Plates

Plate 1a: Genomic diversity seen by rep-PCR with Box primer between \textit{R. solanaceum} biovar 2a isolates of Peru [B-G]; Colombia [H-M] and other S. American countries [N-S]

Plate 1b: Dendrogram of rep-PCR data on \textit{R. solanacearum} biovar 2a isolates of S. America

Plate 2a: Soil microcosms for assessment of BCA survival with and without potato, and interaction with WT populations

Plate 2b: Enumeration of BCA (kan), WT (rif) and recombinant (kan/rif) populations from soil on selective SMSA medium
Plates

Plate 3: SSPS seed cultivation seed spacing

Plate 4: Improvised planting aid (dibber) and seed grader

Plate 5: SSPS seed selection is targeted at medium sized tubers

Plate 6: SSPS seed cultivation planting
Plates

 YEAR 2000 CALENDAR

IMPROVING YOUR POTATO PRODUCTION:

• Talking with farmers and gaining their knowledge has helped in understanding the problems of potato production and marketing.
• The main diseases and pest problems have been identified by observing potato fields and listening to farmers.
• Potato wilt is a major disease problem leading to yield losses. No chemical will prevent this disease, only good crop management is effective.
• Potato wilt is a disease carried in the seed and the soil.
• It is very important to plant healthy seed, as this will reduce disease and increase the yield and quality of potato produced. Good quality seed is scarce and expensive, and therefore we must maximize its use. An on-farm practice that separates seed production from ware (ridge/furrow) cultivation helps in getting good quality seed.

This method:
• Minimizes land usage and empowers the farmer with producing their own good quality seed without reducing the land planted to ware production.
• Reduces the quantity of good quality seed required by an individual farmer. This makes the purchase of good quality seed affordable and increases its availability for both traditional and new varieties, such as Tigoni and Asante developed by the National Potato Research Centre.

Plate 7a: Calendar January – March 2000
Plates

Potato seed health in Kenya

Plate 7b: Calendar April – June 2000
Potato seed health in Kenya

Plate 7c: Calendar July – September 2000

Y E A R 2 0 0 0 C A L E N D A R

IMPROVING YOUR POTATO PRODUCTION:
ON-FARM PRODUCTION OF GOOD QUALITY SEED

- Extension services are available to help with this new system. Seed tubers
  are NOT selected from the ware crop, but produced from nursery plots.
- Purchase of a small quantity of good quality seed from a recognized source
  every 2nd or 3rd year is the only additional expense.
- Select a fertile area of land that was not under potato production last season,
  or ideally, several seasons before that. Also, identify an equal area of land
  and keep this free of potato (including volunteer potato) and other
  solanaceous crops. This is next season’s seed nursery plot.
- Tubers are planted at 20 x 20cm on a flat bed of soil (3a). Ensure that the
  soil is a light tilth and create a hole about 6 – 8 inches deep and wide
  enough for a potato tuber. A cut-off spade handle will make an ideal hole (3b).
- Make sure that the potato is set well in the hole and then cover with soil.
  Look out for diseases and pests and treat immediately with chemicals or by
  roguing. Wilting potatoes and their neighbouring plants (even if healthy)
  must be rogued along with their tubers and discarded. Dihydroxy early as this
  will reduce disease. Only select seed of an egg size. Retain enough seed to
  maintain the seed nursery next season, the remaining seed is for your ware
  production.
Plate 7d: Calendar October – December 2000
A solution to Potato Bacterial wilt and other pest problems

Multiplication of disease-free seed potato in seedplots

Plate 1. A bacterial wilt-affected potato field, the result of planting diseased tubers.

This bulletin describes the multiplication of disease-free seed potato in small plots (seedplot system). The system:

- Separates on-farm ware and seed production.
- Optimises seed-size tuber selection, promoting higher potato yields.
- Reduces on-farm land requirement for seed tuber production by 50%.
- Promotes the maintenance of seed tuber health through intensive pest and disease control.

Background information

On-farm potato production does not achieve potential yields due to poor seed selection that is biased towards under-sized tubers from a ware cropping system. Such tubers are known to be low yielding and potentially increase tuber-borne diseases like bacterial wilt (Plate 1) and viruses. It is, therefore, necessary to optimise the use of good quality seed and maintain its health status over cropping cycles.

The seedplot system

The seedplot system separates seed production from ware production and maintain the good health status of seed tubers through intensive control of pests and diseases. The system requires 50% less land than the ware production system to meet on-farm seed tuber requirements. It is recommended that the ‘freed’ land be managed as next season’s seed plot by leaving it fallow or planting a short season non-solanaceous crop.

Basic requirements for seedplots

1. **Land.** The seedplot must be established on land recognised as fertile and preferably without a history of potato production or other solanaceous crops such as capsicums, tomato and brinjals. The land should be situated where no runoff water flows into it.

2. **Disease-free tubers.** Obtain initial tubers from a reliable source, preferably a seed production centre or a recognised potato seed dealer. Tubers should be 2.5-5.5cm in diameter.

Land preparation and planting

Mark out beds of 2m width and a sufficient length depending on your seed needs (see Table 1). Loosen the soil sufficiently to a satisfactory depth and fine tilth.

Broadcast DAP fertiliser on the seedplot at the rate of 500g for every 9m² (i.e. an area of 2m width by 4.5m length) and rake it in.

Make holes at a spacing of 20cm (8 inches) by 20cm (8 inches) on the seedplot by pushing a dibber (spade handle or a similar tool) through the soil to a depth of about 15cm (6 inches) and plant a well-sprouted tuber in each hole (see Plate 2).

Weeding and hilling

Hand weeding is recommended. Ordinary hilling (earthing up) carried out in ware production fields is not necessary provided the recommended planting depth is adopted.

Disease and pest control

Seedplots need to be inspected frequently to ensure that pests (e.g. aphids, potato tuber moths, etc.) and diseases (e.g. late blight, early blight, etc.) are controlled promptly (see Plate 3). Fungicides (e.g. ‘Ridomil’ and ‘Acroba’) effectively control foliar fungal diseases while arthropod pests can be controlled using insecticides e.g. ‘Karate’.

Important: Removal and destruction of diseased plants, good field hygiene, crop rotation (to avoid potatoes, tomatoes, brinjals and capsicums for 3 years or more) should be practised to prevent bacterial wilt and other diseases.
Plate 8: Bacterial Wilt leaflet Page 3 & 4

Plate 2: Tubers placed in holes (8"x8" spacing) before covering with soil.

Plate 3: Inspection for pests and diseases in order to apply control measures.

Plate 4: Seed tubers of optimum size (2.5-5.5cm diameter) for good yields; avoid the use of very small tubers ('chatts').

Harvesting and grading
Seedplots must be harvested about 3 weeks earlier than in a ware potato crop. Potato vines (haulms) must be removed about 2 weeks before harvesting so that tuber skin can harden.

Grading involves selecting unbruised, disease-free tubers, which are 2.5-5.5cm in diameter. Tubers outside this diameter range are unsuitable for use as seed.

Post-harvest handling
Selected tubers should be stored under conditions of diffuse light and ample aeration. A wooden crate is ideal (see Plate 4).

Usage of seedplot tubers
Tubers harvested from seedplots are divided into two lots; one lot is used in establishing a new potato seedplot as previously described and the other lot is planted in the main ware potato field at the recommended spacing of 75cm by 30cm and adopting usual management practices.

Table 1. Approximate seedplot sizes to produce adequate seed tubers for ware fields

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<th>Seed plot measurements</th>
<th>Ware field size (acres)</th>
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Graphs

Graph 1a: Efficacy of BCA Omega 5.1 UK Centre [Egham]

Graph 1b: Efficacy of BCA Omega 5.1 and BCA ARC – ARC VOPI, Republic of South Africa

Graph 2: Interaction between solanum spp. (S. tuberosum and S. andigena) and R. Solanacearum isolates typical of Peru, Colombia and other world-wide countries

Graph 3: Efficacy of BCA against R. Solanacearum isolates typical of Peru and other world-wide countries (except Colombia).
Graphs

**Survival of BCA in matrix carriers**
- Perlite
- Vermiculite
- Alginate
- Peat

**Weeks post inoculation**
- Log cfug\(^{-1}\) of matrix

**Survival of BCA on potato surface**
- Perlite dust
- Perlite slurry
- Water suspension

**Days post inoculation**
- Log cfug\(^{-1}\) of potato

Graph 4a: Growth and survival of BCA in various matrix carriers during storage

Graph 4b: Application and survival of BCA on tuber surface during chitting

**BCA and wild type**

**Days post inoculation**
- Log cfug\(^{-1}\) soil

Graph 5: Survival of BCA and wild type *R. solanacearum* in soil with and without stand of potato

Graph 6a: Survival BCA and wild type *R. solanacearum* populations in rhizosphere soil of rotation crops
Graphs

Graph 6b: Ratio of BCA to wild type *R. solanacearum* populations from rhizosphere soil of rotation crops

Graph 7a: Effect of seed size planted on yield. On-station trial undertaken at KARI NARL.

Graph 7b: Effect of seed size on yield. On-farm trial undertaken at Njabini

Graph 7c: Proportional distribution of harvested tubers by number per size class from seed of varying size (T1 = Tigoni < 25 mm, T2 = 25-35… RT1 = Roslin Tana < 25 mm, RT2 = 25-35 mm etc.)
Graphs

Graph 7d: Proportional distribution of harvested tubers by number per size class from seed of varying size (TS = Tigoni Small, TM = Medium… RTS = Roslin Tana Small, RT2 = Medium etc..)

Graph 8a: Tuber size distribution profiles for Tigoni under SPSS and Ware-to-ware spacing

Graph 8b: Seed (25-55mm) production per tuber planted.

Graph 8c: Seed production per m² of land planted.
Graphs

Graph 8d: Seed production across farms for Tigoni.

Graph 8e: Ware production for Tigoni

Graph 8f: Ware production for Roslin Tana

Graph 8g: Ware production across farms for Tigoni
Graph 9a: Effect of planting density and cultivation system on seed production – Tigoni

Graph 9b: Effect of planting density and cultivation system on seed production – Romano

Graph 9c: Effect of planting density and cultivation system on seed production – Kerrs Pink