



**Assured Produce**

**Crop Specific Protocol**

**SWEDE, TURNIP AND KOHLRABI**

**(CROP ID: 44s, 67t and 68k)**



**February 2008**

|                                                                                           |    |
|-------------------------------------------------------------------------------------------|----|
| <b>Acknowledgements</b> .....                                                             | 4  |
| <b>1 General introduction</b> .....                                                       | 6  |
| 1.1 Specific notes for edible turnip production .....                                     | 6  |
| 1.2 Specific notes for Kohlrabi production .....                                          | 7  |
| <b>2 Planning and records</b> .....                                                       | 7  |
| <b>3 Site selection</b> .....                                                             | 8  |
| 3.1 Site history .....                                                                    | 8  |
| 3.2 Crop rotation .....                                                                   | 8  |
| <b>4 Site management</b> .....                                                            | 8  |
| <b>5 Variety selection</b> .....                                                          | 8  |
| <b>6 Nutrition</b> .....                                                                  | 9  |
| <b>7 Irrigation</b> .....                                                                 | 9  |
| <b>8 Crop protection</b> .....                                                            | 9  |
| 8.1 The basic approach to crop protection .....                                           | 9  |
| 8.2 Plant protection product choice .....                                                 | 9  |
| 8.3 Advice on the use of pesticides .....                                                 | 10 |
| 8.4 Application of pesticides .....                                                       | 10 |
| 8.5 Records of application .....                                                          | 10 |
| 8.6 Protective clothing/equipment .....                                                   | 10 |
| 8.7 Pesticide storage .....                                                               | 10 |
| 8.8 Empty pesticide containers .....                                                      | 10 |
| 8.9 Pesticide residues in fresh produce .....                                             | 10 |
| 8.10 Pest, disease and weed control .....                                                 | 11 |
| <b>9 Harvesting and storage</b> .....                                                     | 17 |
| <b>10 Pollution control and waste management</b> .....                                    | 18 |
| <b>11 Energy efficiency</b> .....                                                         | 18 |
| <b>12 Health &amp; Safety</b> .....                                                       | 18 |
| <b>13 Conservation issues</b> .....                                                       | 18 |
| <b>Appendix 1 Typical fertiliser requirements for culinary root brassicas (kg/ha)</b> ... | 19 |
| <b>Appendix 2 Factors influencing nitrogen use decisions</b> .....                        | 20 |
| <b>Appendix 3 Insecticides currently approved for cabbage root fly control on Swedes</b>  | 21 |

---

|                                                                                          |    |
|------------------------------------------------------------------------------------------|----|
| <b>Appendix 4 Insecticides currently approved to control other pests on Swedes</b>       | 22 |
| <b>Appendix 5 Molluscicides currently approved for use on Swede, Turnip and Kohlrabi</b> | 23 |
| <b>Appendix 6 Fungicides currently approved for use on Swedes</b>                        | 24 |
| <b>Appendix 7 Herbicides currently approved for use on Swedes</b>                        | 25 |
| <b>Appendix 8 Specific off-label approvals for Swedes</b>                                | 26 |
| <b>Appendix 9 Specific off-label approvals for Turnips</b>                               | 27 |
| <b>Appendix 10 Insecticides for control of cabbage root fly on Kohlrabi</b>              | 28 |
| <b>Appendix 11 Insecticides approved for aphid control on Kohlrabi</b>                   | 29 |
| <b>Appendix 12 Insecticides currently approved to control other pests on Kohlrabi</b>    | 30 |
| <b>Appendix 13 Fungicides currently approved for use on Kohlrabi</b>                     | 31 |
| <b>Appendix 14 Herbicides currently approved for use on Kohlrabi</b>                     | 32 |
| <b>Appendix 15 Specific off-label approvals for Kohlrabi</b>                             | 33 |
| <b>Appendix 16 Specific off-label approvals for protected Kohlrabi</b>                   | 34 |
| <b>Appendix 17 Control Points: Swede, Turnip and Kohlrabi</b>                            | 35 |

## Acknowledgements

Assured Produce gratefully acknowledges the contribution of all consultees in the preparation of this protocol, particularly members of the Brassica Growers Association and Richard Moynan.

## Preface

This crop specific protocol has been written to complement and avoid duplicating the generic principles of the scheme and appendices.

It is advisable to read the Assured Produce Generic Crop Protocol Standards and the Assured Produce Generic Protocol Guidance Notes (referred to in this document as the Generic Standards and Generic Guidance Notes) first before reading this crop specific protocol.

This protocol is designed to stimulate thought in the mind of the reader.

This crop specific protocol contains crop specific parameters and guidance, where applicable, for the requirements stated in the Generic Standards.

All statements in this protocol containing the words "**strongly recommended**" (in bold type) will be verified during the Assured Produce assessment and their compliance will form a part of the certification/approval decision. The score required for these "**strongly recommended**" control points can be found on the final page of this document and in the checklists produced by Assured Produce licensed certification bodies.

## Disclaimer and trade mark acknowledgement

Although every effort has been made to ensure accuracy, Assured Produce does not accept any responsibility for errors and omissions.

Trade names are only used in this protocol where use of that specific product is essential. All such products are annotated<sup>®</sup> and all trademark rights are hereby acknowledged.

### Notes:

Pesticides with 'Essential Use' derogations that expired 31 December 2007 can no longer be used or stored.

There may be other withdrawals or revocations. Products containing substances which have been revoked are shown on the PSD website (<http://www.pesticides.gov.uk>). Growers should check with their advisers, manufacturers, the Assured Produce website 'Newsflashes', the PSD website ([www.pesticides.gov.uk](http://www.pesticides.gov.uk))

Growers should comply with the 'Use up by' dates for all pesticide products. Growers should also be aware of and comply with changes on new product labels.

There may be changes for the following reasons:

- the deadline for use of NPE formulations has been extended to 31 August 2008, see <http://www.pesticides.gov.uk/approvals.asp?id=2122>
- Pesticides with NPE formulations must be used up by 31 August 2008. In many cases products will be replaced by new non-NPE formulations.
- At re-registration stage after Annex 1 listing there may be: reductions of dose rates; changes in timings and/or number of applications for some products.

In the following Appendices products and use by dates are only listed for SOLAs, and in some cases new product MAPP numbers may not be available yet.

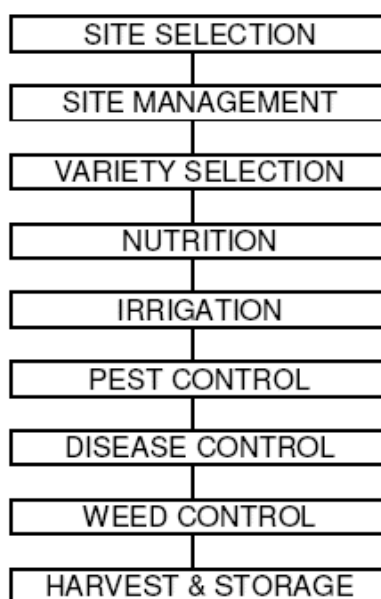
For pesticides on-label, only active substances are shown.

Any new standards have been prefixed in the text with **(NEW)**

## 1 General introduction

Following a systematic approach will help growers to identify and manage the risks involved in crop production. This protocol is based on a typical crop production process. Using a flowchart approach, food safety, Health & Safety, environmental and quality hazards are identified. Appropriate controls may then be established to minimise risk. Food safety and Health & Safety issues always take precedence over quality and environmental controls.

The flow chart is structured as shown below. Note that the sectional layout of both this protocol and the crop specific protocols follow the same structure.



The contents of each crop specific protocol are reviewed annually by informed farmers and growers, food technologists, scientists, the relevant fresh produce association, processors and agronomic consultants. Updated editions are issued prior to the cropping season.

The review process considers both new developments and all relevant technology which has emerged throughout the course of the previous year and which have been found to be both workable by the grower and beneficial to the environment. As one aim of the Scheme is to transfer such information and technologies to growers, attention is drawn to those features of specific relevance to ICM by using *italic* script. In order that growers may be confident that they are working to a current document, each protocol is dated and numbered.

### 1.1 Specific notes for edible turnip production

**Site selection:** As for Swedes with particular emphasis on cooler soils because Turnips grow at lower temperatures than similar crops

**Crop rotations:** Keep out of brassica rotations as Swede; also grow away from other brassica crops, especially oil seed rape to avoid infestation with aphids.

**Growing systems:** As for Swedes.

**Varietal choice:** There is no disease resistance difference; varieties should be chosen to suit the particular market requirement.

**Nutrition:** As Swede although nitrogen requirements are a little lower: boron, manganese and molybdenum are of importance.

**Irrigation:** In dry conditions irrigation of seedbed before final cultivations and drilling is preferable.

**Major pests:** As for Swedes; cabbage root fly, flea beetle, aphids, tortrix moth caterpillars, cutworms and slugs being the most important.

**Minor pests:** As for Swedes; beet cyst nematode in areas where sugarbeet is grown should be avoided by rotation where it is known to be a problem.

**Disease and weed control:** As for Swedes.

**Harvesting and storage:** As for Swedes; many crops are hand- pulled, some are mechanically lifted. Storage time is limited and Turnips are more susceptible to damage from frost.

## 1.2 Specific notes for Kohlrabi production

**Site selection:** As for Swedes. Avoiding adjoining sites of potential cabbage root fly infection.

**Crop rotation:** As for Swedes. Clubroot considerations.

**Growing systems:** Usually grown in beds and planted from mid March to early August. Kohlrabi can grow in warmer soils than Turnips, as quick growth is essential to avoid woodiness.

Clear plastic film or fleece may be used to advance early crops, but the price advantage may not justify the cost incurred. Crop netting is widely used to protect against cabbage root fly and other insect pests.

**Varietal choice:** Varieties must be chosen to suit market, soil and climate.

**Nutrition:** As for Swedes but with emphasis on magnesium, manganese and sulphur.

**Irrigation:** It is essential to ensure rapid growth. Soil moisture should not go below 2.5 cm deficit.

**Pests:** As for Swedes. With emphasis on cabbage root fly, flea beetle, turnip gall weevil, swede midge and aphids. Kohlrabi is a minor crop and pesticides that were approved by extrapolation for use on celery, leek and cabbage may no longer be used on the crop. See Appendices 10, 11 and 12.

**Diseases:** Main problems are clubroot, downy and powdery mildew, phoma and *Alternaria*. *Rhizoctonia* and turnip mosaic virus can also be of significant importance.

**Disease control:** Kohlrabi is a minor crop and pesticides, which were approved by extrapolation for use on celery, leek and cabbage, may no longer be used on the crop. See Appendix 13.

**Weed control:** Less difficult than Swede because the crop develops quickly but Kohlrabi is now suffering from a lack of approved pesticides following the revision of the long term arrangements. See Appendix 14.

**Harvesting and storage:** Hand harvesting direct into nets or boxes or mechanised using a rig washing and packing. Storage at about 3°C for limited period only as discolouration takes place. In the UK, Kohlrabi is usually only sold fresh.

## 2 Planning and records

See Generic Standards and/or Generic Guidance Notes.

### 3 Site selection

#### 3.1 Site history

It is **strongly recommended** that soil type, the topography of the land and the risk of run-off and soil erosion are considered when choosing fields for swede production.

The most suitable soils for Swedes are well-drained loams, silts and light clay loams, with up to 20% clay content. The most suitable areas are those with relatively cool summers, where neither extremes of drought or wetness are experienced. The crop is grown mainly in the southwest, west and north of England, also in Wales and Scotland.

The soil should be of reasonable structure, with no compaction and should not be low in organic matter. Farmyard manure (FYM) may be used to advantage but should be well incorporated. The aim is to produce a fine, firm seedbed with minimum moisture loss. Care should be taken on poorer structured soils not to over-cultivate due to the possibility of soil compaction and capping especially on wet soils with powered equipment. Use of modern wheel equipment should be made particularly with heavier tractors (cage, dual or wide profile tyres).

On heavier soils, pre-Christmas ploughing will create a frost tilth. On lighter soils, late ploughing with minimum cultivations will maintain soil structure and retain moisture.

The land should be free from perennial weeds, especially couch, and severe infestations of other troublesome weeds. Hares, pigeons and rabbits can also devastate unprotected crops, so areas with a known problem should be avoided.

Run off and soil erosion can occur during the growth of the crop, during harvest or after as a result of compaction during the harvesting operation.

#### 3.2 Crop rotation

*Swedes are particularly susceptible to club root infection. Therefore, a wide rotation of at least four to five years is recommended between Swedes and any other brassica crop. It is important to remember that club root can be transmitted in manure from stock fed diseased roots. Such roots should not be fed or stored on land where Swedes are likely to be grown in the near future. Sheep will also carry infection on their feet to clean ground.*

Culinary Swedes are also susceptible to cabbage root fly damage and should not be grown in areas where other brassicas, particularly oil seed rape, have been grown in recent years. Where cabbage root fly has not been treated in established brassica crops there is an increased risk of a higher endemic population developing in the locality. Monitoring of future sites may be useful during the preceding season.

### 4 Site management

See Generic Standards and/or Generic Guidance Notes.

It is **strongly recommended** that on early protected crops, fleece or polythene is recovered and recycled where possible or taken to a registered landfill site.

### 5 Variety selection

*There is very little difference in disease and pest resistance between commercially available varieties at present. NIAB lists indicate current cultural differences and CCFRA results indicate taste and culinary*

*properties. Varieties should be chosen with good commercial, agronomic and culinary properties.*

*As new varieties are developed, further disease and pest resistance will be bred into them.*

## 6 Nutrition

*Soil samples should be taken every three to four years to establish the status of phosphate, potash and magnesium in the soil. Interim nutrient status can be calculated using the balance sheet method. Nitrogen residue analysis will accurately indicate soil levels and enable crop requirements to be calculated. This reduces the potential for excess nitrates to leach into ground water. Nitrogen requirements may also be calculated by the balance sheet method (See Appendix 2). It is important not to overdo the nitrogen application, as this will encourage soft growth and excess top.*

Nutrients should be applied according to soil analysis. Typical requirements are shown in Appendix 1. Although Swedes only take up about 40 kg/ha of phosphate, they show good response to readily available phosphate at drilling. Swedes are very responsive to potash but too much in the seedbed can cause scorch. Magnesium should be supplemented at Index 1 and below.

Soil pH of 6.5 or above is required. This is of particular importance in the presence of clubroot.

### Trace elements

Key elements include boron, manganese and molybdenum.

Swedes are very susceptible to boron deficiency. It is best to have soil analysed for boron. Deficiency may be corrected by applying soluble boron to the soil before drilling, or using boronated fertilisers.

Caution: At pH 7.0 and above boron becomes less available, over liming for clubroot control will cause progressive boron 'lock-up'.

## 7 Irrigation

*Adequate soil moisture is essential to give satisfactory plant establishment. Continuing soil moisture will ensure even growth and quality of crop avoiding growth cracks that are caused by periods of uneven growth.*

In dry conditions, it is preferable to irrigate the seedbed before final cultivations and drilling.

Anti-capping agents should be used if early irrigation is anticipated on soils prone to capping. Plants under drought stress tend to be more susceptible to pest attack and uneven growth causing growth cracks. Soil moisture deficits should not be allowed to build up.

## 8 Crop protection

### 8.1 The basic approach to crop protection

See Generic Standards and/or Generic Guidance Notes.

### 8.2 Plant protection product choice

See Generic Standards and/or Generic Guidance Notes.

### Approved uses not included on the product label

In some circumstances product labels do not include all of the approved uses and growers and advisers wishing to check the approval notice of a particular product should note that this information is available from [www.pesticides.gov.uk/psd\\_databases.asp](http://www.pesticides.gov.uk/psd_databases.asp)

A search on the database for a product name should yield a results page. A click on the product name should link to a summary of the approval information. At the bottom of the summary are links to available notices which will give the statutory conditions of use.

In the case of products with older approval an electronic approval may not be available. In these cases growers should contact the PSD Information Services Branch for details of the approved conditions of use.

Contact details are: [p.s.d.information@psd.defra.gsi.gov.uk](mailto:p.s.d.information@psd.defra.gsi.gov.uk) tel. 01904 455775

### **8.3 Advice on the use of pesticides**

See Generic Standards and/or Generic Guidance Notes.

### **8.4 Application of pesticides**

See Generic Standards and/or Generic Guidance Notes.

### **8.5 Records of application**

See Generic Standards and/or Generic Guidance Notes.

### **8.6 Protective clothing/equipment**

See Generic Standards and/or Generic Guidance Notes.

### **8.7 Pesticide storage**

See Generic Standards and/or Generic Guidance Notes.

### **8.8 Empty pesticide containers**

See Generic Standards and/or Generic Guidance Notes.

### **8.9 Pesticide residues in fresh produce**

**See Generic Protocol Guidance Notes 8.9 for further background and generic advice .**

*Assured Produce is aware that a key area in the production of fresh produce which requires continued attention by growers and their advisers is that of keeping pesticide residues to a minimum. The issue is not just one of meeting the MRL trading standard but ensuring that any individual or multi residues are kept as low as possible below this level.*

**The key targets are:**

- **Optimising late application of fungicides and insecticides to the edible part of the crop**
- **Optimising the use of post harvest treatments**
- **Ensuring minimum harvest intervals are followed**

- **Ensuring that application equipment is applying products correctly**

Currently there are no residue issues associated with this crop but the awareness needs to be maintained for any future issues.

## 8.10 Pest, disease and weed control

### 8.10.1 Pest control

*The main principle is that pesticide inputs should be minimised through prevention rather than cure. However, routine applications are not desirable for many reasons. An integrated approach should be adopted using the following management steps.*

- Where agricultural and geographic factors allow, choose a site away from existing brassica crops.*
- Rotate crops, look after soil structure and ensure correct crop nutrition.*
- Ensure good crop and field hygiene and use irrigation to ensure healthy growth.*

*If such management fails to control pests, the following approach should be adopted:*

- Regular and systematic crop walking to monitor crop development, using insect traps, egg counts and computer forecasting techniques to monitor pests.*
- Identify both pests and beneficial predators, using threshold levels, if available, to assess risk.*
- Consider use of biological or natural methods if available.*
- Consider use of crop covers, but care should be taken where pupae are already present in the soil.*
- Where chemical control is needed, the following points should be considered:*
  - Use least toxic and persistent product and the product which leaves the least residue.*
  - Use most selective product to reduce impact on beneficial organisms.*
  - Use minimum effective dose rate.*
  - It is **strongly recommended** that seed treatments are used as a first line of defence against pests and diseases.*
  - With some pests which first attack edge of crop, consider headland sprays or edge sprays. However, avoid spraying hedges, banks and ditches to preserve beneficial insects.*

The use of some approved pesticides may not be acceptable to certain processors. In order to conform to the requirements of the processors, proposed applications should be confirmed with the company concerned.

#### 8.10.1.1 Cabbage root fly

This pest is a major problem in Swede production. The larvae feeding on the host plants cause damage. Cabbage root fly is present in all brassica-growing areas of the UK. In these areas growers cannot avoid routine control measures. Rotation or siting away from other brassica crops will not give adequate control. The effects can be divided into two main periods.

**First generation:** attacking young plants. Feeding at this stage will often kill young plants, reducing the plant stand and final yield as well as causing irregular root sizes. The first generation emerges and egg laying occurs late April to early May. Preventative treatments are essential at the peak of the first generation.

**Second and third generation:** Attack consists of characteristic mining around the base of the Swede.

#### Forecasting

*Present monitoring methods include egg counts, non-selective water traps and chemical attractant*

*traps for adults. This information, in conjunction with HRI's computer prediction model, using local incidence data and local weather data, gives a forecasting system for fly activity.*

### **Control methods**

It is now **strongly recommended** that crops be covered with crop netting, in the absence of approved pesticide.

Currently there are no approved control methods for establishing the crop, or for protection of the developing crop from later generations of cabbage root fly. It is legal to import treated seed from another EU country where that treatment is approved in the country of origin. Treated seed will protect the crop during early establishment.

Crop covers, at present, are the only option in medium to high pest pressure situations, in low pest pressure situations the use of garlic products may give adequate control in sympathetic weather conditions. Crop covers also reduce flea beetle damage, cut worms and other larger moth species, but aphids are known to have infested some crops under covers.

#### **8.10.1.2 Cabbage aphid ( *Brevicoryne brassicae* )**

The mealy cabbage aphid will check the growth of young plants. On older plants, leaves curl and yellow predisposing to disease and later to neck rots.

**Cultural control:** *Most cabbage aphid infestations develop from colonies that overwinter on old brassica crops. Plough in or destroy as soon as possible.*

*Aphids are killed by many insect predators including ladybirds, hoverflies and parasitic wasps. Crops should be walked regularly to determine the balance of predators in relation to plant size etc. to determine whether the crop actually needs spraying. Many people are involved in the integrated approach and thresholds are being developed by HRI/ADAS. Weather conditions and time of year should be taken into account.*

**Chemical control:** Currently approved aphicides are listed in Appendix 4.

Consider using/alternating chemicals of different groups to avoid chemical resistance.

Consider early control before infestation becomes severe.

#### **8.10.1.3 Caterpillars**

Caterpillar damage will depend on numbers and the size of plants infested. Check regularly and only treat if plants are severely damaged. Currently approved insecticides are given in Appendix 4.

#### **8.10.1.4 Cutworms**

Cutworms are caterpillars of several species of noctuid moth. The most important is the turnip moth ( *Agrostis segetum* ). The young caterpillars hatch in June/July and feed on the foliage for at least a week before descending to feed on the underground parts of the plant.

Cutworm attacks are worst in hot dry summers. Routine treatment is not required. Warnings are issued based on trap catches combined with a weather model to define a high-risk period. When caterpillars are small they can be controlled by rainfall/irrigation or chemical treatment. Use pheromone traps to monitor moth numbers if local information is not available. Use irrigation if available and apply 10 cm of water. In the absence of rainfall and water, control with a systemic pyrethroid insecticide, timed as recommended by spray warning.

### 8.10.1.5 Slugs

Slugs damage brassica seedlings and can kill them. They also damage Swedes at all stages of growth causing ugly scars that predispose to secondary rots entering via damaged tissue.

**Cultural control:** *Consolidate soil to inhibit slug movement. Surface bait traps will indicate the need and timing of further treatment.*

**Chemical control:** Broadcast an approved molluscicide if bait traps and weather conditions indicate a high-risk period. A specific parasitic nematode is being developed which will not harm other organisms.

### 8.10.1.6 Minor pests

Chemical treatment for the following pests is only justified if they are present in crops, or if there is a history of infestation on the farm.

#### **Beet cyst nematode( *Heterodera schachtii* )**

Found mainly in East Anglia and the Isle of Axholme. It attacks most of the beet and brassica families. Although Swedes are rarely damaged they are effective hosts on which the nematode can increase to a level that will affect future beet crops.

*Sample if presence is suspected and avoid frequent cropping with alternative host crops if the nematode is present.*

#### **Brassica cyst nematode ( *Heterodera cruciferae* )**

Although this pest is widely distributed, it rarely reduces crop yields. Cysts survive in the soil for several years until stimulated to hatch by the presence of a fresh host crop.

*Sample if its presence is suspected and avoid overcropping with brassica crops.*

#### **Cabbage leaf miner ( *Phytomyza rufipes* and *Scaptomyza aplicalis* )**

Both species are widely distributed and occasionally damaging Swede crops. As large populations can develop in oilseed rape crops, avoid siting Swedes nearby if possible. *Control measures are only required if damage levels are high;* sprays applied for black diamond moth will keep leaf miner under control.

#### **Cabbage seed weevil**

In recent years large numbers of adult cabbage seed weevils have infected brassica crops in some localities during mid summer. Weevils can damage the leaves and have occasionally checked the growth of small plants. Application of a synthetic pyrethroid as control of caterpillars should kill some weevils and deter others from entering the crop.

#### **Cabbage stem flea beetle( *Psylliodes chrysocephala* )**

This widespread pest can attack most brassica crops, especially seed crops. The build-up occurs on oilseed rape crops and may lead to an attack on young plants stunting growth.

#### **Cabbage stem weevil ( *Ceutorhynchus quadridens* )**

A widely distributed but sporadic pest that attacks all cruciferous crops. The larvae feed in the stems and petioles of plants which subsequently wilt.

### **Cabbage whitefly( *Aleyrodes proletella* )**

An occasional pest which causes damage by its white scale-like larvae sucking the sap from the underside of leaves. Where large numbers are present, vigour may be reduced. There are up to five generations per year and adults over winter on the underside of leaves. Severe infestations leave a sticky secretion that attracts black sooty moulds.

*Destroy overwintering brassica crops;* treatment is rarely necessary, but pyrethroids will give some control of adults.

### **Flea beetles( *Phyllotreta spp .* )**

In drilled crops, small holes are eaten in cotyledons, stems and first and second true leaves. In warm dry conditions, the damage can be severe and seedlings may be killed.

*Damage to young plants is fairly local and most crops establishing quickly will grow away without further treatment.*

If damage is severe and seedlings are only growing slowly apply deltamethrin.

### **Leatherjackets ( *Tipula spp .* )**

Leatherjackets are only likely to be of importance in fields previously in grass or weedy stubble. Most damage occurs in the spring.

### **Turnip gall weevil( *Ceutorhynchus pleurostigma* )**

A common but local pest found in South West England. The main roots or root collar have hemispherical galls about 1 cm in diameter. These are excavated by the larvae in the course of their development. They are distinguished from club root galls by the interior feeding tunnels. Severe damage to Swedes is rare.

### **Wireworms( *Agriotes spp .* )**

Wireworms are most likely to be of consequence in fields cropped soon after grass . *Plough early with additional cultivations if wireworm damage is anticipated.* Little can be done once an attack has started.

### **Swede midge( *Contarinia nasturtii* )**

Midge occasionally causes severe localised damage in the growing points of young plants, resulting in the death of the plant. The first generation of larvae appear during the second half of May/beginning of June. High humidity situations favour their build up; drought slows up or stops emergence. The larvae hatch from eggs laid in groups of 15-25 and feed on the young tissue in the growing points.

At present there are no products approved for the control of swede midge.

### **Turnip Sawfly ( *Athalia rosae* )**

A previously unimportant pest which has caused severe localised damage to a number of brassica crops in S W England. Adults emerge in May and June and lay soon after mating. Larvae hatch after 6-8 days and mature in 10-13 days in temperatures above 20 C, when they consume more than twice their weight in 24 hours. Young larvae strip underside of leaf and are difficult to spot, whilst older larvae skeletonize leaves in a very short time. In the event of swarming as seen in 2006 whole areas of crop are destroyed in a few days. Approved aphicide will kill larvae (deltamethrin)

## 8.10.2 Disease control

### 8.10.2.1 Introduction

The guiding principle is that fungicide inputs should be minimised through prevention rather than cure. An integrated approach should be adopted in order to achieve this involving the following management steps.

#### Good management and planning:

- a. *Careful site selection to avoid known potential or previous disease problems .*
- b. *Sensible crop rotations to avoid build-up of disease.*
- c. *The inclusion of resistant varieties (where available) in cropping programmes whilst respecting the need to meet the required quality parameters and eating requirements.*

#### Cultural preventative techniques:

- a. *Good crop and field hygiene.*
- b. *Maximising nutrient availability to promote crop health through soil analysis.*
- c. *Accurate nutrient application to avoid excess.*
- d. *Use irrigation if appropriate and available.*

**Control measures:** If management has failed to control or prevent disease, the following approach should be adopted:

- a. Identify the need to take corrective action by regular monitoring and referring to thresholds (where established).
- b. Taking into account the prevailing weather conditions.
- c. Where corrective action is required, biological and natural methods (if available) of disease control should be considered first.
- d. If chemical control is needed, the following should be considered, whilst ensuring that effective control is achieved:
  - Use least toxic and persistent product, and the product which leaves the least residue.
  - Use most selective product to reduce effect on other beneficial organisms.
  - Use minimum effective dose rate.
  - Use appropriate application method with calibrated and well-maintained equipment, spot treating where possible.

Seedling diseases are the most consistently damaging and routine treatment is required in most cases. Later, when disease levels are not severe, two well timed applications of protectant and/or eradicant fungicide will prevent disease build-up.

### 8.10.2.2 Club root

This is the most important disease of Swedes and all brassicas, and also all cruciferous weeds. It is soil-borne and very persistent. It can remain viable in the soil for up to twenty years. It is worst in low pH situations, poorly drained or compacted soil (anaerobic conditions) and high temperatures in wet conditions.

Rotation must be practised in areas where it is a known problem because there is no chemical control since the withdrawal of mercury.

Soil tests can give an indication of a potential infection but are not totally conclusive.

Liming to maintain a soil pH of 7.0 - 7.3 will give a measure of control - there is no cure for infected plants -

but this will lock-up Boron.

Resistant varieties will be introduced but existing varieties with resistance appear to be breaking down.

Do not incorporate FYM on land to be used for Swedes from animals fed on diseased roots, as the spores remain viable even after passing through the intestines. Also stock-fed diseased roots should not be moved direct to land scheduled for growing Swedes in the near future.

No chemicals give satisfactory control; calcium cyanamide gives a degree of control. Research continues with various fungicides and some work has shown a reduction in club root with the application of burnt lime. The caustic action of the calcium hydroxide reduces the activity of the zoospores.

#### **8.10.2.3 Downy mildew (*Peronospora parasitica*)**

Air and soil-borne the fungus may affect young plants via the roots. Spores are produced on infected plants and are distributed by air currents and by rain splash to re-infect the plants via the leaves. 10-15°C and high humidity favour the disease but usually in field conditions the crop will outgrow the disease.

#### **8.10.2.4 Powdery mildew (*Erysiphe cruciferarum*)**

This disease is caused by an air-borne fungus, which produces a whitish/grey powdery growth on the upper side of the leaf. It can reduce the bulking up of the roots and seems to predispose it to late neck rots.

Control is recommended to prevent the build up of the disease. Sulphur can give early protection, but when the disease is seen eradicant fungicides are required.

#### **8.10.2.5 *Phoma* (*Phoma lingam*)**

A dry rot causing rotting plants during the autumn, the disease can also spread in storage. Light coloured spots enlarge, turn light brown, and become sunken and split. Pycnidia, which contain spores, are produced round the edge of the sunken area. Secondary wet bacterial rots soon invade masking the original cause. The source of pathogen is from crop residues in the soil, but seed infection can also occur.

**Control:** *Ensure long rotations, as fungus remains viable for two to four years .*

*Ensure seed is treated or free from infection because there is no in-field treatment.*

#### **8.10.2.6 *Alternaria* (*Alternaria brassicae*)**

This disease causes severe leaf spotting and even defoliation. The disease is spread from infected plant debris and seed.

**Control:** No chemical control is approved but some control will be achieved with recent systemic fungicide.

#### **8.10.2.7 *Rhizoctonia* (*Rhizoctonia solani*)**

This disease causes crater rots and can be quite severe. Trials are being conducted but no chemicals have been approved

*Rhizoctonia* is an aggregate species containing a widely varied morphology and pathology attacking a vast range of plants. It is common in all cultivated soil and is one of many seedling rots. This again leads to the use of treated seed.

#### **8.10.2.8 Other diseases**

**Violet root rot** is occasionally found on Swedes and is the same disease that affects carrots.

**White blister** occasionally affects Swedes but is usually of no economic importance.

**Virus diseases:** Turnip crinkle and turnip mosaic viruses can affect Swedes, but control measures against the vectors are not normally recommended.

### 8.10.3 Weed control

*Good ploughing with the burial of all trash is an ideal start. Stale seedbed techniques should be used where time allows but care should be taken to avoid moisture loss.*

*Mechanical methods with tractor hoes may be used where practical, which reduces the need for chemical control.*

*Rotation of crops will prevent the build-up of predominant or resistant weed species but can lead to certain volunteer problems.*

Effective weed control is essential to ensure satisfactory growth of the crop. Chemical weed control will depend largely on soil acting residual herbicides applied either pre- or post-drilling and also on post emergence products both contact and residual, depending on the weed spectrum present. Currently approved herbicides are listed in Appendix 7.

## 9 Harvesting and storage

### Harvesting

There are two methods of harvesting suitable for culinary Swedes:

- a. Hand pulling is the traditional way that is still widely used with Swedes put into nets or placed in potato boxes. This ensures that the best Swedes are selected and little damage is done to the product, but is very labour intensive.
- b. Mechanical lifting using adapted potato-lifting equipment. This requires the crop to be grown in beds to avoid wheel damage. The Swedes can again be put into potato boxes or bulk trailers to transport to the packhouse.

Care should be taken to ensure that the minimum damage is done to the crop, and to the land during harvesting operations.

The choice of system will depend on the suitability of the soil type for harvesting the crop at the anticipated harvest date, the availability of labour, the scale of the operation, and prevailing ground conditions at the time of harvest.

### Storage

Swedes can be stored for a few weeks after lifting, but extensive trials have shown that even with temperature and humidity control, weight loss and spoilage by rots is unacceptably high. Swedes stored in bulk boxes in cold store at around 3°C will keep for 4-6 weeks. At low ambient temperatures, Swedes will keep for 1 to 2 weeks reducing to only a few days at higher temperatures. Chemical dips are not approved for use on culinary Swedes.

## **Packhouse**

- a. *All packhouses must conform to current government legislation for safe practices at work.*
- b. *All water used for washing and in processing must have an annual certificate of potability. It is **strongly recommended** that water used for washing harvested produce is cleaned, steps are taken to conserve the use of water and waste water is disposed of appropriately.*
- c. *A system for pest and rodent control must exist in the packhouse.*
- d. *Under the Control of Substances Hazardous to Health Act, an assessment must be made of all packaging operations.*
- e. *All packhouses supplying multiple retailers must have systems to implement individual customer's quality assurance practices.*

## **10 Pollution control and waste management**

See Generic Standards and/or Generic Guidance Notes.

## **11 Energy efficiency**

See Generic Standards and/or Generic Guidance Notes.

## **12 Health & Safety**

See Generic Standards and/or Generic Guidance Notes.

## **13 Conservation issues**

See Generic Standards and/or Generic Guidance Notes.

**Appendix 1 Typical fertiliser requirements for culinary root brassicas (kg/ha)**

| Nutrient (kg/ha)      | Soil Index |     |         |      |      |      |
|-----------------------|------------|-----|---------|------|------|------|
|                       | 0          | 1   | 2       | 3    | 4    | 4+   |
| Nitrogen              |            |     |         |      |      |      |
| Mineral soils         | 150        | 100 | 50      | zero | zero | zero |
| Peat soils            | 60         | 40  | zero    | zero | zero | zero |
| Phosphate             | 200        | 150 | 100     | 50   | zero | zero |
| Potash <sup>(1)</sup> | 300        | 250 | 150-200 | 60   | zero | zero |
| Magnesium             | 150        | 100 | zero    | zero | zero | zero |

No more than 100 kg/ha of nitrogen should be applied to the seed bed; the remainder should be applied as a top dressing.

Where organic manures (FYM, etc.) have been applied to the crop, these levels will need readjustment.

<sup>(1)</sup> Different potash recommendations are given for the lower half (2-) and upper half (2+) of the K Index 2.

## Appendix 2 Factors influencing nitrogen use decisions

Following the introduction of the revised RB 209 Fertiliser Recommendations, new methods of nitrogen assessment have been introduced.

The nitrogen index is now assessed using the new soil nitrogen supply (SNS) tables that are found in the new 7<sup>th</sup> Edition [2000] RB 209 fertiliser recommendations book. These tables take into account soil type and annual rainfall for the particular field in question.

**The soil nitrogen supply (SNS) is the amount of nitrogen (kg/ha N) in the soil that becomes available for uptake by the crop from the establishment to the end of the growing season, taking account of nitrogen losses.**

**Soil nitrogen supply (SNS) = soil mineral nitrogen (SMN) + estimate of total crop nitrogen + estimate of mineralisable nitrogen.**

In most situations the SNS Index will be identified by using the field assessment method based on field specific information from previous cropping, fertiliser and manure use with soil type and rainfall average for area. There will be no need for soil sampling. This method will give a satisfactory assessment of the SNS. However, soil sampling and analysis for SMN are recommended where high or uncertain amounts of nitrogen are expected.

The SNS tables (A-C) are to be found on pages 66 - 68 of RB 209.

### Appendix 3 Insecticides currently approved for cabbage root fly control on Swedes

**Notes:** THERE ARE CURRENTLY NO INSECTICIDES APPROVED FOR USE AGAINST CABBAGE ROOT FLY.

**Appendix 4 Insecticides currently approved to control other pests on Swedes**

| Active Ingredient           | Product Features                                                                                                        | Approval Status | Harvest Interval <sup>(1)</sup> | Buffer Zone | Hazard Rating               | MRL (mg/kg) |
|-----------------------------|-------------------------------------------------------------------------------------------------------------------------|-----------------|---------------------------------|-------------|-----------------------------|-------------|
| deltamethrin <sup>(3)</sup> | contact and residual pyrethroid insecticide for flea beetle. Dangerous to bees.                                         | Full            | Zero                            | A           | Harmful<br>Irritant         | 0.01        |
| nicotine                    | non persistent contact alkaloid insecticide. Dangerous to bees.                                                         | Full            | 2 days                          | C           | <b>Toxic Part II Poison</b> | none set    |
| pirimicarb                  | Carbamate aphicide, with little effect on bees, ladybirds and other insects. Suitable for Integrated control programmes | Full            | 3 days                          | C           | Toxic and Harmful           | none set    |
| thiacloprid                 | A chloronicotinyl insecticide                                                                                           | SOLA            | 35 days                         | C           | Harmful                     | none set    |

**Notes:**

(1) or latest time of application

(2) SOLA - see Appendix 8 for the specific product and expiry dates

(3) approved for use on Turnips by extrapolation from Swedes under the "Long term arrangements" (see Appendix G in the Generic Guidance Notes)

Not all products containing these active ingredients may be currently approved for use on Swedes. As label recommendations are revised regularly, read a current label before use.

MRL's have been included where a level has been set in the Maximum Residue in Crops, Food and Feeding Stuff Regulations, 1994/95.

Not all products containing these active ingredients may be subject to the buffer zone restrictions. Read a current label before use.

Note that the hazard rating only applies to operator safety when handling a concentrate.

### Appendix 5 Molluscicides currently approved for use on Swede, Turnip and Kohlrabi

| Active Ingredient | Product Features                                                             | Approval Status | Harvest Interval <sup>(1)</sup> | Buffer Zone | Hazard Rating | MRL (mg/kg) |
|-------------------|------------------------------------------------------------------------------|-----------------|---------------------------------|-------------|---------------|-------------|
| metaldehyde       | large or small (mini) pellets. Use does preserve ground beetle populations.  | Full            | zero                            | C           |               | none set    |
| Ferric phosphate  | Biodegraded to plant nutrients. Use does preserve ground beetle populations. | Full            | zero                            | C           |               | none set    |

**Notes:**

<sup>(1)</sup> or latest time of application

Best results are achieved during mild damp weather when slug and snails are active.

All pellets are harmful to aquatic life. Broadcast clear of surface water and ditches etc.

Although pellets need to be used in standing crops, ensure that the pellets do not lodge in crops as marketability may be affected by the presence of partly decomposed pellets.

Not all products containing these active ingredients may be currently approved for use on Swede. As label recommendations are revised regularly, read a current label before use.

MRL's have been included where level has been set in the Maximum Residue in Crops, Food and Feeding Stuff Regulations, 1994/95.

Not all products containing these active ingredients may be subject to the buffer zone restrictions. Read a current label before use.

**Appendix 6 Fungicides currently approved for use on Swedes**

| Active Ingredient | Product Features                                        | Approval Status | Harvest Interval <sup>(1)</sup> | Buffer Zone | Hazard Rating | MRL (mg/kg) |
|-------------------|---------------------------------------------------------|-----------------|---------------------------------|-------------|---------------|-------------|
| azoxystrobin      | systemic translaminar protectant, strobilurin fungicide | SOLA            | 35 days                         | C           | Irritant      | None set    |
| flusilazole       | A systemic, protective and curative triazole            | SOLA            | 42 days                         | C           | Toxic         | None Set    |
| iprodione         | seed treatment                                          | Full            | none stated                     | C           | Irritant      | none set    |
| sulphur           | inorganic protectant fungicide and foliar feed.         | Full            | Use before end September        | C           | None          | none set    |
| tebuconazole      | systemic conazole fungicide.                            | Full            | 35 days                         |             | Harmful       | none set    |
| tolclofos-methyl  | protectant organophosphorus fungicide                   | SOLA            | none stated                     | B           | Irritant      | none set    |

**Notes:**

(1) or latest time of application

(2) SOLA - see Appendix 9 for the specific product and expiry dates

(3) approved for use on Turnips by extrapolation from Swedes under the "Long term arrangements" (see Generic Guidance Notes, Appendix G)

Not all products containing these active ingredients may be currently approved for use on Swede. As label recommendations are revised regularly, read a current label before use.

MRL's have been included where a level has been set in the Maximum Residue in Crops, Food and Feeding Stuff Regulations, 1994/95.

Not all products containing these active ingredients may be subject to the buffer zone restrictions. Read a current label before use.

Note that the hazard rating only applies to operator safety when handling a concentrate.

**Appendix 7 Herbicides currently approved for use on Swedes**

| Active Ingredient                                  | Product Features                                                                                                                                      | Approval Status | Harvest Interval <sup>(1)</sup> | Buffer Zone | Hazard Rating | MRL (mg/kg) |
|----------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|---------------------------------|-------------|---------------|-------------|
| chlorthal - dimethyl <sup>(3)</sup>                | residual benzoic acid herbicide for annual dicotyledons.                                                                                              | Full            | none stated                     | C           | None          | None set    |
| chlorthal - dimethyl and propachlor <sup>(3)</sup> | Residual herbicide mixture for wide range of annual dicotyledons applied pre-or post-emergence of crop, but pre-emergence of weed                     | Full            | None stated                     | C           | None          | None set    |
| clomazone                                          | An isoxazolidinone residual herbicide                                                                                                                 | SOLA            | None stated                     | C           | Irritant      | None set    |
| clopyralid <sup>(3)</sup>                          | foliar, translocated picolinic herbicide particularly useful for composite weeds eg. thistles, mayweed, groundsel.                                    | Full            | 6 weeks                         | C           | Irritant      | None set    |
| cycloxydim <sup>(3)</sup>                          | translocated post - emergence oxime herbicide for grass weed control. (not annual meadow grass).                                                      | Full            | 8 weeks                         | C           | Harmful       | None set    |
| glyphosate <sup>(3)</sup>                          | translocated non-residual phosphonic acid for use pre - drilling/pre - emergence for annual weeds and volunteer cereals.                              | Full            | none stated                     | C           | Harmful       | None set    |
| metazachlor <sup>(3)</sup>                         | residual anilide herbicide for pre and post emergence use for broad leaf weed control. Medium persistence (12 weeks).                                 | Full            | 6 weeks                         | C           | Harmful       | None set    |
| propachlor <sup>(3)</sup>                          | pre - emergence amide herbicide for use pre - or post emergence of crop: (3 - 4 true leaf) for broad-leafed weed control. Short persistence (6 weeks) | Full            | none stated                     | C           | Irritant      | none set    |
| propaquizafop                                      | a phenoxy alkanolic acid foliar acting grass herbicide. Buffer zone restrictions.                                                                     | Full            | 8 weeks                         | A           | Irritant      | none set    |
| trifluralin <sup>(3)</sup>                         | soil incorporated dinitroaniline herbicide rate varies with soil type. Persistent (40 weeks).                                                         | Full            | none stated                     | C           | Harmful       | none set    |

**Notes:**

<sup>(1)</sup> or latest time of application

<sup>(2)</sup> SOLA - see Appendix 8 for the specific product and expiry dates

<sup>(3)</sup> approved for use on Turnips by extrapolation from Swedes under the "Long term arrangements"

Not all products containing these active ingredients may be currently approved for use on Swede. As label recommendations are revised regularly, read a current label before use.

MRL's have been included where a level has been set in the Maximum Residue in Crops, Food and Feeding Stuff Regulations, 1994/95.

Not all products containing these active ingredients may be subject to the buffer zone restrictions. Read a current label before use.

Note that the hazard rating only applies to operator safety when handling a concentrate.

## Appendix 8 Specific off-label approvals for Swedes

| Number  | Product Name | Ingredients      | Expiry   |
|---------|--------------|------------------|----------|
| 0614/04 | Amistar      | azoxystrobin     | 31/12/11 |
| 3749/02 | Basilex      | tolclofos-methyl | 31/12/13 |
| 3132/07 | Biscaya      | thiocloprid      | 31/12/14 |
| 3284/07 | Capitan 25   | flusilazole      | 31/12/13 |
| 0419/08 | Gamit 36     | clomazone        | 28/02/10 |
| 3283/07 | Genie 25     | flusilazole      | 31/12/13 |
| 3270/07 | Lyric        | flusilazole      | 31/12/13 |
| 0534/06 | Rovral Flo   | iprodione        | 31/12/08 |

### Notes:

Specific off-label approvals (SOLAs) provide for the use of the product named in respect of crops, situations or pests other than those included on the product label. Such use is undertaken at the user's choosing and the risk is entirely theirs and /or their advisers.

Specific off-label uses may only take place if all the conditions given in the "Notice of Approval" document, the product label and/or leaflet and any additional guidance on off-label approvals have first been read and understood. The conditions of approval given in the "Notice of Approval" are statutory and supersede any on the label that would otherwise apply.

All SOLAs are conditional on the extant approval of the specific product.

## Appendix 9 Specific off-label approvals for Turnips

| Number  | Product Name | Ingredients      | Expiry   |
|---------|--------------|------------------|----------|
| 0614/04 | Amistar      | azoxystrobin     | 01/07/08 |
| 3749/02 | Basilex      | tolclofos-methyl | 31/12/13 |

### Notes:

Specific off-label approvals (SOLAs) provide for the use of the product named in respect of crops, situations or pests other than those included on the product label. Such use is undertaken at the user's choosing and the risk is entirely theirs and /or their advisers.

Specific off-label uses may only take place if all the conditions given in the "Notice of Approval", the product label and/or leaflet and any additional guidance on off-label approvals in the "Notice of Approval" have first been read and understood. The conditions of approval given when "Notice of Approval" are statutory and supersede any on the label that would otherwise apply.

All SOLAs are conditional on the extant approval of the specific product.

## Appendix 10 Insecticides for control of cabbage root fly on Kohlrabi

| Active Ingredient           | Product Features                                                         | Approval Status | Harvest Interval <sup>(1)</sup> | Buffer Zone | Hazard Rating | MRL (mg/kg) |
|-----------------------------|--------------------------------------------------------------------------|-----------------|---------------------------------|-------------|---------------|-------------|
| chlorpyrifos <sup>(2)</sup> | Contact 21 days and ingested organophosphate.<br>Broad spectrum granule. | SOLA            | 6 weeks                         | A           | Harmful       | 0.05        |

### Notes:

<sup>(1)</sup> or latest time of application

<sup>(2)</sup> SOLA - see Appendix 15 and 16 for the specific product and expiry dates

Not all products containing these active ingredients may be currently approved for use on Swede. As label recommendations are revised regularly, read a current label before use.

MRL's have been included where a level has been set in the Maximum Residue in Crops, Food and Feeding Stuff Regulations, 1994/95.

Not all products containing these active ingredients may be subject to the buffer zone restrictions. Read a current label before use.

Note that the hazard rating only applies to operator safety when handling a concentrate.

### Appendix 11 Insecticides approved for aphid control on Kohlrabi

| Active Ingredient         | Product Features                                                 | Approval Status | Harvest Interval <sup>(1)</sup> | Buffer Zone | Hazard Rating | MRL (mg/kg) |
|---------------------------|------------------------------------------------------------------|-----------------|---------------------------------|-------------|---------------|-------------|
| dimethoate <sup>(2)</sup> | contact and systemic organophosphorus insecticide and acaricide. | SOLA            | 7 days                          | C           | Harmful       | 1.0         |

**Notes:**

<sup>(1)</sup> or latest time of application

<sup>(2)</sup> SOLA - see Appendix 15 and 16 for the specific product and expiry dates

Not all products containing these active ingredients may be currently approved for use on Swede. As label recommendations are revised regularly, read a current label before use.

MRL's have been included where a level has been set in the Maximum Residue in Crops, Food and Feeding Stuff Regulations, 1994/95.

Not all products containing these active ingredients may be subject to the buffer zone restrictions. Read a current label before use.

Note that the hazard rating only applies to operator safety when handling a concentrate.

## Appendix 12 Insecticides currently approved to control other pests on Kohlrabi

| Active Ingredient           | Product Features                                            | Approval Status | Harvest Interval <sup>(1)</sup> | Buffer Zone | Hazard Rating | MRL (mg/kg) |
|-----------------------------|-------------------------------------------------------------|-----------------|---------------------------------|-------------|---------------|-------------|
| chlorpyrifos <sup>(2)</sup> | contact and ingested organophosphate.<br>Dangerous to bees. | SOLA            | 21 days                         | A           | Harmful       | 0.05        |
| dimethoate <sup>(2)</sup>   | contact and systemic organophosphate.<br>Dangerous to bees. | SOLA            | 7 days                          | A           | Harmful       | 1.0         |

### Notes:

<sup>(1)</sup> or latest time of application

<sup>(2)</sup> SOLA - see Appendix 15 and 16 for the specific product and expiry dates

Not all products containing these active ingredients may be currently approved for use on Swede. As label recommendations are revised regularly, read a current label before use.

MRL's have been included where a level has been set in the Maximum Residue in Crops, Food and Feeding Stuff Regulations, 1994/95.

Not all products containing these active ingredients may be subject to the buffer zone restrictions. Read a current label before use.

Note that the hazard rating only applies to operator safety when handling a concentrate.

### Appendix 13 Fungicides currently approved for use on Kohlrabi

| Active Ingredient           | Product Features            | Approval Status | Harvest Interval <sup>(1)</sup> | Buffer Zone | Hazard Rating | MRL (mg/kg) |
|-----------------------------|-----------------------------|-----------------|---------------------------------|-------------|---------------|-------------|
| tebuconazole <sup>(2)</sup> | systemic conazole fungicide | SOLA            | 21 days                         | C           | Harmful       | none set    |

**Notes:**

<sup>(1)</sup> or latest time of application

<sup>(2)</sup> SOLA - see Appendix 15 and 16 for the specific product and expiry dates

Not all products containing these active ingredients may be currently approved for use on Swede. As label recommendations are revised regularly, read a current label before use.

MRL's have been included where a level has been set in the Maximum Residue in Crops, Food and Feeding Stuff Regulations, 1994/95.

Not all products containing these active ingredients may be subject to the buffer zone restrictions. Read a current label before use.

Note that the hazard rating only applies to operator safety when handling a concentrate.

**Appendix 14 Herbicides currently approved for use on Kohlrabi**

| Active Ingredient          | Product Features                                                                                                           | Approval Status | Harvest Interval <sup>(1)</sup> | Buffer Zone | Hazard Rating | MRL (mg/kg) |
|----------------------------|----------------------------------------------------------------------------------------------------------------------------|-----------------|---------------------------------|-------------|---------------|-------------|
| glyphosate                 | translocated non-residual phosphonic acid herbicide for pre-drilling/pre-emergence for annual weeds and volunteer cereals. | Full            | none stated                     | C           | Irritant      | none set    |
| propachlor <sup>(2)</sup>  | pre-emergence chloroacetanilide herbicide.                                                                                 | SOLA            | none stated                     | C           | Irritant      | none set    |
| trifluralin <sup>(2)</sup> | soil incorporated dinitroaniline herbicide                                                                                 | SOLA            | none stated                     | C           | None          | none set    |

**Notes:**

<sup>(1)</sup> or latest time of application

<sup>(2)</sup> SOLA - see Appendix 15 and 16 for the specific product and expiry dates

Not all products containing these active ingredients may be currently approved for use on Swede. As label recommendations are revised regularly, read a current label before use.

MRL's have been included where a level has been set in the Maximum Residue in Crops, Food and Feeding Stuff Regulations, 1994/95.

Not all products containing these active ingredients may be subject to the buffer zone restrictions. Read a current label before use.

Note that the hazard rating only applies to operator safety when handling a concentrate.

## Appendix 15 Specific off-label approvals for Kohlrabi

| Number  | Product name                       | Ingredients  | Expiry   |
|---------|------------------------------------|--------------|----------|
| 1986/0  | Treflan <sup>®</sup>               | trifluralin  | 31/08/08 |
| 1159/02 | Ramrod Flowable <sup>®</sup>       | propachlor   | 31/12/13 |
| 1537/00 | Dursban <sup>®</sup>               | chlorpyrifos | 31/12/13 |
| 2540/07 | Alpha Propachlor 50SC <sup>®</sup> | propachlor   | 31/01/09 |
| 1881/03 | Folicur <sup>®</sup>               | tebuconazole | 31/12/13 |
| 0389/94 | BASF Dimethoate <sup>®</sup>       | dimethoate   | 31/12/13 |
| 1748/03 | Alpha Trifluralin <sup>®</sup>     | trifluralin  | 31/08/08 |
| 1391/03 | Dursban WG <sup>®</sup>            | chlorpyrifos | 31/12/13 |
| 1910/07 | Alpha Chlorpyrifos                 | chlorpyrifos | 31/08/08 |
| 1400/05 | Orius <sup>®</sup>                 | tebuconazole | 31/12/13 |
| 1586/06 | Parapet <sup>®</sup>               | chlorpyrifos | 31/12/13 |
| 0026/08 | Govern <sup>®</sup>                | chlorpyrifos | 31/12/13 |
| 1377/07 | Alpha Tebuconazole                 | tebuconazole | 31/12/13 |
| 0235/05 | Cyren                              | chlorpyrifos | 31/12/13 |
| 1505/04 | Danadim                            | dimethoate   | 31/12/13 |
| 0682/05 | Danadim Progress                   | dimethoate   | 31/12/13 |
| 1360/07 | Mitre                              | tebuconazole | 31/12/13 |
| 0552/07 | Riza                               | tebuconazole | 31/12/13 |

### Notes:

Specific off-label approvals (SOLAs) provide for the use of the product named in respect of crops, situations or pests other than those included on the product label. Such use is undertaken at the user's choosing and the risk is entirely theirs and /or their advisers.

Specific off-label uses may only take place if all the conditions given in the "Notice of Approval", the product label and/or leaflet and any additional guidance on off-label approvals have first been read and understood. The conditions of approval given in the "Notice of Approval" are statutory and supersede any on the label that would otherwise apply.

All SOLAs are conditional on the extant approval of the specific product.

**Appendix 16 Specific off-label approvals for protected Kohlrabi**

| Number  | Product name                          | Ingredients  | Expiry   |
|---------|---------------------------------------|--------------|----------|
| 1505/04 | Danadin <sup>®</sup>                  | dimethoate   | 31/12/13 |
| 0235/05 | Cyren <sup>®</sup>                    | chlorpyrifos | 31/12/13 |
| 1977/04 | Alpha Chlorpyrifos 48 EC <sup>®</sup> | chlorpyrifos | 31/12/07 |
| 1159/02 | Ramrod Flowable                       | propachlor   | 31/12/13 |

**Notes:**

Specific off-label approvals (SOLAs) provide for the use of the product named in respect of crops, situations or pests other than those included on the product label. Such use is undertaken at the user's choosing and the risk is entirely theirs and /or their advisers.

Specific off-label uses may only take place if all the conditions given in the "Notice of Approval", the product label and/or leaflet and any additional guidance on off-label approvals have first been read and understood. The conditions of approval given in the "Notice of Approval" are statutory and supersede any on the label that would otherwise apply.

All SOLAs are conditional on the extant approval of the specific product.

**Appendix 17 Control Points: Swede, Turnip and Kohlrabi****CS.44 SWEDE**

- CS.44.1 Growers should be able to show evidence that when choosing fields, consideration is given to soil type, the topography of the land and the risk of run-off and erosion - Protocol reference: Section 3.1
- CS.44.2 On early protected crops, all fleece or polythene waste recovered should be recycled or disposed of in an appropriate manner - Protocol reference: Section 4
- CS.44.3 Where appropriate, growers should be able to show evidence of cleaning, conservation and disposal of water used for washing harvested produce - Protocol reference: Section 9
- CS.44.4 Growers should consider using seed treatments as a first line of defence against pests and diseases - Protocol reference: Section 8.10.1
- CS.44.5 In the absence of approved pesticide, growers should cover crops with crop netting - Protocol reference: Section 8.10.1.1

**CS.67 TURNIP**

- CS.67.1 Growers should be able to show evidence that when choosing fields, consideration is given to soil type, the topography of the land and the risk of run-off and erosion - Protocol reference: Section 3.1
- CS.67.2 On early protected crops, all fleece or polythene waste recovered should be recycled or disposed of in an appropriate manner - Protocol reference: Section 4
- CS.67.3 Where appropriate, growers should be able to show evidence of cleaning, conservation and disposal of water used for washing harvested produce - Protocol reference: Section 9
- CS.67.4 Growers should consider using seed treatments as a first line of defence against pests and diseases - Protocol reference: Section 8.10.1
- CS.67.5 In the absence of approved pesticide, growers should cover crops with crop netting - Protocol reference: Section 8.10.1.1

## Appendix 17 Control Points: Swede, Turnip and Kohlrabi

### CS.68 KOHL RABI

- CS.68.1 Growers should be able to show evidence that when choosing fields, consideration is given to soil type, the topography of the land and the risk of run-off and erosion - Protocol reference: Section 3.1
- CS.68.2 On early protected crops, all fleece or polythene waste recovered should be recycled or disposed of in an appropriate manner - Protocol reference: Section 4
- CS.68.3 Where appropriate, growers should be able to show evidence of cleaning, conservation and disposal of water used for washing harvested produce - Protocol reference: Section 9
- CS.68.4 Growers should consider using seed treatments as a first line of defence against pests and diseases - Protocol reference: Section 8.10.1
- CS.68.5 In the absence of approved pesticide, growers should cover crops with crop netting - Protocol reference: Section 8.10.1.1