



## Package of practices for ware and seed potato production in North-Western hills



Central Potato Research Institute  
(Indian Council of Agricultural Research)  
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## Package of Practices for Ware and Seed Potato Production in North-western Hills

In India, potato covers an area of about 1.01 million hectares producing nearly 20 million tonnes with an average yield of about 17 tonnes per hectare. The area in the Indo-Gangetic plains is about 90 per cent of the total acreage under potato and remaining 10 per cent lies in the hills.

In North-western high hills potato is one of the most important cash crop. Beside bringing good monetary returns to the farmers, this crop also gives employment to the landless labourers of the region. Seed produced in the high hills is used for raising potato crop in areas like Karnataka, Gujarat, Maharashtra, West Bengal and Punjab. The hills are suitable for raising healthy seed potatoes due to high winds, high humidity and low temperatures, resulting in absence or low population of aphids responsible for transmission and spread of viral diseases.

Potato being vegetatively propagated crop, is prone to many pests and diseases. Of these, viral diseases are of prime importance. Presence of these degeneration diseases in seed stocks, reduce the yield potential of crop progressively, if such seed stocks are used year after year. It is also a prerequisite condition for growing the seed and table potatoes that the soil should be free from any soil borne pathogens like brown-rot, common scab, root knot nematodes, etc.

### Major problems

The major problems of the hilly regions are as follows:

- (i) Non-availability of the inputs like quality seed of recommended cultivators, fertilizers, plant protection chemicals and equipments
- (ii) Lack of adoption of improved cultural practices
- (iii) Prevalence of diseases, varietal impurity that harbour the potato diseases, therefore, fields planted with leguminous or cereal crops in previous years should be selected for raising a seed crop.

## Ware Potato Production

**Cultivar** : Kufri Jyoti and Kufri Giriraj being late blight resistant are most suitable for cultivation in North-western and UP hills.

**Seed source** : Seed should be procured from a reliable source, preferably from seed producing agency, like the state Agriculture/Horticulture Department, Seed Corporations etc. It is advisable to replace the seed after 3-4 years.

**Seed size** : Well sprouted seed weighing 40-50 g should be used for planting.

**Seed preparation** : Seed should be pre-sprouted for 15 days in diffused light in baskets, or sprouting trays (75x45x25cm) or spreading in a ventilated room to develop thick, green and multiple sprouts before planting, for ensuring quick-uniform and full germination. Remove unsprouted and rotted tubers periodically. This also helps in achieving, more number of stems per plant, early establishment, bulking and maturity, resulting in higher yields with more number of seed size tubers. Take well sprouted tubers for planting in a basket or in sprouting trays to avoid damage to sprouts.

**Selection of the field** : Potato grows well in sandy or sandyloam soils because the loose soil allows its root system, stolon and tubers to spread freely. Ground keepers or volunteers plants are known to reduce the varietal purity and harbour diseases. In, soils severely infected with brown rot, 3-5 year rotation should be followed. Soil burning with organic matter is also recommended for sick soil infected with this disease. Further, use of cut seed should be avoided.

**Planting time** : In higher hills (1800M ASL), plant potatoes during second week of April. In lower hills (800-1800M ASL), plant during December-January.

**Manuring** : (i) Apply farm yard manure (FYM) 25-30t/ha. It is better to apply half of it by broadcast after the previous main crop harvest and plough it into the soil, and the rest, just before planting in furrows.

(ii) Apply also in furrows 100-120kg nitrogen (4.0-4.8q as calcium ammonium nitrate), about 100 kg phosphate (6.25 q single super phosphate) and 100 kg potash (1.65 q muriate of potash) per hectare. If FYM has been applied 25-30t/ha, the doses of phosphate and

potassium can be reduced by half. Nitrogen is best applied in two split doses, 100 kg at planting and 20 kg at the time of earthing up. The fertilizer should be covered with soil before planting tubers to avoid direct contact with fertilizer.

### **Method of planting**

Make furrows across the slopes at 60 cm distance between the rows. Making the furrows against the slope and not along the slope, is important and necessary to avoid soil erosion. Plant the crop in 4 m small beds and after every bed, provide drains to drainout excess rain water. Apply FYM and fertilizers in furrows and plant 40-50 g tubers in them at 20-25 cm distance. For smaller size tubers a closer spacing and for bigger size a relatively wide spacing should be followed. Cover the tubers immediately after planting by making small ridges of 10-15 cm height over the furrows.

**Mulching** : It is better to cover the ridges after planting with any plant material or farm waste such as pine needles, straw etc. to conserve soil moisture and thus ensure quicker and better germination.

**Interculture** : Interculture operations, such as weeding and earthing up are taken up according to the availability of soil moisture. These operations are delayed, if the soil moisture is inadequate after planting. If there is of weed growth, weeding may be done when potato plants are 10-15 cm high. Undertake final earthing up when the crop is about 6-8 weeks old. At this time, apply 20 kg of nitrogen.

**Plant protection** : (i) Potato is severely affected by white grubs in this region. During years of extended dry spells, cut worms and defoliators may also damage the crop. For controlling white grubs, integrated approach is recommended by applying Carbofuran 3G or phorate-10G @ 2.5kg a.i./ha at earthing up. For cut worms, drench the ridges with Chlorpyriphos 20EC @2.5 l/ha. in 1000-1250 litres water after 75% germination has been obtained and 2% plant are damaged. For defoliators, spray the crop with monocrotophos 40EC @ 1.2 /ha or carbaryl 50% WP@ 2.5 kg/ha in 1000-1200 litres water. If pest incidence continues, give a second spray. Do not apply heptachlor and aldrin dusts as recommended by some agencies, because of longer persistency of their residues in tubers and their use has been banned for this purpose.



(ii) **Control of fungal and bacterial diseases** : Several fungal diseases affect the potato crop in the hills. Late blight is the most important one. The others are *Cercospora bloch*, *Phoma* and early blight. To control these diseases, periodic sprays with 0.2% solution of mancozeb or bordeaux mixture (5:5:50) at 8-10 days interval is recommended with the onset of monsoon. While spraying, it should be ensured that the lower surface of the foliage is thoroughly drenched with the fungicide solution. A sticker should also be added to fungicide solution during rainy season. If the late blight is not checked with the spray of mancozeb then spray Ridomil MZ-72 @ 2.5 kg/ha (systemic fungicide).

Brown rot is the most important disease of Kumaon hills. Infected seed tubers and soil are the primary source of infection and perpetuation of the disease. It is advisable to use only the healthy seed, free from brown rot infection. The incidence of the disease can be reduced with rotational crops like maize, wheat, buck wheat, onion, garlic, cabbage, cauliflower and Lupin. In soil severely infected with brown rot, 3-5 year rotation should be followed. Soil burning with organic matter is also recommended for sick soil infected with this disease. Use of cut seed should be avoided.

**Harvesting and marketing** : Crop should be harvested as soon as it matures. Harvesting should be done preferably on bright sunny days. After harvesting, air-dry the tubers and keep in heaps for 10-15 days for skin curing. Sort out the damaged or rotten tubers. Grade the tubers into different sizes and pack in gunny bags according to grades. Store the bags in a cool place till the produce is sent to the market to avoid greening of tubers.

## Seed potato production

**Recommended cultivar** : Kufri Jyoti and Kufri Giriraj. Kufri Chandramukhi for Lahaul Valley of Himachal Pradesh.

**Seed source** : Obtain certified seed from an authorised agency, like state departments or government seed producing agencies or National Seeds Corporation.

**Seed size** : Use seed tubers of 40-50 gm weight having multiple sprouts. Well sprouted seed tubers having multiple sprouts produce large-number of seed size tubers. Do not use cut tubers as seed.

**Seed preparation** : Pre-sprouted seed, collected from the previous crop harvest, by keeping in baskets or sprouting trays or spreading in a ventilated room, exposed to diffused natural light to ensure development of green healthy sprouts should be planted. This will promote the production of multiple sprouts. Carry the sprouted seed to the field for planting only in seed trays or baskets to avoid sprout damage.

**Planting time** : In normal years, plant the crop in the second or third week of April. Early planting will cause cracking of tubers.

**Manuring** : Apply well rotten FYM @ 15-30 t/ha in furrows at the time of planting. 30t/ha can take care of phosphorus and potassium needs of potato crop. However, if FYM is applied at 15 t/ha, then half the dose of phosphorus and potassium is to be applied through fertilizers. Apply FYM after the snow fall when field preparation is done.

Apply 100-120kg nitrogen (4.0-4.8q calcium ammonium nitrate); about 100 kg phosphorus (6.25q single super phosphate) and 100 kg potash (1.65q muriate of potash) per hectare in furrows. Nitrogen is best applied in two split doses, 100 kg at planting and 20 kg at the time of earthing up. The fertilizer should be covered with soil before planting tubers to avoid direct contact with fertilizer.

**Planting** : Make furrows against the slope at 60 cm distance. This is important to avoid soil erosion. Apply FYM and fertilizer in furrows and plant the tubers at 20-25 cm distance using a *khilna* ( a hand tool used for cultivation in the hills) . Cover the tuber by making small ridges of 10-15 cm height immediately after planting.

**Mulching** : Cover the ridges after planting with any plant material or farm wastes such as pine needles, straws etc. to conserve soil moisture, which ensures quicker germination.

**Interculture** : Earth-up the beds after planting. Complete all the crop operations such as weeding and earthing up within 40-50 days of planting, so that the plants are least disturbed at later stages of crop growth. Apply the second dose of nitrogen at earthing up.

**Roguing** : The seed crop should be inspected at least thrice during the crop season, first at 50 to 55 days of planting, second at flowering time (70 to 75 day) and third, near maturity (100 to 105 days).

All undesirable plants showing symptoms of diseases, such as mosaics, veinal necrosis, crinkle, rolling of leaves, marginal yellowing and purple top roll should be rogued out alongwith their tubers. Ground keepers or volunteers should be rogued out alongwith mother tubers at an early stage.

### Plant Protection

- (i) **Insect pests:** White grubs, cut worms and defoliators may damage the crop. Cut worms become serious during early stages of the crop, particularly in the years of prolonged dry spell. White grubs can be controlled by applying phorate 10 G or carbofuran 3 G @ 2.5kg ai/ha at earthing up. For controlling cut worms, drench the ridges with chlorpyrifos 20EC @ 2.5 litre per ha in 1000-1250 liters of water after 75% germination has been completed. For controlling defoliators, spray the crop with Endosulfan 35EC @ 1.5 lit/ha. or carbaryl 50% WP @ 2.5kg/ha in 1000-1200 litre water. Do not apply heptachlor and aldrin in potato crop because of longer persistency of their residues in potato tubers. Their use has been banned. To control aphid vectors of various virus diseases, which appear in the hills during middle of July, spray the crop with oxydemeton-methyl @ 1.2 l/ha or dimethoate 1.0 l/ha in 1000-1200 litre water once or twice during July and August at 10 days intervals when the number of aphids reach 20 per 100 compound leaves.
- (ii) **Fungal diseases:** In the hills, several fungal diseases damage the crop. Among them, late blight is the most important one. Others are *Cercospora* blotch, *Phoma*, early blight etc. To control them, spray the crop with 0.2% mancozeb or bordeaux mixture (5:5:50) solution at about 10 days intervals with the onset of monsoon. If the late blight is not checked with the spray of mancozeb then spray Ridomil MZ 72 @ 2.5 kg/ha. While spraying, take care to see that the lower surface of the foliage are also covered with the spray solution. Add sticker to the fungicide solution when spraying during rainy season.

**Haulm Cutting :** Cut the haulms in the 2nd -3rd week of August as the crop starts maturing. This is done to prevent infestation by aphids. Bury cut haulms in pits, and do not leave them in the field. Ensure that there is no regrowth on the stumps after dehauling, as tender and succulent leaves attract aphids. Haulm can also be killed

by spraying Grammaxone (Paraquat dichloride) 2 litres in 1000 litres of water per hectare on clear sunny days.

**Harvesting, Grading and Marketing :** The crop should be harvested 15 days after haulm cutting when the fields are in workable condition and skin is mature. The produce should be graded in three sizes i.e. large (above 75 gm), medium (35 to 75gm) and small (below 25 gm).

**Seed treatment :** The produce meant for own seed should be treated with boric acid to control the surface borne diseases. After grading, wash the tubers in water. Dip the washed tubers in 1% Chlorocin solution and then rinse in water before treating with 3% solution of boric acid for 30 minutes. The solution for this treatment can be used 20 times if the tubers have been thoroughly washed. After treatment, ensure proper drying of the tubers.

**Seed Storage :** Keep the treated seed in wooden or plastic trays of convenient size (say 75cm x 45cm x 15cm) or in baskets or spread on floor in a well ventilated room. Expose the seed tubers to diffused light 15 days before planting. Take care that there is no risk of freezing during entire period of storage particularly in February-March. Turn over the seed potatoes, spread on the floor once in a week to ensure uniform greening of tubers. Do not store seed potatoes in gunny bags to prevent development of etiolated and lanky sprouts.

**For Further Information contact**

Director,  
Central Potato Research Institute  
Shimla-171001  
Phone: 0177-225073  
Fax: 0177-224460