REPUBLIC OF KENYA

KALRO
Kenya Agricultural & Livestock Research Organization

NAVCDP
National Agricultural Value Chain Development Project
Transitioning from Subsistence to Commercial Farming

True Potato Seed (TPS) Technology as Alternative Method for Potato Production

Introduction

Production of potato through True Potato Seed is done either by transplanting the seedlings raised from the potato berries, in the nursery beds or by planting seedlings from tubers produced in the previous season. Farmers may opt for either of the methods that is suitable for their area. Raising a potato crop from seedling and then transplanting may be done only in areas where temperatures are mild, adequate water through irrigation is assured and crop season is of longer duration to accommodate nearly one month period required to raise seedlings in nursery beds.

Production of true potato seed

Production of TPS requires technical expertise in order be able to select male and female parental lines with desired characteristics while maintaining genetic purity of desired characteristics. True potato seeds are produced by breeders through controlled crossing of selected mother plants. The seed obtained through sexual reproduction, where the fertilised flowers forg fruits/berries that resemble tomatoes. A potato plant would produce approximately 20 berries, each berry having 300 seeds. The berries can be harvested after 60 days when the seeds are already mature.

True potato seeds are produced as follows:

Figure 1. Crossing exercise

Figure 2. Successful crosses (fruits)

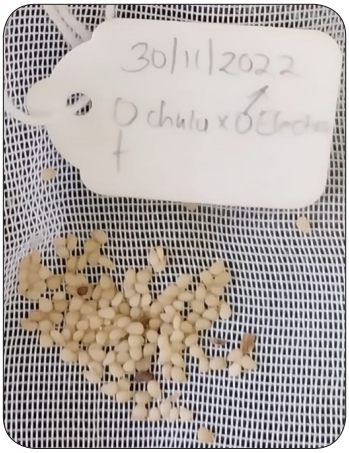

Figure 3. True potato seeds (TPS) ready for pre-germination

Figure 4. Germinated transplants

Utilization of TPS technologies in potato production

TPS can be utilized using 3 approaches:

i) Direct sowing in the field: This is only viable in areas with low temperature and high rainfall during the first 6 weeks after sowing TPS. However, this is usually challenging due to inconsistency in germination, weeds, and vulnerability of the seeds to pests and diseases.

ii) Transplanting seedlings in the field. The seed is planted in a nursery to raise seedlings which are then transplanted in the field to produce potato seed tubers.

iii) Planting seed tubers produced from TPS for the production of ware potatoes. Seedlings from TPS are raised in nursery beds to ensure better establishment in the field.

Nursery establishment, seed sowing, and management

The nursery is prepared on punnets (containers) measuring 48 by 27cm, having 230 cells in each punnet, with each cell measuring 3cm deep and 2 cm wide. The punnets' cells are filled with peat moss ready for planting.

True potato seed (TPS) seeded in punnets as the nursery bed

Nurseries are beds prepared and kept in the screen house to protect them from pests and diseases and adverse weather conditions. The media is sprayed with contact fungicides to prevent damage from soil-borne pathogens causing damping off (Rhizoctonia and Pythium spp).

Nurseries are drenched with water and chemical fertilizers one day before TPS sowing. True potato seeds are treated with a recommended fungicide such as "Mancozeb" and are then sown at 0.5 cm deep. A recommended nutrient solution such as "Microsol B" in 500 litres of water is applied every 3 days till the seedling are ready for transplanting. The TPS are ready for planting when they have developed 5-6 leaves or attained 9-12 cm shoot height. Plant protection management is carried out during this period.

Land preparation and transplanting

The land is prepared using the conventional way of potato production where the field is tilled to a fine tilth. About 20 cm high ridges are made, and the distance between the ridges is 75 cm whereas the seedlings are planted at 20 cm apart. The ridges are flattened on top to provide proper irrigation.

TPS transplanted in the field on ridges

During transplanting, soil moisture should be high to reduce transplanting shock. Thus, the field may be irrigated one day before planting. During the warm season, transplanting should be done late in the afternoon and watering done immediately after transplanting to avoid wilting. During planting, DAP (18% N: 46% P_2O_5) should be applied at the recommended rate of 500 kg/ha. This will enable the seedling to produce new shoots faster and enhance root development.

Crop management

Good agronomic practices are imperative for high yield and production of good quality tubers. Weeds must to be controlled, either through mechanical, cultural, or chemical ways to reduce the competition for

space and nutrients from the soil as well as provide aeration in the root zone and reduce yield loss.

It is also important to earth-up. Hilling or ridging is a process of heaping soil to about 15 cm high around the root and base of the potato crop. This allows stolons to form tubers under the soil, prevents tubers from being exposed to sunlight and puts the roots deeper into the soil while creating a fluffy surrounding for tuber bulking.

Well ridged potato crop

True potato seed are delicate plants and therefore are prone to pests and diseases. Measures are therefore taken to control pests and diseases in the nursery and in the field. Rhizoctonia, Pythium and fusarium are the most common disease after transplanting. Spraying both contact and systemic fungicides on the furrows and at the base part of the plant is important. Care must be taken while irrigating the crop during the first 20 days after transplanting. Subsequent irrigation is done on a need basis. When TPS is used for seed production, the potato crop is dehaulmed

(the vegetative top is separated from the roots) when 80 % of tubers are seed size, whereas in ware production dehaulming is skipped. At harvest, tubers are graded into different seed sizes and large tubers above 65 mm diameter are sold as ware.

Potato production using TPS tubers

TPS tubers are produced from 1st generation tubers (tubers from potato plants that were raised from seed) in the nursery beds or the TPS in the field. These seedling tubers are often of a pure variety and free from soil-borne diseases and pests. Seed tubers weigh between 10 g to 30 g and are not prone to unfavourable weather conditions compared to seedlings. Production of tubers in the nursery is as described above. Seedling are then transplanted into 500cc containers where they establish better and seed tubers weighing between 10 g to 30 g. These first-generation tubers can now be planted in the field for ware production.

Some of the advantages of true potato seeds over seed tubers are:

1. True potato seeds would reduce the cost and space of storage as seed tubers require more space and controlled temperatures,

2. True potato seeds reduce problems associated with tuber disease transmission

3. True potato seeds have potential for expanding potatoes production in regions where the environmental conditions do not favour their production.

4. True potato seeds also offer more room for research into new varieties than seed tubers.

In the contrast between the seed tubers and the seedling tubers' yield, there is no significant difference in their yield. This means, instead of ploughing back potential food into our farms as seeds, we can comfortably use the seedling tubers for ware production (Rowell, et al., 1986).

The only challenge comes when the seedling tubers planted are not of the same size. Grading of potato seed is very crucial to ensure uniformity in germination and growth vigour in the field.

Disadvantages of TPS

There are however disadvantages of using TPS as planting material:

(a) Freshly harvested TPS are dormant

(b) A major problem associated with the technique is poor germination and seedling establishment

(c) Duration of the growth cycle of a TPS crop is longer than that of a crop from seed tubers

(d) Crops grown from TPS are less uniform in plant type and maturity

(e) Plants from TPS are more susceptible to pests, diseases and competition from weeds

(f) The tubers produced from TPS are less uniform in shape, colour, size and dry matter content than tubers produced from a clone

(g) TPS production is vulnerable to environmental stress and has high

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