown in the high hills generally 2500 meters above the mean sea level or in situations declared technically suitable for seed production plains seed (PS) shall be grown in such areas where aphid infestation is low during the crop growing season and which are technically suitable for seed production.

II. Land Requirements

A crop of seed potato shall not be eligible for certification if grown on land infested with:
-wart (*Synchytrium endobioticum* (Schilb.) Perc. and or cyst forming nematodes;
-brown rot (*Pseudomonas solanacearum* (E.f. Sm.) E.F. Sm or on-cyst forming nematodes within the previous three years;
-common scab (*Streptomyces scabies* (Thaxt.) Waks. & Henrici).

III. Field Inspection

A minimum of four inspections shall be made as follows:

1. The first inspection shall be made about 45 days after planting in the hills and about 35 days after planting in the plains to verify isolation, Off-types and the extent of disease infection with specific reference to mild and severe mosaics, leaf roll, yellows, brown rot and other relevant factors;
2. The second inspection shall be made about 60-65 days after planting for early varieties and about 70-75 days after planting for late varieties or at appropriate growth stage depending on the crop duration of the variety concerned to check isolation, offtype and extent of disease infection and extent of disease infection with specific reference to mild and severe mosaics, leaf roll, yellows, brown rot and other relevant factors;
3. The third inspection shall be made immediately after haulms cutting/destruction in order to verify that haulms have been cut/destroyed by the prescribed date and in proper manner;
4. The fourth inspection shall be made about 10 days after haulms cutting/destruction and before harvesting in order to verify that no re-growth of haulms has taken place.

IV. Field Standards

A. General requirements

1. Isolation

The fields of seed potato shall be isolated from the contaminants shown in the column 1 of the Table below by the distances specified in columns 2,3 and 4 of the said Table:

Contaminants	*Minimum distance (meters)*		
	Foundation		*Certified*
	Stage-I	*Stage-II*	
1	2	3	4
Fields of other varieties	5	5	5
Fields of the same variety not conforming to varietal purity requirements for certification	5	5	5

B. Specific requirements

Factor		*Maximum permissible limits*		
	Stage	*Foundation*		*Certified*
		Stage-I	*Stage-II*	
1	2	3	4	5
Off-types	I & II Inspection	0.050%	0.050%	0.10%
Plants showing symptoms of : -Mild mosaic	I&II Inspection	1.0%	2.0%	3.0%
-Severe mosaic, leaf roll and yellows	I&II inspection	0.50%	0.750%	1.0%
*Total virus	-	1.0%	2.0%	3.0%
**Plants infected by brown rot	I&II Inspection	None	None	3 plants per hectare
***Re-growth of plants after destruction of haulms	IV inspection	0.50%	0.50%	0.50%

*Of the two inspections, the higher virus percentage will be considered for the purpose of the specified limits of tolerance.

The presence of brown rot infected plants within the specified limits of tolerance shall be permitted in the areas known to be infected with the disease. In case of plants suspected to be infected with brown rot, the neighboring plants, one on either side should also be rouged along with tubers.

***Standards for re-growth after destruction of haulms shall be met at fourth inspection to be conducted about 10 days after haulms cutting.

Note:

1. All Off-types and diseased plants should be rogued out alongwith the tubers and destroyed.
2. Gaps in the seed plot should not be more than 10.0%
3. Haulms must be destroyed as close to the ground as possible before the date specified by the certification agency. Failure to destroy haulms in time shall render the crop liable for rejection

V. Seed Standards

A. Specification in respect of size and weight of seed material for foundation stage-I, foundation stage-II and certified class shall be as under

Size	Mean length and two widths at the middle of tuber	Corresponding weight
(a) Hill seed (HS)		

Seed size	30mm-60mm	25-150gm
Large size	above 60mm	above 150gm
(b) Plains seed (PS)		
Seed size	30 mm- 55 mm	25-125gm
large size	above 55 mm	above 125 gm

Note:

1. The size of tuber will be decided either on the basis of mean of two widths of a tuber at the middle and that of length or on the basis of corresponding weight of tuber.
2. In a seed lot, tubers not conforming to specific size of seed shall not exceed more than 5.0% (by number)
3. (a) The seed material shall be reasonably clean healthy firm and shall conform to the characteristics of the variety the tubers not conforming to the varietal characteristics shall not exceed 0.050% and 0.10% (by number) for foundation and certified seed classes respectively.
   (b) Cut, bruised, unshapy, cracked tubers or those damaged by insects, slugs or worms shall not exceed more than 1.0% (by weight.)
   (c) Greenish pigmentation on tubers will not be a disqualification for certification.

B. Maximum tolerance limit of tubers showing visible symptoms caused by the diseases mentioned below will be as follows:

Contaminants	*Maximum permissible limits*		
	Foundation		*Certified*
	Stage-I	*Stage-II*	
1	2	3	4
Late blight (*Phytophthora infestans*, dry rot or charcoal rot	1.0% (by number)	1.0% (by number)	1.0% (by number)
Wet rot	None	None	None
*Common scab	3.0% (by number)	3.0% (by number)	5.0% (by number)
**Black scurf	5.0% (by number)	5.0% (by number)	5.0% (by number)
***Total diseases	5.0% (by number)	5.0% (by number)	5.0% (by number)

*Even if a single tuber infected with common scab is detected in a seed lot, the entire seed lot shall be treated with approved fungicide before seed lot is declared fit for certification. Seed lots having infected tubers more than the prescribed limits will not be certified even after treatment.

**(a) A tuber carrying 10.0% or above scurfed surface will be considered as one infected unit.

(b) Seed lots having black scurf infection more than the prescribed limits could be certified after treatment with approved chemical/fungicide.

***For all diseases, the higher disease percentage will be considered for the purpose of the specified limits of tolerance.

TRUE POTATO SEED (TPS) (*Solanum tuberosum* L.)

HYBRIDS

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 hybrid TPS.

B. The General Standards are amplified as follows to apply specifically to the TPS hybrids.

1. Eligibility requirements for certification

(a) The parental seed stock to be eligible for certification shall be from a source such that its identity may be assured and approved by the Certification Agency.

(b) Hybrid seed to be eligible for certification shall be the progeny of two approved parental lines.

2. Classes and Sources of seed

(a) Breeder and foundation seed classes shall be produced and multiplied from seed potato (seed tubers).

(b) Foundation class of seed potato shall conform to the same minimum seed certification standards as specified for certification of seed potato and if required may be increased in two stages namely foundation stage – I and foundation stage-II.

(c) The certified class seed shall be the hybrid TPS to be planted for any use except seed production.

II. Land Requirements

Seed fields offered for certification of TPS hybrid preferably should not be infested with:
-wart (*Synchytrium endobioticum* (Schilb.) Perc. and or cyst forming nematodes;
-brown rot (*Pseudomonas solanacearum* (E.F. Sm.) E.F. Sm or non-cyst forming nematodes within the previous three years;
-common scab (*Streptomyces scabies* (Thaxt.) Waks. & Henrici).

III. Field Inspection

A minimum of four inspections shall be made as follows:

1. The first inspection shall be made before flowering, to verify isolation, extent of disease infection and Off-types in female and male blocks:
2. The second and third inspections shall be made during flowering to verify Off-types, extent of disease infection and efficiency of cross-pollination;
3. The fourth inspection shall be made during harvesting in order to confirm that selfed berries are eliminated and only properly crossed berries are harvested

IV. Field Standards

A. General requirements

1. Isolation

Seed fields of TPS hybrid for Certified seed class shall be isolated from the contaminants shown in column 1 of the Table below by the distances specified in column 2 of the said Table:

Contaminants	Minimumdistance (meters)
	2
Fields of other varieties including the commercial hybrid of the same variety	50
Fields of the same hybrid (code designation) not conforming to varietal purity requirements for certification.	50
Between blocks of the parental lines of the same hybrid in case female and male parents are planted in separate blocks	5

B. Specific requirements

Factor	Maximum permissible limits
	Certified seed stage (for both the parents)
1	2
*Off-types	0.10%
**Plants showing symptoms of:	
-Mild mosaic	3.0%
- Severe mosaic, leaf roll and yellows	1.0%
**Plants infected by brown rot	3 plants per Hectare

*Maximum permitted at and after flowering.

**Maximum permitted at final inspection, though the diseases mentioned above are not transmitted through TPS but it is essential to maintain a good crop hygiene.

C. 1. All certified hybrid TPS lots produced by adopting emasculation or tubing or without emasculation with timely application of pollen from male parent to avoid selfing or through use of Chemical Hybridising Agents' (CHAs') shall be subjected to grow-out test and shall conform to the following minimum genetic purity (Hybridity) requirements:

Class	*Genetic purity (%) (Minimum)*
Certified	90

2. During grow-out test, the offtype plants (other than selfed plants) such as segregants, outcrosses and plants of other varieties should not exceed more than 1.50% out of 10.0% plants earmarked for selfed plants.
3. The minimum population size of 400 plants shall be maintained in two replicates of 200 each or four of 100 throughout the test and each plant shall be examined individually. The reject number shall be as follows:

Class	*Minimum genetic purity (%)*	*Reject number*
Certified	90.0(10 in 100)	44

V. Seed Standards

Factor	*Standards for certified seed class*
1	*2*
Pure seed (minimum)	98.0%
Inert matter (maximum)	2.0%
Weed seeds (maximum)	10/kg
Germination (minimum)	80%
Moisture (maximum)	8.0%
For vapour-proof containers (maximum)	6.0%

TARO (*ARVI): Colocasia esculenta* (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 taro.

II. Land Requirements

1. Land to be used for seed production of taro shall be free from volunteer plants. Avoid swampy, low lying and over shaded conditions.
2. Avoid taro residue and drainage from other taro fields.

III. **Field Inspection**

A minimum of three inspection shall be made, the first and second about 60 and 90 days respectively after planting and third about 160 days of planting and prior to harvesting or at appropriate growth stage depending on the crop duration of the variety concerned to check isolation, Off-types and other relevant factors.

IV. Field Standards

A. General requirements

1. Isolation

Seed fields 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	5	5
Fields of the same variety not conforming to varietal purity requirements for certification	5	5

B. Specific requirements

Factor	*Maximum permitted (%)**	
	Foundation	*Certified*
1	2	3
Off-types	0.10	0.50
Plants showing symptoms of dasheen Mosaic	0.50	1.0
Plants infected by phytophthora (*Phytophthora colocasiae* (Rac.) disease	None	None
Plants infested with scale insects and mealy bugs	None	None

*Standards for Off-types shall be met at final inspection and for designated disease and insects at each inspection.

Note: 1. All Off-types, diseased and insect infested plants shall be rogued out alongwith corms, cormels and destroyed.

2. Gaps in the seed field shall not be more than 10.0%

V. Seed Standards

A. Specification in respect of size and weight of seed material for Foundation and Certified classes shall be as under:

Size of seed corms	*Corresponding weight*
4-6 cm x *2.5 to 3.5 cm*	*20-40 gm*

Note: 1. In a seed lot, corms not conforming to specific size of seed shall not exceed more than 5.0% (by number)

2. The seed material shall be reasonably clean, healthy, firm and shall conform to the characteristics of the variety. The corms not conforming to varietal characteristics shall not exceed 0.10% and 0.50% (by number) for Foundation and Certified seed classes respectively

3. Cut, bruised, cracked corms or those damaged by insects (other than scale insects and mealy bugs), slugs or worms shall not exceed more than 1.0% (by weight).
4. Maximum tolerance limit of corms showing visible symptoms of infestation caused by scale insects and mealy bugs shall be as follows:

Factor	*Standards for each class*	
	Foundation	*Certified*
1	2	3
Corms infested with scale insects and mealy bugs	None	None

SWEET POTATO (*Ipomoea batatas* (L.) Schott.)

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 sweet potato.

B. The General Standards are amplified as follows

All certified classes shall be produced from either vine cuttings or from sprouts cut from the bed whose source and identity may be assured and approved by the Certification Agency.

II. Land Requirements

Avoid sweet potato residue and drainage from other sweet potato fields.

III. Field Inspection

A minimum of two inspections shall be made as follows:

1. The first inspection of plants bed shall be made when plants are nearly large enough to transplant;
2. The second inspection shall be made shortly after transplanting in the seed field.

IV. Field Standards

A. General requirements

1. Isolation

Seed fields 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	5	5
Fields of the same variety not conforming to varietal purity requirement for certification	5	5

B. Specific requirements

Factor	*Maximum permitted (%)**	
	Foundation	*Certified*
1	2	3
Plant bed		
Black rot	None	None
Wilt	None	None
Scurf	None	None
Off-types	None	None
Seed field		
Wilt (*Fusarium oxysporum)*	None	None
Mosaic	0.050	0.10
Off-types	0.050	0.10

*Maximum permitted at any one inspection.

Note: 1. All off-types and diseased plants should be rouged out along with root and destroyed.

V. Seed Standards

1. The seed material shall be reasonably clean, healthy, firm and shall confirm to the characteristics of the variety.
2. Cut, bruised, unshaped, cracked, root or those damaged by insects (except sweet potato weevil), slugs or worms shall not exceed more than 1.0% (by weight.)
3. Maximum tolerance limit of roots showing visible symptoms caused by the diseases, sweet potato weevil and other factors will be as follows:

Factor	*Maximum permissible limits % (By number)**	
	Foundation	*Certified*
1	2	3
Storage rot	None	None
Black rot	None	1.0%
*Scurf	None	1.0%
Wilt	None	1.0%
Internal cork	5.0%	5.0%
Nematode	None	1.0%
Wire worm	1.0%	5.0%
Other distinguishable varieties	0.10%	0.20%
Sweet Potato weevil	None	None

* A root carrying 10.0% or above scurfed surface would be considered as one infected unit.

TAPIOCA (Cassava)*: Manihot esculenta* Crantz.

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 tapioca planting material.

B. The General Standards are amplified as follows to apply specifically to tapioca:
All certified classes shall be produced from planting stakes (stem cutting) cut from the seed field whose source and identity may be assured and approved by the Certification Agency.

II. Land Requirements

(a) Land to be used for seed production of tapioca shall be free from volunteer plants. Swampy and shaded conditions might be avoided.

(b) Avoid tapioca residue and drainage from other tapioca fields.

III. Field Inspection

A minimum of four inspections shall be made, the first about 60 days, the second about 120 days and the third about 180 days after planting or at appropriate growth stage depending on the crop duration of the variety concerned and the fourth prior to cutting of planting stakes to verify isolation, Off-types and other relevant factor.

IV. Field Standards

A. General requirements

1. Isolation

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

Contaminants	*Minimum distance (Meters)*	
	Foundation	*Certified*
1	2	3
Fields of other varieties	5	5
Fields of the same variety not conforming	5	5

to varietal purity requirement for certification

B. Specific requirements		
Factor	*Maximum permitted (%)**	
	Foundation	*Certified*
1	2	3
*Off-types	0.10	0.20
Plants showing symptoms of mosaic	0.10	0.50
Plants infested with scale insects	None	None

*Standards for Off-types shall be met at final inspection and for mosaic and plants infested with scale insects at each inspection.

Note: All off-types, diseased plants and plants infested with scale insects should be rouged out along with tubers.

V. Seed Standards

A. Specifications in respect of size and age of the planting stakes for foundation and certified classes shall be as follows:

1. Age of the crop: 7 to 12 months.
2. Diameter of the stem: 1.5 to 2.5 cm (planting stake)
3. Approximate length of the stem: 20 cm (planting stake)
4. Approximate number of nodes : 5 in the planting stake.
5. Presence of latex at the cut end of the planting stake is the indication of good quality planting material.

B. Maximum tolerance limit of planting stakes showing visible symptoms ofinfestation caused by scale insect will be as follows:

Factor	*Maximum tolerance limit*	
	Foundation	*Certified*
Planting stakes infested with scale insects	None	None