

Potato Cultivation Under Organic Farming

M. Vijayakumar¹, S. Manivasakan^{1*}, B. Vinothkumar¹, C. Cinthia Fernandez¹, P. Raja¹, L. Rajendran² and S. Vennila³

¹ICAR-TNAU-Krishi Vigyan Kendra, GCP Doddabetta Post, The Nilgiris

²Horticultural Research Station, TNAU, Ooty, The Nilgiris

³Agricultural College and Research Institute, TNAU, Vazhavachanur

*Corresponding Author: manivasakan.s@tnau.ac.in

Potatoes (*Solanum tuberosum*) are a member of the family Solanaceae. More than a billion people worldwide eat potato. The potato is the third most important food crop in the world after rice and wheat in terms of human consumption. Organic potato production generally fits into a planned rotation on an organic farm. It is possible for a specialist potato farmer to grow organic potatoes on an organic farm. All other organic standards will still need to be implemented and the farmer will have to register with a certification body. It may also be possible to have a single field in organic crop production, providing it operates a suitable planned rotation, and organic potatoes can be adequately isolated from any other potatoes grown on the farm. Organic potatoes contain a higher content of nutritionally important minerals with a higher amount of vitamin C, iron, Magnesium and phosphorous. Moreover, organic potato production is of interest to many farmers as the crop:

- Is in demand from consumers
- Can be profitable
- Can be a starting point for a break crop from grass in the rotation
- Requires cultivation which help control weeds

Challenges of organic potatoes

Potato producers face two predominant challenges when they pursue organic farming: disease and nutrient management. Both factors are limited by regulations that on the one hand prohibit the use of chemical fertilizers, especially nitrogen and, on the other hand, most synthetic pesticides. Late blight, caused by *Phytophthora infestans* is the major disease in potato which limits the yield. Organic potato cultivation requires a whole system perspective, with particular focus on rotation design. According to the potato production specialist producing organic potatoes relies strongly on indirect, preventive and long-term strategic measures for both plant nutrition

and plant protection. Organic potato production has a number of challenges that must be tackled:

- Providing adequate nutrients
- Preventing potato blight
- Weed control

Organic producers have to rely on alternative approaches rather than artificial fertilizers and synthetic chemical herbicides and fungicides.

Selection of varieties for production of organic potato farming

Kufri Swarna, Kufri Giriraj and Kufri Chipsona- II are suited for organic farming since they are resistant to blight and nematode.

Soil

Planting date and soil temperature are the most important factors decide the germination as well as yield of the potatoes. The soil temperature must be around 8 °C or 6°C for pre sprouted potatoes. Moreover, soil must be sufficient dry condition. The soil should be friable, porous and well drained. The optimum pH range is 4.8 to 5.4. It is a cool weather crop. Potato is mostly grown as a rainfed crop. It is cultivated in regions receiving a rainfall of 1200 – 2000 mm per annum.

Depth of planting

Seed potatoes must be treated with Pseudomonas and Trichoderma and planted in a depth of two to three inch either in rows or in raised beds.

Season and planting

Hills

Summer : March – April

Autumn : August – September

Irrigated : January – February

Plains

October – November

Propagation

Use disease free, well sprouted seeds weighing 40 – 50 grams. Plant the tubers at 20 cm apart. Seed rate is 3000 – 3500 kg/ha.

Selecting potato varieties

In selecting varieties for organic production there are two simple rules:

- Grow varieties suited to organic production
- Grow varieties which best suit the intended market as with all organic produce, grow what will sell, not what you want to sell

Preparation of field

Prepare the land to fine tilth. In hills provide an inward slope of 1.40 in the terraces. Provide drainage channel along the inner edge of the terrace. Form ridges and furrows with a spacing of 45 cm between the ridges either by hand hoe or ridger.

Irrigation

Irrigate the crop 10 days after planting. Subsequently irrigation should be given once in a week.

Manuring

In potato production, crop rotations, cover crops and green manure crops and animal manure particularly cattle manure and poultry manure used to manage nutrients. In general, strong interactions between the type and timing of nutrient application influences several pests and diseases, especially wire-worms and black scurf caused by *Rhizoctonia solani*. In potato wire-worms are often a problem if the potatoes follow in the rotation after several years of pasture or grass-clover, *R. solani* is favored by high amounts of raw organic materials from manure or possibly also grass-clover pre-crops under suboptimal climatic conditions reported by many of the researchers. Straw mulch applications reduced potato virus infestation, while at the end of the potato season the straw reduced nitrogen leaching.

- Green manuring with lupin 60 DBP.
- Sprinkling horn manure to the soil @ 75 g/ha by dissolving it in 40 litres of water at the time of land preparation.
- Application of well decomposed farm yard manure @ 50 t/ha at the time of land preparation

- Application of biodynamic compost @ 5 t/ha at the time of land preparation
- Application of vermicompost @ 5 t/ha at the time of land preparation
- Application of neem cake @ 1250 kg/ha at the time of land preparation
- Application of biofertilizers like *Azospirillum* and Phospho bacteria @ 25 kg each/ha at the time of land preparation
- Spraying cow pat pit @ 5 kg/ha in 100 liters of water on 45th, 60th and 75th day after planting
- To increase the pH of the soil, application of dolomite @ 10 tonnes/ha should be done

Weed management

The critical period of weed competition is up to 60 days and it is essential to keep the field weed free during that period. Take up the first hoeing on 45th day without disturbing stolons. Second hoeing and earthing up should be done at 60th day. As no herbicides are permitted, weed control is carried out by:

- Use of Stale seed bed preparation technique
- Choosing fields with no major weed problems
- Flame weeding of weed seedlings before the potato tops emerge – this can be expensive
- Mechanical weed control just before tops meet between rows
- Limited hand weeding of any large invasive weeds

Growth regulators

- Foliar spraying of panchagavya @ 3 per cent at 10 days interval from 1st month after sowing
- Spraying 10% vermiwash 5 times at 15 days interval from one month after sowing
- Foliar spray of horn silica @ 2.5 g/ha in 50 litres of water on 65th day after sowing

Plant protection- Pests

Aphids

- Foliar spray of 10% nettle leaf extract on 45th, 60th and 75th day after sowing
- Foliar spray of 10% garlic- chilli extract on 45th, 60th and 75th day after sowing
- Foliar spray of 3% neem oil

Cutworms

- Install light trap during summer to attract adult moths

- Install sprinkler irrigation system and irrigate the field in day time to expose the larvae for predation by birds
- Application of pyrethrum bait in soil

White grubs

- Summer ploughing to expose the pupae and adults
- Install light traps between 7 pm and 9 pm in April – May months
- Hand pick the adult beetles in the morning
- Hand pick the 3rd instar grub during July – August
- Application of *Metarrhizium anisopliae* @ 20 kg/ha at the time of land preparation

Potato tuber moth

- Avoid shallow planting of tubers. Plant the tubers at 10 – 15 cm depth
- Install pheromone traps @ 20 numbers per hectare
- Earth up at 60 days after planting to avoid potato tuber moth egg laying in the exposed tubers
- To control foliar damage, spray 5% neem seed kernel extract
- Keep pheromone traps in godowns
- In godowns cover the upper surface of potato with *Lantana* or *Eupatorium* branches to repel ovipositing moths

Diseases

Potato blight

Potato blight cannot be cured and particularly in an organic situation, avoidance is definitely the best policy.

- Blight is not generally a problem with early harvested, early varieties
- Plant early varieties if suitable/possible
- Plant healthy, blight free seed
- Select varieties with high blight resistance
- Listen for and pay attention to blight warnings
- If the blight pressure is high apply a permitted fungicide
- Remove ground creepers which serve as a source of infection

- Spraying Agni Hotra ash (200 g Agni Hotra ash soaked in 1 liter cow urine for 15 days and diluted in 10 litres of water before spraying) 3 times at one month interval from one month after planting

Virus diseases

- Use virus free potato tubers
- Rogue the virus affected plants regularly
- Control the aphid vectors by spraying 10% nettle leaf extract on 45th, 60th and 75th day after planting

Nematodes

- Avoid growing potato year after year in the same field
- Follow rotation of crop with vegetables and green manure
- For cyst nematode, a resistant variety called Kufri Swarna can be grown
- Application of *Pseudomonas fluorescens* @ 10 kg/ha can be done
- Sow mustard as intercrop at the time of potato planting and harvest the mustard greens on 45th day for the control of potato cyst nematode

Haulm removal

Only physical means of haulm removal are permitted. These include:

- Flailing (haulm chopping)
- Haulm pulling
- Flaming
- Chemical methods of desiccation or application of sulphuric acid are not permitted.

Storage

Normal methods of storage apply to organic potatoes however,

- Adequate isolation from non-organic potatoes will be required to avoid substitution or contamination. This may require visibly identifiable varieties only.
- Sprout suppressants and fungicides are not permitted in store.

Yield

- 15 - 20 t/ha in duration of 120 days.
