



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



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Package of Practices for Ware and Seed Potato Production in Eastern Indo-Gangetic Plains

Ware potato production

1. **Hot weather cultivation:** Plough the fields during the summer months of April-June. Keep the fields open and give one or two turnings to the soil during the hot summer days to reduce incidence of soil borne diseases and weeds.
2. **Green manuring:** Practice green manuring with dhaincha before potato planting, to reduce N, P and K doses by 20-30% and improve the potato yield by 3 t/ha.
3. **Variety:** Grow the following high yielding varieties.

| Maturity class period | Variety | Maturity |
|--------------------------|--------------------------------------|--------------|
| Early | Kufri Chandramukhi (white tuber) | 70-80 days |
| | Kufri Ashoka (white tuber) | |
| Medium | Kufri Jyoti (white tuber) | 90-100 days |
| | Kufri Lalima (red tuber) | |
| | Rajendra Potato-2 | |
| Late | Kufri Badshah (white tuber) | 110-120 days |
| | Kufri Sindhuri (red tuber) | |
| | TPS/C-3, HPS. 1/13 (white tubers) | |
| | Rajendra Potato-1 | |

Recently released varieties like Kufri Anand, Kufri Pukhraj and processing varieties like Kufri Chipsona-1 and Kufri Chipsona-2 are also suitable for the region.

4. **Seed source:** Obtain seed from a reliable source preferably from a government seed producing agency. Replace the seed stock every 3-4 years because the yield is reduced progressively if the same seed is used year after year.
5. **Field preparation:** After green manuring, prepare the field for planting. The field should be levelled and provide good drainage. The potato does not thrive on wet and undrained soil. Well drained sandy loam and loamy soils are most suitable for potato cultivation. Plough the field with a mould-board plough or disc-harrow followed by one or two tillings with a tiller or a *desi* plough. It is better to plank the soil after each round of tilling. Planking and tilling can be combined.
6. **Seed size:** Use well sprouted tubers or cut pieces weighing 30-40 g each. As far as possible use whole tubers as seed.
7. **Seed preparation:** Remove the seed potato from the cold store at least 10 days before the planting date. Keep the seed bags in precooling chamber of the cold store for 24 hours. Bringing tubers from the cold store directly outside will result in condensation and promote rotting. Do not expose the seed tubers in the bags to the sun. Spread the tubers in shade or in a cool place for sprouting. Remove unsprouted and rotted tubers. Carry sprouted tubers to the field in seed trays or baskets for planting.
8. **Planting time:** Plant the early crop in the last week of September or first week of October, the main crop in the last week of October or in the first week of November and the late crop after paddy in the last week of November or first week of December. In the plateau region of Chhota Nagpur (Bihar), plant the *Kharif* crop in the second or third week of July. In North Bihar plant the crop in the first fortnight of November.
9. **Manuring:** (a) Apply 15-30 t/ha well rotten FYM in furrows at the time of planting. 30 t/ha FYM can take care of phosphorus and potassium needs of potato crop. If FYM is applied at 15 t/ha, then half the dose of phosphorus and potassium is to be applied through fertilizers.

(b) The optimum dose of inorganic fertilizer will depend upon the soil fertility, crop rotation and growing period of the variety.

Generally, 90 kg nitrogen (3.6q calcium ammonium nitrate), 60 kg phosphate (3.75q single super phosphate) and 120 kg potash (2.0 q muriate of potash) per hectare at the time of planting and another 90 kg nitrogen (3.6q calcium ammonium nitrate) per hectare at the time of earthing up are recommended. For basal application, apply the fertilizers in the furrows, cover them partially with soil and then plant the tubers so that they do not come in direct contact with the fertilizers. In calcasious soils of North Bihar copper and zinc in proper dose should be applied.

10. **Planting method:** (a) Keep the seed in furrows already made for the application of fertilizers. In planting with tractor, keep spacing between the rows at 60 cm and between the tubers at 20 cm. Cover the tubers with soil after planting, using a ridger or a spade,

(b) Potatoes are also planted by dibbling on ridges. Open furrows 60 cm apart with narrow spade or tractor driven marker in East-West direction and keep the soil on the southern side forming the ridges. Place the fertilizer mixture on the northern side of the ridge and cover it with 3-4 cm of soil. Dibble the tubers on the ridges at a distance of 20 cm and at 5-6 cm depth. Alternatively use a tractor driven fertilizer drill-cum-potato planter or a fertilizer drill-cum-marker for making furrows to reduce the number of field operations.
11. **Mulch:** If any plant material such as paddy straw, wheat husk or farm refuse is available, apply it on the ridges as mulch. Early planted crop must be mulched. Remove the mulch 20-25 days after planting for interculturing and earthing up operations. Mulch reduces the soil temperature by 4-5 °C, helps to conserve soil moisture and also controls weeds.
12. **Interculture:** After 25 days of planting, when the potato plants are 8-10 cm high, remove the weeds by using either a tractor driven spring tine cultivator between the rows or by *khurpi*. Apply the remaining dose of nitrogen and cover it with soil to make a thick ridge with the help of narrow spade or tractor driven potato ridger.
13. **Irrigation:** Give one irrigation before planting to ensure uniform germination. If pre-irrigation has not been given then the first irrigation may be given the day after planting. The post planting

irrigation should be light. Give subsequent irrigation at 6-10 days interval in sandy loam soil and 10-12 days in heavy soils. Do not let the ridges submerge under water in any case. Stop irrigation 10 days before harvest.

14. **Plant protection:** (i) Normally, early blight, *phoma*, and late blight diseases start appearing from December. To control them, spray 0.2% solution of mancozeb at 10-15 days interval beginning from the first week of December. Ensure that all parts of the plants including the lower surface of the foliage are completely covered with the spray solution. In case, late blight is not controlled by mancozeb, crop is to be protected through sprays of matalaxyl preparations like Ridomil MZ, Matco or Kriilaxyl @ 2.0 l/ha.

(ii) If leaf eating caterpillars damage is noticed, spray the crop with monocrotophos 40EC @ 1.2 l/ha or with carbaryl 50WP @ 2.5 kg/ha in 1000-1200 litres water.
15. **Harvesting and marketing:** Harvest early potato when the prices are remunerative. Kufri Chandramukhi can be harvested 60-70 days after planting. Harvest the late crop before the temperature rises above 25-28°C to avoid tuber rottage from soft rot or charcoal rot. It is better to harvest the crop with the help of a tractor or bullock drawn potato digger because they cause less tuber damage than when harvested with *khurpi*.

After harvest, air-dry and keep the tubers in heaps for 10-15 days in shade for curing of skin. Remove all damaged and rotten tubers. In order to get better returns, the produce should be graded and packed in gunny bags. Do not expose the tubers to light as far as possible, other wise they will become green, bitter in taste, difficult to cook, and disliked by consumers.

Seed potato production

If the seed is meant for sale, consult the state seed certification agency about the choice of variety, seed source and seed certification standards.

1. **Hot weather cultivation:** Plough the field during the summer months of April-June. Keep the fields open and give one or two

turnings to the soil during hot summer days to reduce incidence of soil borne diseases and pests, also control perennial weeds.

2. **Green manuring:** Green manuring with *dhaincha* before planting can reduce N, P & K doses by 20-30 per cent and improve the potato yield by 3t/ha.
3. **Variety:** Grow the following high yielding varieties.

| Maturity class | Variety | Maturity period |
|----------------|--|-----------------|
| 1. Early | Kufri Chandramukhi (white tuber) | 70-80 days |
| 2. Medium | Kufri Ashok (white tuber) | 90-100 days |
| | Kufri Jyoti (white tuber) Kufri Lalima (red tuber) Rajendra Potato-2 | |
| 3. Late | Kufri Badshah (white tuber) | 110-120 days |
| | Kufri Sindhuri (red tuber) | |
| | Rajendra Potato-1 | |

4. **Seed source:** Procure the seeds from the state agriculture, horticulture department or the national or state seeds corporation. Use only foundation or certified seed for multiplication. Replace the seed stock after 3-4 years.
5. **Field preparation:** After green manuring, prepare the field for planting. Level the field and provide good drainage. The potato does not thrive on wet and undrained soil. Well drained sandy loam and loamy soils are most suitable for potato cultivation. Plough the fields with a mould-board plough or disk harrow followed by one or two tillings with a tiller or a *desi* plough.

Plank the soil after each round of tilling. Planking and tilling can be combined.
6. **Seed size:** Use well sprouted tubers weighing about 40 g each. Well sprouted tubers having multiple sprouts produce more number of seed size tubers. Do not use cut tubers for raising seed crop.

7. **Seed preparation:** Remove the seed potato from the cold store at least 10 days before planting. Keep the seed bags in pecooling chamber of the cold store for at least 24 hours. Do not bring the seed bags outside directly from cold stores as it will result in rottage due to immediate exposure to high temperature. Do not expose the seed tubers to the sun. Spread the tubers in shade or a cool place for sprouting. Remove unsprouted and rotten tubers and plant only sprouted tubers.
8. **Planting time:** Plant the seed crop during the last week of October or first week of November. Do not plant early as this will produce lanky plants with deformed leaves. The actual time for planting may, however, vary with the prevailing temperature and other factors such as crop rotations followed etc.
9. **Manuring:** (i) Apply 15-30 t/ha well rotten FYM in furrows at the time of planting. 30 t/ha FYM can take care of phosphorus and potassium needs of potato crop. However, if FYM is applied at 15t/ha, then half the dose of phosphorus and potassium is to be applied through fertilizers.

(ii) The optimum dose of inorganic fertilizers depends on the soil type, soil fertility, crop rotation and related factors. The seed crop should be supplied with 90 kg nitrogen (3.6 q calcium ammonium nitrate), 60 kg phosphate (3.75 q single super phosphate) and 120 kg potash (2.00 q muriate of potash) at the time of planting and 90 kg nitrogen (3.6 q calcium ammonium nitrate or 1. 5 q urea per hectare at the time of earthing up. Do not apply excess nitrogen as it will be difficult to rogue out diseased plants from such plots and it will result in more number of large size tubers with consequent reduction in the number of seed sized tubers. Apply fertilizers in furrows, then cover the furrows partially with soil so that the tubers do not come in direct contact with fertilizers.
10. **Planting method:** (i) Keep the seed in furrows already made for the application of fertilizers. In planting with tractor, keep spacing between the rows at 60 cm and between the tubers at 20 cm. Cover the tubers with soil after planting using a ridger or spade

(ii) Potatoes are also planted by dibbling on ridges

Open furrows 60 cm apart with narrow spade or tractor driven marker in East-West direction and keep the soil on the southern

sided forming the ridges. Place the fertilizer mixture on the northern side or ridge and cover it with 3-4 cm of soil. Dibble the tubers on the ridges at a distance of 20 cm and at 5-6 cm depth. Alternatively, use a tractor driven fertilizer drill-cum potato planter, or a fertilizer drill-cum-marker for making furrows to reduce the number of field operations.

11. **Interculture:** After 25-30 days of planting, when the plants are 8-10 cm high, remove the weeds using a tractor-driven spring tine cultivator, better control weed by spraying paraquat dichloride @ 2.5l/ha dissolved in 1000 litres water. Weedicide spray is given when the plant emergence is about 5%. Apply the remaining dose of nitrogen. Mix it with a spring tine cultivator and earth up to make a thick ridge with the help of a narrow spade or tractor driven potato ridger. Care should be taken that the plants are not disturbed during cultural operations.
12. **Irrigation:** One irrigation before planting is advantageous for ensuring uniform germination. If pre-irrigation has not been given, then the first irrigation should be given soon after planting. The post planting irrigations should be light and subsequent should be given at 6-10 days interval in sandy loam soil and at 10-12 days in heavy soils. Normally, the soil should remain moist but not become too wet. Do not let the ridges submerge under water in any case. Stop irrigation 7-10 days before haulm cutting. Under north Bihar conditions only three irrigations are required.
13. **Roguing:** During crop season, examine the seed plots at least thrice to remove off-types and diseased plants, e.g. those showing mottling, mosaic, veinal necrosis, crinkling, rolling of leaves, marginal flavescence and purple top roll. Complete first roguing 20-30 days after planting. Remove the diseased and off-type plants along with their tubers. Third roguing is done 3-4 days before haulm cutting. Collect diseased plants in a bag and bury in a pit away from the field.
14. **Plant protection: (I) Control of insect pests :** For aphids and leaf hoppers, apply granular systemic insecticides such as phorate 10 G @ 10kg/ha at the time of planting and a second dose at the same rate at the time of earthing up. If necessary, spray the crop with dimethoate 30 EC or methyl demeton 25 EC @

1.0 l/ha in 1000 litres water by first week of January to check leaf hoppers and aphid build up. Repeat the spray after 10-15 days interval, if required.

If leaf eating caterpillar damage is noticed, spray the crop with endosulfan 35 EC @ 1.5 l/ha or with carbaryl 50 WP @ 2.5 kg/ha in 1000-1200 litres water. If cut worm damage is observed in more than 2% of the plants, drench the ridges with chloropyrifos 20EC @ 2.5 l/ha in 1000 litres water.

(ii) **Control of fungal diseases:** Normally early blight, phoma and late blight diseases start appearing from December. To control them, 0.2% solution of mancozeb may be sprayed at 10-15 days interval beginning from the first week of December. While spraying, it should be ensured that all parts of the plant including the lower surface of the foliage are completely covered with the spray solution.

15. **Haulm cutting:** Stop irrigation 7-10 days before haulm killing. Cut the haulms when 3-5 green peach aphids/100 compound leaves are observed. Normally this occurs between 10-15 January. Cut the plants at ground level. Ensure that all regrowths appearing on the stumps after dehauling are promptly removed, as tender and succulent leaves attract the aphid vectors. For killing the haulms, paraquat dichloride @ 2.5 l/ha in 1000 litres water has also been found to be effective. Two sprays at 4-7 days interval are necessary to completely kill the haulms.
16. **Harvesting and grading:** Harvest 10-15 days after haulm killing when the skin of the tubers become firm. Complete the harvesting by 15 February and do not delay beyond 4th week of February, as this may result in tuber rot due to soft rot and charcoal rot. Harvesting is better done by a tractor driven or bullock drawn potato digger, as it causes less tuber damage than when done by a *khurpi*. After harvest, keep the potatoes in heaps in a cool place for about 10-15 days for curing of the skin. The height of the heap should not be more than 1-1.5 meters.
17. **Seed treatment:** After grading, wash the tubers in water and then dip in 1% chlorocin solution followed by rinsing in water and treating in 3% solution of boric acid for 30 minutes to control surface-borne diseases. 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 being poisonous should not be used for table purposes.

18. **Seed storage:** Store the seed bags in a cold store. Label the seed bags as 'poisonous' so that they do not get mixed with table potatoes stored in the same cold store. The seed potatoes should be sent to the cold store by 15 March, as otherwise the rising temperature will adversely affect the tubers in various ways. The bags should be kept in pre-cooling chamber before loading in the cold store. The temperature inside the cold store should be maintained at 2-4°C during storage and the relative humidity should be maintained above 95%. The stored bags should be inspected periodically. The bags should be stacked in the cold store in a manner as to allow free circulation of air.

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