

TUBER CROPS

Potato (*Solanum tuberosum*)

Varieties:

Name	Duration (days)	Yield (q/ha)		Plant characters	Tuber characters	Tolerance to diseases
		Rainfed	Irrigated			
Kufri Chandramukhi	80-100	85-100	150-160	Medium tall, erect	Oval, slightly curved, skin white, eyes flat	Leaf roll & virus Y
Kufri Jyoti	110-120	85-100	150-160	Tall, erect	Oval, flat, skin white, eyes flat, flesh dull white	Late blight
Kufri Megha	100-120	120-150	175-200	Tall, erect	White round oval tubers of medium size, white eyes, Flesh dull white, good keeping quality & no tuber cracking	Late blight resistant
Kufri Pukhraj	60-75	145	200-250	Medium, erect	Easy to cook; Texture-waxy texture; Free from after cooking discolouration	Moderately resistant to Late blight & tolerant to viruses

Potato variety Kufri Megha can be grown late (up to Mid December) in Upper Brahmaputra Valley Zone.

Soil Type:

Well drained sandy loam and loam soils, rich in organic matter are suitable. A pulse crop should preferably be included in the rotation to improve the soil condition.

Field Preparation:

Field should be thoroughly ploughed to obtain a good tilth. It should be leveled for uniform distribution of irrigation water or to maintain soil moisture uniformly under rainfed situation. The furrows should be prepared at 50 cm apart.

Time of Planting:

The optimum time for planting is mid October to mid November. In case of Kufri Sindhuri planting may be extended up to middle of December.

The optimum planting time for white and red eyed local potato is 15-30th October in Assam.

Method of planting:

The sprouted tubers should be planted in furrows with sprouts facing upward. Care should be taken to avoid sprout damage handling the tubers.

Seed Selection:

Virus free, healthy, medium sized sprouted tubers are to be selected for planting. Ideal size is about 2.5 cm in diameter (25-40 g). Bigger sized tubers may be cut into pieces longitudinally with 2-3 eyes in each piece.

Seed Sources:

Certified seeds of the recommended varieties are to be procured from Govt. or other recognized agencies.

Seed Treatment:

In case of cut seeds, the pieces are to be dipped in carboxin @ 2g in 1 litre of water for about 10 minutes. After treatment, the seeds are to be spread thinly and dried under shade for 48 hours, or should be covered with moist gunny bags for 2-3 days for tuberization.

Seed Rate:

The seed requirement is 22.5-25 q/ha when size of the tubers are about 2.5 cm in diameter (about 25 g) and planted with an intra row spacing of 15 cm. Intra row spacing is increased with bigger sized tuber.

Fertility Management:

Ten tonnes or 5 truck loads or 20 cart loads of well decomposed FYM should be applied per hectare in the furrows before planting.

Nutrient	Requirement (kg/ha)	Form	Fertilizer requirement	
			kg/ha	kg/bigha
Rainfed				
N	60	Urea	133	19
P ₂ O ₅	50	SSP	312	45
K ₂ O	50	MOP	83	12
Irrigated				
N	60	Urea	133	19
P ₂ O ₅	100	SSP	624	90
K ₂ O	100	MOP	168	24

Entire quantity of fertilizers should be applied in furrows as basal application and be covered with a thin layer of soils so that tubers do not come into direct contact with the fertilizers.

The crop booster 'Green Harvest' is recommended @ 25 g/10 lit of water at 30 days after planting.

Mulching:

Adoption of mulching under rained situations increases tuber yield. Water hyacinth plant materials are applied to cover the entire field after planting of tubers under flat method. Of course, skin of the tubers may turn green due to exposure to sunlight or shrinkage of mulching materials on drying.

Tubers become unsuitable for consumption on greening, however, quantities may be reduced by applying mulching materials in furrows just after planting of tubers, immediately followed by light soil cover. Such practices also reduce rodent damage of tubers considerably.

Irrigation:

The furrow method of irrigation has to be adopted. Three irrigations should be applied, first at 25 days (stolon formation stage), second at 60 days (tuber formation stage) and third at 80 days (tuber development stage) after emergence of sprouts. In case of application of mulching materials in furrows, only two irrigations are to be applied at 25 and 60 days after emergence of sprouts. At the time of application of irrigation, care should be taken not to submerge the ridges completely.

Weeding and Interculture:

Earthing up is to be done just before first and second irrigation. Under rainfed condition, this should be done at stolon and tuber formation stages. One or two interculture operations may be necessary when weed infestation is high.

Apply metribuzine @ 0.75 kg/ha (100 g/bigha) at 10% plant emergence (about 10 DAP) to get optimum weed control.

Plant Protection:

A). Insect Pests:

In areas where infestation of red ant and other soil insects are common, application of thiamethoxam 25WG @ 26 g a.i./ha and clothianidin 50 WDG @ 80 g a.i./ha is effective.

Application of mustard oil cake @ 150 kg/ha at the time of earthing up reduces red ant and white ant infestation to a great extent.

B). Diseases:

- i). Against late blight, six spraying with copper oxychloride 50WP @ 2 g commercial formulation /lit at an interval of 12 days. Or Spraying with dimethomorph 50WP @ 1g commercial formulation per lit followed by copper oxychloride 50WP @ 2g commercial formulation per lit in alternate application (3 sprays with the dimethomorph & 3 with copper oxychloride) at an interval of 12 days give very good

control if used at the following rates with high volume sprayer.

Early stage (1st month): 600 lit of water/ha

Mid stage (2nd month): 800 lit of water/ha

Late stage (3rd month): 1000 lit of water/ha

The first spray should be given 40-45 days after planting (canopy closure stage). Use of sticker Triton (0.5 ml/lit) will be essential in the spray solution for spraying during rainy weather.

Depending upon weather conditions, particularly in cloudy weather, copper oxychloride should be sprayed as a prophylactic measure. If disease appears, spraying should be done at an interval of 7 to 10 days depending upon weather conditions. While spraying, care should be taken to ensure wetting of the lower sides of the leaves.

Practices for On-farm storage of seed potatoes:

- The seed tubers for preservation in on-farm storages should be harvested from fully matured potato crop.
- Among the different tuber grades, small sized (5-15g) tubers can be kept suitably in on-farm stores as compared to big sized tubers (>20g).
- Loading density of 75g/m² proved beneficial than higher loading density for stored tubers under traditional stores.
- Seed potatoes collected from the main field should be cured properly for 10-15 days in cool place and then treat the healthy tubers with 3% boric acid for 30 min followed by 0.2% copper oxychloride for 20 min. After shade drying, the tubers should be loaded in the bamboo rakes fitted in the store.
- Use 4cm thick layer of shade dried 'Neem' or *Eucalyptus* leaves under and over stored tubers help in controlling potato tuber moth.
- Stored potatoes should be covered with mosquito nets in PTM endemic areas.
- Frequent inspection of the tubers in the store is essential. Remove the rotten tubers periodically.
- Sprout breaking during August is essential in order to minimize over-shrinkage and shriveling of tubers.

PACKAGE OF PRACTICES FOR GROWING OF POTATO CROP FROM TRUE POTATO SEEDS

The potato crop can be grown from True Potato Seeds (TPS). The three methods are as follows:-

- 1. Transplanted crop:** Seedlings are transplanted in the field after raising in the nursery. About 70% of the total produce is marketable and the remaining quantity of small sized tubers is used as seedling materials in subsequent seasons.
- 2. Tuberlet production:** TPS are sown in nursery beds and 70-80% is produced as tuberlets, which are used as planting materials.
- 3. Planting of Tuberlet:** Mainly commercial tubers are produced on planting of tuberlets, though tuberlets can be used as planting material during subsequent years.

Varieties:

Varieties	Transplanted crops (q/ha)	Tuberlet production From direct seeding (q/ha)	Tuberlets as planting Materials (q/ha)
HPS 1/13	229	265	314
HPS 7/67	251	276	282
HPS 11/13	220	231	294
TPS C-3	257	290	308

Characteristics of the varieties:

- Resistant to Late Blight disease
- Reduced pathogen transmission
- Higher yield potential
- Tuber shape may be round and oval
- Skin smooth with fine and medium deep eyes.

1. Transplanted Crop:

Preparation of nursery bed for raising seedling:

- Make the nursery beds of one meter breadth and of convenient length (preferably 3 m)
- Prepare a raised nursery bed by filling 7-8 cm with soil, FYM substrate. Prepare the substrate for the seedbed by mixing sterilized soil and well rotten and dried FYM or compost or bio-gas slurry in 1:1 ratio. Apply fertilizer @ 4-5 g N, 6-8 g P₂O₅ and 10 g K₂O/ sq.m in the substrate and mix thoroughly. After 2-3 days, the bed is ready for sowing of TPS. The soil could be sterilized by drenching the soil with 4% formalin followed by covering with polythene or locally available materials (like banana leaf/ straw etc.) for 72 hrs and then remove the cover.

- III.** Cover the top of the nursery beds with 2-3 cm thick layer of finely sieved FYM. Thus the nursery bed is raised to about 10 cm. from the field level.

Seedling Raising:

- a. Prepare the seeds for sowing in nursery during the 1st week of October (TPS germinate well when the daily minimum temperature touches 20°C and maximum temperature is 30°C)
- b. Soak the TPS in water for 24 hrs and then incubate in FYM + soil mixture (1:1) for 2-3 days. Pre-germinated seeds are to be sown in nursery bed.
- c. Lightly irrigate the nursery beds a day before TPS sowing to keep the bed in moist conditions.
- d. Sow the pre-germinated TPS in 0.5cm deep furrows drawn 10cm apart across the breadth of the bed @ 2 g seeds/sq.m and cover these with 0.5cm layer of finely sieved FYM. Seedling raised per 10 sq. m nursery can cover 1500-1600 sq. m area. About 120g TPS and a nursery bed area of 75 sq. m are required for raising seedlings for transplanting in one hectare. Sprinkle water on the seedbeds 2-3 times a day for about a week after sowing the TPS using a sprayer or a gardeners water can to keep the seedbed moist (avoid excess water). Care should be taken so that seeds are not distributed during irrigation and to avoid run-off waters. Subsequently sprinkle water once or twice a day.
- e. Protect the nursery beds from direct bright sun light by providing thatch grass shade during mid day for 10-12 days after sowing. Remove the cover in the late afternoon and put it by morning (8-10 am). However, shade should be provided to protect the seedlings from rain, whenever necessary.
- f. Nursery bed should be weed free.
- g. After the germination is completed and the leaves start emerging (around 10 days) spray on the seedlings every 4-5 days interval with 0.1% urea (prepared by dissolving 1g urea in 1 litre of water), till these are ready (4-5 leaf stage) for transplanting. The seedlings are ready for transplanting after 25-30 days of sowing.

Field preparation and seedling transplanting:

- a. Prepare the field as per normal recommended practice.
- b. Basal application (broadcasting) of N, P₂O₅ and K₂O (60:100: 100 kg/ha) at the last round of field preparation. Apply FYM @ 10 t/ha during field preparation.
- c. Prepare the ridge at 50 cm apart in the East-West direction. Irrigate the furrows one day before transplanting of seedlings. However, irrigation may not be applied if sufficient moisture (around field capacity) remains in the soil, particularly on ridges.
- d. Carefully uproot the seedlings from nursery beds and carry them to the field in a basket. Transplant one seedling per hill in north facing ridges at 10 cm. spacing. Transplanting should be done preferably in the afternoon.
- e. Irrigate the furrows after transplanting to keep the soil moisture in root zone (ridge) at

field capacity. While irrigating, care should be taken not to submerge the seedlings. Irrigate the crop every third/fourth day subject to the moisture condition of the soil, till the seedlings get established. Thereafter, frequency of irrigation can be restricted to one in 8-10 days.

- f. Gap filling should be done within a week of transplanting.
- g. Spray 0.2% dursban on the 4th day after transplanting to protect the seedlings from cutworms.
- h. Light manual interculture operation (using *khurpi*) to be performed at about 10 days to loosen the soils in the root zone.
- i. Earthing up should be done 20-25 days along with the application of 25 kg of N/ha. Care should be taken during earthing up so that seedlings come to lie in the center of the ridges and maximum nodes are covered with soil leaving open the top 5-6 upper leaves.
- j. Second earthing up should be done at tuborization stage (45-50 days). The remaining cultural operations to be followed are similar to standard cultivation practices for potato crop. However, fungicides should be applied only when disease symptoms are visible on the leaves.
- k. De-haulm the crop after 105-110 days of transplanting.
- l. Harvesting is done 10-12 days after dehaulming.

2. Seedling Tuber Production:

To produce seedling tubers, the procedure to be followed for nursery bed preparation are identical to the methods recommended in raising seedling for transplanted potato crop, except the practices mentioned below :

- a) Add NPK fertilizers @ 60: 100: 100 kg/ha to the FYM substrate and mix properly.
- b) Irrigate the nursery beds a day before sowing of TPS.
- c) Mark the rows in the nursery beds at 10 cm. inter row distance. Sow 2-3 seeds at 10 cm intra-rows distance at a depth of 0.5 cm and cover them with 0.5 cm. thick layer of fine sieved FYM.
- d) Irrigate the seedbed twice or thrice a day or as needed for a week after sowing, using water cane or sprayer, ensuring that the soil is kept moist (field capacity) without any run-off water. Subsequently, irrigate once or twice in a day to keep the beds moist.
- e) Provide shade initially as mentioned in earlier methods to protect from rain, bright sunshine etc.
- f) After 10 days of emergence, spray the seedlings with 0.1% urea on every third or fourth day for boosting up the growth and vigour of the seedlings. Spraying of urea solution should be stopped when the seedlings become vigorous.
- g) When the seedlings attain a height of 15cm, cover the lower-most three internodes of the seedlings with additional quantities of substrate mixture and repeat the earthing up

three times at an interval of 7-8 days.

- h) Proper and timely weeding is essential. Follow the usual cultural practices like irrigation, plant protection etc.
- i) Cut haulm at the age of 90-95 days.
- j) Harvest the seedling tubers after 12-15 days of haulm cutting.

Cultivation of Potato crop from Tuberlets:

The seedling tubers produced either by direct seeding of TPS or from transplanted potato crop are planted in the field in the next season. The method is similar to the recommended conventional cultivation practices of potato crop, except the variation in spacing according to seed rate and seed size.

Tuberlet size (g)	Inter-row spacing (cm)	Seed rate (q/ha)
20-40	20	25
10-20	15	17
*5-10	10	12

In case of 5g two tuberlets should be planted. Moreover, seedling tubers (tuberlets) can be used for 3-4 successive years if seed plot technique is followed appropriately.