



Package of practices for ware and seed potato production in Central Indo-Gangetic plains



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Ware potato production

1. **Hot weather cultivation:** To keep the potato fields free of common weeds and soil borne diseases like scabs and black scurf, plough the fields during the summer months when temperatures are above 40°C. Keep the land open in ridge and furrows during May and June to reduce incidence of soil borne diseases and control perennial weeds. If need be, irrigate the fields once in May to make workable soil for ridging at least twice, at a fortnight interval.
2. **Green manuring:** Green manuring with *dhaincha* (*Sesbania* sps.), *sanai* (*Crotalaria* sps.) or *Lobiya* (cowpeas) be done in *kharif* (rainy season) before potato planting. This practice can reduce NPK doses by 20 to 30 per cent and improve the potato yields upto 3 t/ha because of improved organic contents and moisture retainability in such fields.
3. **Variety:** The following high yielding varieties are recommended for the region:

Crop season	Variety	Crop duration
Early crop (mid-sept.- early Dec.)	Kufri Chandramukhi	60-70 days
	Kufri Bahar	
Main Crop (Oct.-Feb)	Kufri Bahar	90-100 days
	Kufri Badshah	
	Kufri Suttlej	
	Kufri Lalima	
Late crop (Dec.-April)	Kufri Badshah	110-120 days
	Kufri Suttlej	

Recently released varieties, viz, Kufri Anand, Kufri Pukhraj are also suitable. Varieties best suited for processing namely Kufri Chipsona-1 and Kufri Chipsona-2 are also recommended for the region.

4. **Seed Source:** For growing ware potatoes the farmer should preferably have his, 'home grown seed'. Initial stocks should be obtained from a reliable source preferably from a Government seed producing agency. It is better to replace the initial seed every 3-4 years to maintain varietal purity and health standard to have optimum yield and size of ware potatoes.
5. **Seed size and spacing:** Always use well graded seed lots. Any size lot can be used profitably by adjusting inter and intra row spacing of seed tubers. Use well sprouted tubers. 30-40 g seed size is most economical but is always at a high price. In mechanical cultivation adjust intra row spacing at 10 to 30 cm for 30 to 100 g seed size, respectively.
6. **Seed preparation:** Seed potato should be removed from the cold store at-least 7-10 days before planting. Do not bring the bags directly from the cold store in high sun or high temperatures. The seed tubers should be spread in thin layers under shade in diffused light for proper and healthy sprouting. Unsprouted and rotted tubers should be removed from the seed lot. If stocks are already sprouted in cold stores, remove such sprouts as these will die out in the soil and delay germination due to slow resprouting in the field conditions.
7. **Planting time:** Planting should be done during 2nd to 4th week of September for early, 2nd-4th week of Oct. for main and mid-November to end December for late crop. The maximum day temperature at planting for early crop should be less than to 32°C for continuously 3-4 days and a minimum for late crop should be above 5-8°C.
8. **Manuring:** If green manuring is not possible then apply 15-20 t/ha well rotten FYM before planting. If FYM is applied, then only half the dose of phosphorus and potassium is to be applied through fertilizers. Apply 100 to 120 kg nitrogen, 80-100 kg phosphate and 100-120 kg potash per hectare at the time of planting and 100-120 kg nitrogen per hectare at the time of

earthing up. Apply fertilizers in furrows, as side band so that the tubers do not come in direct contact with the fertilizers. If furrows placement is not possible and broadcast of fertilizer mixture is practised then increase the doses by at least 25% above NPK.

9. **Planting method:** Good tilth after pre-sowing irrigation ensures quick and good germination. Keep the seed in the furrows already drawn during the application of fertilizers. Under mechanical cultivation the spacing between the rows should be kept at 60-67 cm. and depending on the seed size the spacing between the tubers (40-80g), at 15-25 cm., and 55-60 cm x 10-30 cm in manual cultivation method for seed sizes of 30 to 100 g. At least 8-10 cm soil covering on seed tubers is required immediately, to avoid soil moisture loss at planting.
10. **Interculture:** Weeding and earthing up of the crop should be done within 20-25 days of planting, preferably when the potato plants are about 8-10 cm high. The final earthing up after weeding should be done quickly after weeding and top dressing of nitrogen, to avoid plant wilting due to root injury of the plants.
11. **Irrigation:** First irrigation should be given after planting at 12-15th day (2-5% germination). This is advantageous for uniform growth and timely interculture. To avoid damage or slipping of the ridges, the first irrigation should be up to half the ridge height only and second irrigation should be given after about a week. Subsequent irrigations are given as and when required. In no case the crop should have moisture stress after tuberization and till rapid bulking which normally occurs between 30 to 70 days depending on variety and crop season. Too heavy irrigations in the heavy soils or too light irrigations in the light soils should be avoided. After earthing up, irrigate crop within 2-3 days. Stop irrigation about 6-8 days before harvest in early crop. For the main crop stop irrigation when 25-30% plants have shown maturity.
12. **Plant protection:** For early crop, insecticidal spray with monocrotophos 40EC @1.2 l/ha and dicofol 18EC @ 2 l/ha at 30-35 days is essential against white flies, leaf hoppers and mites. Prophylactic spray with 0.2% solution of mancozeb should be given by first week of December. While spraying, it should be

ensured that the foliage is thoroughly covered with the chemical sprays. Use fine mist producing spray nozzles and repeat sprays at 10-12 days intervals if clouds are seen for 2-3 days continuously. When late blight infection is noticed, use Metalaxyl formulations (Metco or Ridomil). If any damage is noticed at any stage due to leaf eating caterpillars, spray the crop with monocrotophos 40 EC @ 1.2 l/ha or with Carbaryl @ 2.5 kg/ha in 600-800 litres of water.

- 13. Harvesting and marketing:** The crop should be harvested at 60-70 days for early crop for getting high price. For main crop it should be as soon as it matures and certainly before April end for late crop. Potatoes after harvest should be cured by keeping in heaps for 10-15 days in shade or under covers of mats or dried straw. All damaged and rotted tubers should be removed at harvest before heaping. Grade the potatoes in appropriate grades/sizes and pack in gunny bags. Care should be taken to avoid greening of potatoes due to exposure to sun. Such potatoes are unsaleable upon bitter taste and difficulty in cooking. The bags should be kept in a cool place before sending to market or cold stores. In late crops harvested produce should be always heaped under shade to avoid rottage due to charcoal rot and sun burns at harvest because of high temperatures above 32-35°C

Seed potato production

Seed is the costliest input in potato production and accounts for nearly 50% of the cost of cultivation. In a seed programme, foundation/certified seed is produced under registration of the State Seed Certification Agency and as per their prescribed standards of seed production. Only notified/released varieties purchased from Central/State seed producing agencies and grown in low aphid areas having soil/seed free from scab, nematode and brown rot are permissible under Seed Act.

There is not much difference in the field preparation for seed and ware potatoes. Therefore, majority of agronomic practices except the timely field operation and plant protection measures to ensure disease freedom and check of aphid vectors in seed potato crop remains the same as described above for table potatoes. However, the cultivation

practices differ and are important in seed production and detailed hereafter.

All the practices recommended here are for 'Home Grown Seed' by the farmers for their own use. In case tagged grade of foundation or certified seed is to be grown, then seed of at least one grade superior has to be brought to begin with the seed programme.

1. **Hot weather cultivation and Green manuring:** Same as for ware Potato.
2. **Variety:** The following varieties are recommended for the region which can be successfully grown in seed programme:

Crop season	Variety	Seed crop duration
Early crop	Kufri Ashoka Kufri Chandramukhi Kufri Lauvkar	70-80 days
Medium	Kufri Suttlej Kufri Bahar Kufri Jyoti Kufri Lalima (Red tubers)	80-90 days
Late crop	Kufri Badshah Kufri Sindhuri (Red tubers)	80-100 days

Varieties like Kufri Anand, Kufri Chipsona-1 and Kufri Chipsona-2 which were released recently have also been recommended for the region.

In seed production all the suitable varieties grown here or even those which are in demand elsewhere can be taken up in seed programme. Actually this is the area where longest seed growing season is available before aphid population reaches critical level.

3. **Seed source:** The seed should be obtained from a reliable source, preferably from a Government seed producing agency. It is better to replace the seed every 3-4 years. Seed tags and

proof of its certification for one of the superior stage than proposed to be grown, is essential for registration and certification of fields, for seed purposes.

4. **Seed size and spacing:** For seed production, larger seed size is preferred and always use seed tubers having multiple sprouts, since they produce larger number of seed size tubers. Closer intra-row spacing of 15 to 25 cms for medium to large seed grade, respectively, ensures more production of seed size tubers.
5. **Seed preparation:** Seed potato should be removed from the cold store at least 10 days before the planting date. Do not bring out the seed bags in direct sun as it will result in rottage due to sudden exposure to high temperature. The tubers should be spread in thin layers (2-3 only) in a shed or in a cool place for sprouting. Unsprouted and rotted tubers should be removed. Sprouted tubers should be taken to the field in seed trays or baskets for planting so that sprouts are not broken in handling.
6. **Planting time:** Plant the crop preferably by mid-October. Avoid early planting, as this produces lanky plants with small leaves and few tubers. Seed crop should not be planted late as it allows less than 80 days for proper crop growth and tuber yields before dehauling in early January, when aphids population starts building up on potato crop. Any way, at least 75, 85 and 95 days of crop period is required for early, medium and late maturity varieties for seed purposes.
7. **Manuring:** The manuring is done similar to that of ware crop except that N doses should be moderate and not more than 150-200 kg/ha. Delayed top dressing delays the crop tuberization and bulking which is not desirable for seed crop.
8. **Interculture:** Chemical weed control by 200 g per ha of Sencor spray as pre-emergence just after planting or 2 l/ha Gramaxone as post-emergence of weeds at 5-10% potato germination is recommended for seed crop. Usually, when the potato plants are 8-10 cm tall, earthing up is done soon after manual or mechanical weeding preferably within 20-25 days of planting. Weeds in seed crop are better controlled by spraying weedicide to avoid spread of contact transmitted viruses like PVS & X.

9. **Irrigation:** Pre-planting irrigation is advantageous for ensuring uniform germination. If this has not been given, then the first irrigation should be given within 2-3 days after planting. Subsequent irrigations should be given as required. Both excess and under irrigations should be avoided. Stop irrigation about 10 days before haulm cutting in a seed crop by end of December.
10. **Roguing:** During crop season, examine the seed plot thrice to remove off-type and diseased plants showing mottling, mosaic, veinal necrosis, crinkling, rolling of leaves, marginal flavescence and purple top roll. First roguing is done 20-25 days after planting and immediately before earthing up. Second roguing should be done 50-55 days after planting. Care should be taken to ensure that all the tubers along with the diseased and off -type plants are removed in roguing. The third inspection is to be carried out just before haulm cutting. Seed plot registered for seed production is to be monitored for visible mosaics and off types as per seed inspector's advice to achieve the health standard of the category of the stocks raised.

11. **Plant Protection**

- (i) **Control of insect pests:** Apply granular insecticide such as phorate 10G @ 10 kg/ha at the time of earthing up to prevent infestation of aphid vectors which generally appear in December. The actual appearance will depend upon the prevailing atmospheric conditions. When aphids are seen on the crop spray dimethoate 30EC or methyl dedmeton 25EC @ 1.0 litre/ha (Rogor/ Metasystox) in 1000 litres water by the end of December to control leaf hoppers and aphids. For controlling cut worms, drench the ridges with chloropyriphos 20EC @ 2.5 l/ha in 1000-1200 litres water when 2% damage to the plants due to cut worms is noticed. For controlling defoliators, spray the crop with endosulfan 35EC @ 1.5 l/ha or with carbaryl @ 2.5 kg/ha in 1000 litres water. All sprays are to be need based only.
- (ii) **Control of fungal diseases:** In the plains sometimes fungal diseases such as early blight and Phoma appears. Late blight damage the potato crop when winter rains occurs in December. To control them, prophylactic sprays with 0.2%

solution of mancozeb (2 kg/ha) may be given in the early December. If cloudy weather continues and late blight observed on crop, spray metalaxyl @ 1.5 to 2.0 kg/ha. For sprays, insecticides and fungicide can be combined.

13. **Haulm killing:** Cut the haulms of seed crop when 20 aphids/100 compound leaves are observed on unsprayed crop. This occurs between 5th to 10th January. Cut the plants at the ground level to prevent regrowth. Ensure that no regrowth appears on the stumps after dehauling, as tender and succulent leaves attract the aphid vectors. In case large areas of seed crop is to be dehauled within a limited time, then spray 2.5 to 3.0 litres of Gramaxone to dry out the crop before critical date and then remove the dried stems afterwards.
12. **Harvesting and grading:** Harvesting should begin 20-25 days after haulm killing, when the skin of the tubers has become firm. Harvesting should not be delayed beyond 30°C soil temperatures under any circumstances to avoid charcoal rot. Keep the freshly harvested tubers in heaps in a cool place for about 10 days. The size of the heap should be up to one metre high and 3-4 metres broad. Cover the heaps with mats or paddy/sugar straw to protect them from direct sunlight. If it rains, the heap should be covered with tarpaulins which should be removed immediately after rains to avoid rotting. Grade the tubers according to their sizes preferably in four groups, small (below 25 g), medium (25-50 g) large (50-75 g) and extra large (above 75 g). At the time of grading, cut and crack tubers should be again sorted out.
13. **Seed treatment:** After grading, wash the tubers in water. Dip the tubers in 1% chlorocin solution, if the clayey soil is still sticking on the tuber surface rinse again in water. Treat well washed seed tubers in 3% solution of boric acid for 30 minutes to control surface borne diseases like black scurf and scabs. The solution for this treatment can be used 20 times, if the tubers have been thoroughly washed. After treatment, ensure that the tubers are dried properly. Pack the seed tubers in gunny bags with proper labelling for marketing as seed. Treated tubers should not be used for table purposes.
14. **Storage:** Store the seed bags in a cold store. Label the seed bags as treated so that it does not get mixed up with the table

potatoes stored in the same cold store. Send the seed potatoes to the cold store by 15 March otherwise the rising temperature will adversely affect the quality of seed potatoes.

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