



Potato production from True Potato Seed (TPS) for cold-tolerance and late blight resistance in Nepal

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Summary

This practice describes how to produce late blight and cold tolerant varieties of potato from True Potato Seed (TPS) to enhance potato yield under highly variable temperature regimes.

Description

True potato seeds, or “botanical potato seed” differentiates from “seed potatoes”, which are genetically identical clones produced in large numbers by planting pieces of a potato stem or tuber or through tissue culture.

Conventional varieties in the mid-hill region in Nepal has been found to be vulnerable to foggy weather, cold waves and late blight disease. Hence, farmers have been producing potatoes from TPS seeds from hybrid potato varieties, like HPS 7/67 and HPS 1/13, obtaining yields of about 35 tonne per ha.

1. Potato crops from TPS production

In production from TPS, potato crops can be grown by:

1.1 Field sowing

- Field sowing TPS has potential in areas with mild temperatures, where rainfall is light and evenly distributed during the first five to six weeks after sowing. This permits good germination and seedling establishment in the field.

- Sowing directly to the furrow often produces inconsistent results. There are ways to facilitate field sowing, such as the use of pelleted seed, fluid drilling and the “plug mix” methods. With “plug mix”, seed is pre-germinated in a prepared soil mix and sown.
- Under favourable conditions, good plant emergence from direct sowing of TPS can be achieved.

1.2 Transplanting seedlings to the field

- Transplanting TPS seedlings to the field has several advantages over direct sowing. First, plants are in the field less time, freeing the land for other uses. Weed competition is also reduced and agronomic practices are simplified.
- TPS can be sown in trays or ground beds in a nursery. In warm climates, use of shade in nurseries for 15 to 20 days after sowing helps achieve more uniform emergence and vigorous seedling growth.
- Seedling emergence normally occurs between eight to ten days after sowing. Seedlings are thinned a week to ten days after emergence.
- Approximately 35 days after sowing, the seedlings are ready for transplanting.
- To reduce shock at transplanting due to



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adverse conditions, seedlings can be transplanted with soil-covered roots using containers such as compost cubes, banana leaf cups, or thin, plastic trays.

- This system has promising applications, especially in areas where vegetation production by transplanting is a common practice.
- When adequate management practices are followed, adapted progenies can yield more than 30 tonne per hectare.

1.3 Planting seed tubers produced from TPS:

- The first generation of tubers produced from seedlings grown from TPS are referred to as “seedling tubers”. This production method combines the advantages of TPC with those of planting seed tubers.
- Depending upon environmental conditions, seedling tubers will grow in densely sown ground beds or in rows in the field.
- When properly managed, a nursery bed will yield as many as 800 clean seedling tubers per square meter.

Seedling tubers can be used to increase seed tuber quality, Furthermore, tubers can be multiplied to produce additional potatoes for consumption

2. Steps to implement TPS

Any successful true potato seed program must guarantee a reliable supply. Fortunately, TPS can be produced following steps similar to those used to produce many other vegetable crops.

2.1 Pollination

Pollination can occur either naturally, or under controlled conditions. If plants are left in the field to set fruits naturally, much of the seed will result from self-pollination.

The proportion of out-crossing that occurs is caused primarily by insects.

The resulting TPS is termed “open pollinated seed” as only the female parent is known. Seed also can be produced from controlled pollination done by hand. In this case, the TPS is termed “hybrid progeny”.

With controlled pollination, pollen from the male parent is placed on the stigma of the flower. This can be done in the field or in the greenhouse under controlled conditions.

2.2 Harvest

A few days after pollination, berries will start to develop on the plants. In about 40 days, these berries will be ready for harvesting. Under field conditions, a flowering plant will produce an average of 20 berries.

When berries are mature, they are harvested and kept at room temperature until they are soft enough to easily extract the seed. The number of TPS per berry can range from 50 to 500, though the average usually is about 200. One gram contains approximately 1 500 TPS.

2.3 Storage

TPS extracted from the berries is then dried at room temperature in low relative humidity. When kept at room temperature, seed can remain viable for several months up to approximately two years. At 4° C, TPS can be stored for several years without losing germinability.

In both cases, however, low relative humidity during storage is essential. TPS also has a longer dormancy period than tubers. Although it lasts from four to nine months, it can be broken by a simple treatment with gibberellic acid.



Table 1. Agronomic management of sweet potatoes

Purpose	Nursery/ main field	Size	Fertilizer applied	Spacing for Planting TPS seeds
Producing micro-tubers	Nursery for TPS	1m wide x12m long x 0.1 m high	10 kg compost, 200 g DAP, 150g urea and 200 g potash	25 cm row, 4-5 cm plant to plant and 5 cm depth
Raising seedling	Nursery for micro-tubers	3000 seedlings/ kathha	Nursery covered by cowdung and straw. Fertilizer as above.	3 gm/3 sq. m.
Transplanting in the main field	20/25 days old seedlings	-	Normal production practices	60 cm row to row, 20 cm plant to plant, 20 cm high

Source: FAO 2013

In Nepal, the TPS seeds are produced from hybrid potato varieties like HPS 7/67 and HPS 1/13. TPS farming is done first by producing small micro-tubers and then by raising seedlings in nursery that are transplanted to the main field adopting the agronomic management practices shown in Table 1.

Fertilizers and FYM are applied to the nursery in advance. About 42 kg of small micro-tubers produced from 12 m² of nursery will be enough for 1.5 kathha of nursery in the next year.

Seedlings produced from micro-tubers (3 000 seedlings / kathha) are transplanted to the main field in ridges or raised beds with proper drainage and irrigation facilities. Thus TPS first and second generation seeds can be produced by farmers and they are transplanted to the main field for eating purposes.

Potatoes or TPS seeds produced this way will be free from late blight and other diseases. They can be easily transported

from one place to another. On average, 40 to 80 g of TPS small micro-tubers will be enough for producing seedlings enough for potato production in one hectare of land.

Nearly 20 quintals of conventional potato seed materials will be needed for one ha of land under normal conditions.

3. Technical, economic, financial, social and environmental attributes of the technology

- Increases efficiency of farm input use;
- improves utilization of scarce resources;
- produces late blight tolerant crops;
- can withstand low temperature and vagaries of cold waves; and
- produces high yields.

3.1 Factors underlying success

- Technical know-how of the production technology; and
- access to and availability of quality and good potato seeds.

4. Validation of the practice

Farmers in Nepal produced potatoes from TPS seeds from hybrid potato varieties, like



HPS 7/67 and HPS 1/13, obtaining yields of about 35 tonne per ha.

5. Agro-ecological zones

- Tropics, warm.

6. Objectives fulfilled by the project

- Resource use efficiency; and
- Pro-poor technology.