



**AGRICULTURE AND NATURAL RESOURCES DIVISION**

**Plant Protection Guide for Open Field  
Production**

**Potatoes**

**January 2015**

## Introduction

This guide is written to assist farmers growing potatoes under open field production.

The approach taken is that of prevention and the early detection of pests and diseases to avoid a build up to a damaging level. The aim is to minimise the use of chemical pesticides. This is in the interests of the end consumer of the produce, to reduce the development of pesticide resistance, to protect the environment and last but by no means least, to cut down on costs. Biopesticides (non-chemical pesticides based on natural enemies) and natural enemies are promoted as much as possible.

The guide has seven parts:

- Section 1 gives some general guidelines on scouting, hygiene, plant protection and record keeping.
- Section 2 gives information on cropping, how to grow healthy potatoes.
- Section 3 gives information on specific information on target pests and diseases, giving signs to look out for and how to prevent and treat them, for: fungal diseases, bacterial diseases, insect pests, and mites.
- Section 4 provides information on seed potatoes.
- Section 5 provides information on small scale potato stores and storage.
- Section 6 provides guidance on the pesticides available for the protection of open field potatoes. Refer to the label for application and harvest interval details for other crops.
  - The first template is for the locally available products.
  - A template is also given showing the products available from the ANRD spraying service, plus a table showing which products can be tank-mixed together, to help farmers plan their spraying regimes if they chose to use the ANRD service.
- Section 7 gives details of where to find further information and technical support.

We hope that it is useful and welcome all comments and suggestions for improvements.

# 1. Some general guidelines

## Scouting:

- Check the crop daily if possible. Walk along each row looking at the entire plant, particularly examining any which stand out in the row as looking obviously sick, slower growing or discoloured.
- There seem to be more pests and disease on the plants in the outer rows of fields and less away from the edges.
- Look for holes in leaves, discoloured leaves, insect droppings, or leaves browned and drooping.

## Plant protection:

- Clean away weeds, they can harbour pests.
- Pick off any caterpillars and brown, drooping leaves and take them away for burning, to stop infestations arising.
- Use as little pesticide as possible. This saves you money, protects the pesticide sprayer, the consumer of the crop and also the environment, and also reduces the chances of pesticide resistance developing so that sprays will continue to work when you really need them.
- Always read the pesticide label carefully.

## Records:

- Keep records of all the sprays you use.
- Keep records of what you harvest (weights and/or prices) so you know if you're breaking even.

The guidelines given here are based on a regime of frequent crop inspections and action taken against pests and diseases as required, using pesticides compatible with the natural enemies which occur on the island.

# 2. Cropping guidelines

## Soil

Soil is critical for the health of a plant as this is where it gets nearly all of its nutrients and water, and it is also the plants' anchor.

- Unlike many crops, potatoes will grow well in both light soils (eg Longwood) and heavy clay soils (eg St Paul's area).
- Potatoes prefer slightly acid soils, pH 4.5 to 6.

Alkaline soils (pH range 7.0 to 8.5) can be acidified by adding organic material such as compost or manure.

## Time of year

Potatoes can be planted all the year round.

The common pests and diseases will vary depending on the season.

Summer potatoes (October to April):

- Potato tuber moth
- Broadmite
- Early blight
- Common scab

Winter potatoes (May to September):

- Late blight

General pests and diseases which can attack all the year round:

- Caterpillars
- Bacterial wilt

These are the main pests, those most commonly come across. If you see others please see section 4 for sources of advice and technical information, or call Pest Control at ANRD on 24724.

## 3. Specific information on target pests and diseases

### Fungal diseases

#### Blight



There are two types of blight, Early and Late, and they are caused by different kinds of fungus.

Early blight is caused by the fungus *Alternaria solani*; see the photo above. It is typical of warmer, tropical countries and is the commonest form of blight in St Helena. Late blight is caused by the fungus *Phytophthora infestans*. It is a much more serious disease, being more severe and quick spreading than Early blight, but is rare on St Helena.

Fungi reproduce by spores which can survive in the soil and in plant residues such as stems of potatoes and related plants such as tomatoes and egg plants. Blight can spread from plant to plant by rain splash, and the spores need moisture to grow. Light misty rain and fogs tend to encourage blight and are known as “blight weather”.

### **Signs to look out for:**

#### Early blight

- Numerous small black spots on older leaves. It is also known as target spot. Leaves turn yellow and wither.
- Infected tubers show dark, depressed lesions on the surface.

#### Late blight

- Leaf spots, larger than those of Early blight, with white spores on the underside of the leaf.
- Lesions form on the stem.
- Infected tubers show blueish marks through the skin, the skin becomes lumpy and tissue turns brown.

### **Management:**

There are two approaches you need to take: crop hygiene to prevent its arrival and spread, and pesticide spraying, once blight has been spotted.

#### Crop hygiene

- Do not discard infected plants on the headlands around fields, but burn or bury them well away from the crops.
- Good hilling helps drainage and makes conditions less favourable for blight.
- If the leaves are infected do not pull haulms under damp conditions, do not harvest under wet conditions, and dry the crop quickly.

#### Pesticides

Blight is one of the few problems it can be cost-effective to do preventative spraying for, if you have a large area of potatoes, and if conditions are conducive for blight – a period of light rain or fogs, especially in areas of heavy clay soils which hold moisture and favour fungal build-up. Otherwise check your crop regularly for signs (see above under “signs to look out for”) and treat if you see any.

Check the product label to make sure it is effective against the type of blight you have, and for application rates. One example of an effective suitable product is Bravo (active ingredient chlorothalonil) which is effective against both Early and Late blight.

If you grow potatoes all the time in the same plot and are persistently bothered by blight, crop rotation will help to break the cycle of infection. Plant completely different crops in the plot for 2 or 3 seasons, such as cabbages, beans, or carrots. Avoid tomatoes or egg plants.

## Bacterial diseases

### Bacterial wilt

Bacterial wilt is caused by the bacteria *Pseudomonas solanacearum*. It isn't very common but when it does strike losses can be high. The bacteria can survive indefinitely in the soil, and warm, wet conditions favour the bacteria most (St Helena is ideal).

#### Signs to look out for:

- Entire plant wilts and dies very rapidly, starting at the top of a single stem. Leaves remain green.
- Check by part-filling a jar with water and suspending the cut stem in the water. Within a few minutes (heavy infection) or hours (light infection) you will see strings of milky slime oozing from the stem and hanging in the water.
- Infected tubers: when cut in half you see droplets of milky slime forming on the inside. In more advanced stages you can see a wide, dark brown ring around the cut surface. Slime also oozes from the eyes and makes them sticky, so look out for dirty eyes at harvest.

#### Management:

There are no sprays or pesticides for bacterial wilt.

- Crop rotation using alternative crops is the most effective solution, for 2 – 7 years (ideally 5 – 7 years) depending on the conditions: suggested crops are beans, cereals such as corn, and cabbages.
- All potato plants must be kept out of the field during the period of alternative crops (including rogue potatoes and related plants such as tomato, pepper and aubergines).
- As bacterial wilt also harbours in weeds the field needs to be kept weed free.
- The bacteria don't like acid soils and the application of fertilizers will lower the soil pH to 4 - 5.
- Resistant varieties of potato can also harbour the bacteria and can succumb if wounded. Resistant varieties also don't help clear bacterial wilt, just to tolerate it.
- Tools and other equipment used on the infected field need to be cleaned and sterilised before being used in other areas.

## Common scab



Common scab of potatoes is caused by *Streptomyces scabies*, a very common, soil-inhabiting bacterium. The scab organism can occur in soils where potatoes have never been grown. In most places, however, scab was probably introduced with infected seed potatoes. The problem with scab is:

1. Scab lowers the quality and price of infected tubers;
2. Pest attack can increase, as the lesions cause cracks which allow secondary pests such as button worms to get in.
3. When badly scabbed potatoes are used for seed there can be a reduction in yield, by up to one fifth.

### Signs to look out for:

- Brown woody cracks and lesions on the skin of potatoes.

### Management:

There are no sprays or pesticides for Common Scab.

- Light dry soils are worse for scab. Mix compost and water regularly at the time of tuber formation (just after flowering) for 4 to 6 weeks.
- Do not apply barnyard manure, wood ashes, other organic matter, lime or other alkaline materials to fields or gardens just before potatoes are planted. Where you need to lime potato land for growing legumes or other crops, apply the lime after harvesting the potato crop.
- Crop rotation on a 2-year cycle with a non-vulnerable crop such as corn or cabbages, or avoiding planting potatoes for 7 years will both help.

## Insect pests

### Caterpillars

There are four types of caterpillar which attack crops, two green ones (two kinds of looper, *Trichoplusia ni* and *Ctenoplusia vittata*) and two which can be either green or brown (the army worm *Spodoptera littoralis* and the bollworm *Helicoverpa zea*). Signs to look out for and management are the same, so they are treated collectively here.

**Signs to look out for:**

- Holes in leaves and fruit, “windows” in leaves between the veins, dark round droppings on leaves.

**Management:**

Potatoes can easily lose half of their leaves without affecting tuber production, so it isn't worth treating caterpillars unless they are so abundant that more than half of the leaf on any one plant has been lost. There are also a number of biological control agents on St Helena, working to keep caterpillar numbers down and spraying with pesticides will kill them.

- If infestation is localised nip off all the caterpillars seen, both large and small, and either squash or drown them.
- If infestation is widespread use a general insecticide such as Malathion (active ingredient mercaptothion). Check the product label for application rates.

## Potato tuber moth

The potato tuber moth (PTM, *Phthorimaea operculella*) is a small brown moth which lays its eggs on the leaves or exposed tubers. It is common over summer but rare in winter. The caterpillar is a small, fat creamy-grey grub which rolls itself inside a fold of leaf, this gives it protection from sprays and many natural enemies.

**Signs to look out for:**

- Dried brown folds on the edges of leaves. If you pick these apart, the grub is inside.
- Round holes and shallow tunnels in infected tubers.

**Management:**

As with caterpillars (see above), potato plants can tolerate high leaf loss before tuber production is affected so it isn't worth spraying pesticides for a few PTM on the leaves. Also, the grub is well protected inside its leaf fold and most sprays won't kill it.

There are also a number of biological control agents on St Helena, working to keep PTM numbers down. The problem comes if the tubers get infected:

- Keep tubers in the growing plant well covered with earth moulded up so the moths can't find them to lay eggs. If the soil is very light and might be blown away, add compost to give it more body.
- Remove volunteer plants and never leave infected tubers lying around the fields as they will breed up more pests.



- Check potatoes going into storage for the PTM holes and tunnels, and put them on one side for immediate use. See Section 5, below, for more information on storing potatoes.

## Mites

### Broadmite

Also known as “iron rust”, this condition is actually caused by tiny mites, *Polyphagotarsonemus latus*. Die-off can be very quick so plants need to be treated as soon as symptoms are seen. The mites like hot dry weather so in summer you need to check growing potatoes frequently (ideally every day).

#### Signs to look out for:

- Bronzing of lower leaves, browning and curling of dried leaf edges, sometimes brown dust-like symptoms can be seen along the leaf margins; these are the mite bodies so you need to be careful to avoid spreading them around the crop.

#### Management:

Spray as soon as bronzing is first seen using a pesticide registered for use against mites, such as Dynamec (active ingredient abamectin), following the label instructions for tomatoes. Garden Ripcord (active ingredient cypermethrin) won't kill mites.

- Carefully remove all affected plants, taking care to avoid spreading mites to other plants, and burn or bury it away from the field.
- Dynamec: spray at 7 day intervals, maximum of 6 sprays per crop, only 4 of which can be made when flowers are present.

## 4. Seed potato

Many farmers store seed from previous crops. Any tubers destined for seed should be taken from the highest yielding, healthiest plants and carefully checked for any signs of disease. Any tubers originating in soils infected with bacterial wilt should never be used as seed as they can carry the bacteria.

Seed potato can be imported under licence from the UK or South Africa. Both these countries have internationally recognised seed potato certification schemes.

For the UK seed potato must be certified under the British Seed Potato certification scheme in compliance with EC Directive 2002/56/EC and other relevant EC Directives as follows:

- Category: Basic or Certified
- Grades: Super Elite 1-3 or Elite 1-3
- EC Class: EC2 or EC3

For South Africa seed potato must be certified under the South African Seed Potato Certification Scheme in compliance with the Plant Improvement Act 1976 (Act No. 53 of 1976) and other relevant South African Directives as one of the following classes:

- Class 1, generation 1 to 8
- Elite, generation 1 to 8
- Standard Class

## Pest and disease resistance

Different varieties of seed potato have different levels of resistance to a variety of diseases and conditions, and this is shown in the table below for the commonest varieties imported.

Be careful of varieties from the UK which are listed as “blight resistant” with no further details as this will refer to Late blight, the form of blight which affects the UK (this is the cold weather, temperate region blight). On St Helena Early blight is much commoner so you need to check specifically for this.

### Levels of resistance to three common potato diseases in a selection of seed potato varieties.

Potato variety	UK or South Africa	Common Scab	Early blight	Late blight
BP1	South Africa	Very poor	Poor	Poor
Buffelspoort (BP13)	South Africa	Very poor	Poor	Very poor
Cara	UK	Good	Not listed	Good
Fianna	South Africa	Moderate	Poor	Poor
Konsul	South Africa	Moderate	Moderate	Good
Marimba	South Africa	Good	Poor	Poor
Maris Peer	UK	Moderate	Not listed	Moderate
Maris Piper	UK	Poor	Not listed	Moderate
Mnandi	South Africa	Moderate	Good	Good
Van Der Plank	South Africa	Poor	Poor	Moderate

For further information on both these and other cultivars please check the following links.

#### Varieties from the UK:

- The British potato variety database: <http://www.varieties.potato.org.uk/menu.php>
- British seed potato certification scheme: <http://www.sasa.gov.uk/>

Varieties from South Africa:

- Potatoes Africa <http://www.potatoesafrica.co.za/PAvarieties.html>
- About potatoes: <http://www.aboutpotatoes.co.za/index.html>
- Potato seed: [http://potatoseed.co.za/index.php?c=cultivar\\_characteristics/cultivar\\_characteristics](http://potatoseed.co.za/index.php?c=cultivar_characteristics/cultivar_characteristics)
- South African seed potato certification scheme: <http://www.potatocertification.co.za/home.aspx?IsHome=true>

ANRD produces Guidance Notes on the seed potato varieties imported into St Helena. These can be found on the IPM website <http://www.sainthelena.gov.sh/integrated-pest-management/> or call Pest Control at ANRD on 24724 for hard copies.

## 5. Storing potatoes

If you have potatoes you want to store for a few months, sort them well at harvest, putting aside any damaged, bruised or pest infested ones for immediate use. Then store them in paper sacks or boxes, in the dark, in a cool, clean place. Before putting a new crop into storage, clean your store well with water and disinfectant to kill off any fungus or pests from the last crop. If PTM is a regular problem, apply a residual spray of a general insecticide such as Garden Ripcord to the empty store just before harvest to kill any moths in the store.

Potatoes can be stored under refrigeration: fresh market potatoes may be stored at 4 - 5°C, while seed potatoes need 2 - 4°C.

As potato tubers are living things they respire and create heat during storage, and the highest temperatures are at the top of the stack. This heat reduces the quality and storage life of potatoes and can also cause rot. Sacks and boxes should therefore be stacked off the floor and away from the walls so air can circulate around and keep the stack cool. Alternatively, you can pile loose tubers on racking made of chicken wire or wood / bamboo slats. This also makes any signs of pest infestation or rot easy to spot.

Check the store regularly so that any signs of pests or rot are picked up immediately. There are no sprays for eating potato as it is human food. The PTM is the main pest you are looking for, check for slender grey-brown moths on the walls of the store. As soon as you spot them it is a sign the tubers are getting wormy and need to be sold or used as quickly as possible.

A high humidity of 90% to 95% is needed to prevent weight loss and shrinkage, and this may need to be provided with a humidifier. If condensation forms on the walls or tubers, air circulation must be improved.

Eating potatoes need to be protected from light to stop them from going green. The green itself is harmless but it is an indication of increased levels of substances called glycoalkaloids which are poisonous to people. Green potatoes should not be eaten or sold for consumption. Some potato diseases, such as late blight, can dramatically increase the levels of glycoalkaloids present in potatoes. Potatoes damaged in harvesting and/or transport also produce increased levels of glycoalkaloids; this is believed to be a natural reaction of the plant in response to disease and damage. This is another reason why tubers need to be sorted before storage, to remove all those damaged or from infected plants.

Seed potatoes, unlike eating potatoes, should be stored under diffuse light. It doesn't matter if they go green as they are not for eating, and the light slows sprouting and so prolongs their storage life. One or two small windows in the store are sufficient.

The plant known as wild current (Lantana) has natural insecticide in its leaves and can be used to help protect potatoes in store from PTM. Cut the branches green and layer them with the sacks or boxes, or mixed up with the loose tubers in the store. Make sure you put some over the top too. This natural insecticide won't affect the tubers or make them dangerous to eat.

## 6. Pesticide and spraying guide

### Plant protection template for open field potatoes

Pest / disease	Product trade name	Active ingredient	Resistance code*	Details	Harvest interval
<b>Prevention</b>					
Late blight Early blight	Bravo	Chlorothalonil	M5	Do not mix oils or wetting agents. Spray at 7 to 14 day intervals	14 days
<b>Treatment if seen</b>					
Caterpillar	Malathion	Mercaptothion	1B	Use as for General Crop/Pests: army worm	10 days
Broadmite	Dynamec	Abamectin	1B	Spray every 7 days up to 6 sprays (4 for flowering)	3 days
Late blight Early blight	Bravo	Chlorothalonil	M5	Do not mix oils or wetting agents. Spray at 7 to 14 day intervals	14 days

\*Pesticides are given codes depending on their mode of action. Resistance management is about alternating products with different codes.

Tank mixing two or more products to apply at the same time can damage the plant or be ineffective if the products aren't compatible. Consult the label for compatibility, or contact ANRD for advice.

## Pesticides available through the ANRD spraying service

Pest/disease	Product trade name	Active ingredient	Resistance code*	Details	Harvest interval
Caterpillars	Supasect	Cypermethrin	3A	Spray at 14 day intervals Up to 2 sprays per crop	3 days
Mites	Dynamec	Abamectin	6	Spray every 7 days up to 6 sprays (4 for flowering)	3 days
Late blight Early blight	Sanlaxyl 700 WP	Mancozeb + metalaxyl	M3 + Group A: 4	Spray at 10 to 14 day intervals	14 days
Late blight Early blight	Odeon	Chlorothalonil	M5	Spray at 7 to 10 day intervals	3 days

\*Pesticides are given codes depending on their mode of action. Resistance management is about alternating products with different codes.

## ANRD products: tank mixes – what can be sprayed with what

	Dynamec	Sanlaxyl	Odeon
Supasect	Yes	Yes	Yes
Dynamec		Yes	Yes?
Sanlaxyl			-

## Equivalent products to those used by the ANRD spraying service

The table below gives the products available locally which are equivalent to those available through the ANRD spraying service. In some cases the active ingredient is the same and the products are more or less identical, while in others ANRD can offer a better, professional grade product, or alternative active ingredient for resistance management.

ANRD product	Pest or disease	Locally available product
Supasect (cypermethrin)	Caterpillars, Potato tuber moth	Malathion (mercaptotion)
Dynamec (abamectin)	Mites	Dynamec (abamectin)

Sanlaxyl 700 WP (mancozeb+metalaxyl)	Early blight, Late blight	Bravo (chlorothalonil)
Odeon (chlorothalonil)	Early blight, Late blight	Bravo (chlorothalonil)

## 7. Support and advice

ANRD can provide technical advice and support to assist you in identifying pests and other problems on your crops, checking soil pH, and also offers a complete professional spraying service. Call Pest Control or Farmer Support on 24724.

There is a wealth of information available on the internet. Some useful websites are:

- ANRD IPM webpage: <http://www.sainthelena.gov.sh/integrated-pest-management/>
- Atlas of plant diseases <http://www.atlasplantpathogenicbacteria.it/index.htm>
- IPM Online (University of California): <http://www.ipm.ucdavis.edu/PMG/crops-agriculture.html>
- Plantwise Knowledge Bank: <http://www.plantwise.org/KnowledgeBank/Home.aspx>
- Pests of Field Crops in Southern Africa: <http://www.pestsandcrops.com/index.htm>