Assured Produce

Crop Specific Protocol

LEEKS

(CROP ID: 33)

February 2009

Control Document No: 00032/09

Acknowledgements

Assured Produce gratefully acknowledges the contribution of all consultees in the preparation of this protocol, particularly members of the Leek Growers Association and Peter Parr.

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 **"should/must"** (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 **"should/must"** 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 ® and all trademark rights are hereby acknowledged.

Notes:

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 Products containing substances which have been revoked are shown on the PSD website (http://www.pesticides.gov.uk).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)

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:

- 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.

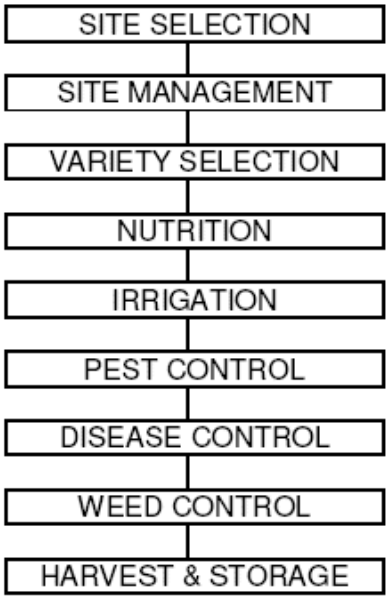
For pesticides on-label, only active substances are shown.

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.

2 Planning and records

See Generic Standards and/or Generic Guidance Notes

3 Site selection

3.1 Site history

Leeks can be grown on a wide range of soil types. Leeks have a very high requirement for water. Soils which dry out rapidly and which cannot be irrigated sufficiently should be avoided.

Consideration should also be given to the fact that Leeks will possibly require undercutting and harvesting in

wet conditions and therefore heavier soils, especially those that drain badly, should also be avoided.

3.2 Rotations

As leeks are members of the *Allium* family, leeks and onions must be regarded as one and the same in respect of rotation. Certain diseases, e.g. white rot, are common to both Onions and Leeks and it is essential to avoid over-cropping, especially where known problems are known to exist.

There is no such thing as an ideal period of rotation but it is advisable not to grow onions or leeks on the same land more than one year in three. If the land has a history of disease, this width of rotation may well have to be increased. An additional factor that may influence rotation is the amount of trash from the crop that is left in the field. Diseases such as white tip are very often more serious where large amounts of diseased material have been left in a field and only a short rotation is practised.

4 Site management

See Generic Standards and/or Generic Guidance Notes

5 Variety selection

5.1 Choice of variety or rootstock

See Generic Standards and/or Generic Guidance Notes

5.2 Seed quality

See Generic Standards and/or Generic Guidance Notes

5.3 Seed treatments and dressings

See Generic Standards and/or Generic Guidance Notes

5.4 Plants and nursery stock

5.4.1 Pesticide applications made at source

Only pesticides specifically recommended for use on leeks must be used by the propagator. Pesticides used under protection must have a specific recommendation for that use. Records must be kept of all pesticide applications. These records must be available for inspection. Propagators must pay particular attention to hygiene, especially in respect of the cleanliness of module trays.

6 Nutrition

6.1 Nutrient requirement

Propagation

Propagation is done in blocks, modules, or as bare root transplants. The latter can be under protection or in an outdoor seedbed.

Correct attention in respect of watering and nutrition must be given at all times. It is particularly important that modules or blocks are moist when they are despatched from the nursery. In particular modules are very prone to drying out as they generally contain less compost than blocks. Once modules or blocks have dried out, they

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are very difficult to re-wet and failure to ensure adequate moisture content before planting can lead to serious plant losses.

Nutrient analysis

Soil analysis for phosphate, potash, magnesium and pH is especially important if fertiliser usage is to be maximised. Soil nutrient levels must be monitored during the life of the crop are monitored by carrying out leaf/sap analysis.

Nitrogen

Leeks are responsive to nitrogen. The majority of the plant's requirement should be applied post-drilling or post-planting. Large amounts of nitrogen applied to the seedbed are not only wasteful and environmentally unsound; they can also inhibit germination.

Applications of nitrogen applied to over-wintering crops in late autumn should be avoided as the plant is unable to utilise nitrogen efficiently during the late autumn and winter. Top dressing can be applied in the spring when growth commences.

Care should be exercised when applying nitrogen top dressing to the leek crop. Broadcast applications may result in granules lodging in the crop and scorching the leaves of the leeks.

Over-application of nitrogen can result in very soft crops that are very prone to disease, especially rust.

Phosphate and potash

Both phosphate and potash should be applied according to soil analysis. Both should be applied pre-planting or pre-drilling according to the table in Appendix 1.

Magnesium

Magnesium is an important element in leek production, especially on light sandy soils. Magnesium should be applied in the spring at least three weeks before planting or drilling. The best form of magnesium to use is kieserite because it is so readily available to the plant. It is possible to obtain kieserite in granular form.

If lime is required in addition to magnesium, it may be more cost effective to apply magnesian limestone. However, magnesian limestone often takes longer to correct pH than does ground limestone.

pH

Leeks are very sensitive to soil acidity. They grow best at a pH of between 6.7 and 7.2. Results given by a laboratory on a composite sample can be misleading and the best way to check pH is by walking the land in the pattern of a 'W' and sampling regularly. Acid patches can be readily identified with the help of a suitable soil indicator.

Unless there is a very well defined and isolated acid patch, soils are best limed according to their lowest pH. Sampling should be carried out in the spring as on some soils winter rainfall can significantly reduce the pH.

Trace elements

Manganese

Leeks occasionally suffer from manganese deficiency: occasionally this is induced by over-liming. Manganese deficiency can be confirmed by leaf analysis and is best corrected by an application of manganese sulphate plus a suitable non-ionic wetter. Manganese sulphate should not be sprayed on a hot day in bright sunlight as some

scorch can occur.

Other trace element deficiencies are rare. Leeks are not particularly responsive to foliar feeding and any suspected trace element deficiency should be positively identified by leaf analysis before any form of treatment is considered.

7 Irrigation

Leeks must have adequate soil moisture if they are to bulk satisfactorily. Lack of soil moisture at certain times of the year can lead to bulbing.

Irrigation at drilling

In particularly dry periods it may be necessary to apply irrigation in order to help the leek seed to germinate. Once irrigation has commenced, it will be necessary to continue to keep the soil moist until the entire crop has emerged. The radical of the germinating Leek plant is very sensitive to drying out. The following must also be borne in mind:

- On soils, which are known to cap when irrigated, it is worth using an anti-capping material immediately after the seed has been sown.
- Apply irrigation 'little and often' rather than in doses which might do damage to the structure of the seedbed.

Newly planted seedlings, especially those planted behind a dibbing machine, require watering as soon as possible after planting. It is more cost effective to apply water to newly planted leeks directly along the rows and down the dibbing holes rather than by using overall irrigation.

It is worth considering monitoring water status in the growing crop. This can be achieved by various methods such as neutron probes, tensiometers etc. Irrigation timing and an indication of the amount of water to be applied can be judged more effectively if some monitoring system is employed. This can result in more efficient and economical use of irrigation.

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

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.

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Contact details are: 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 Standards and/or Generic Guidance Notes

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

See Generic Standards and/or Generic Guidance Notes

8.10.1 Pest control

8.10.1.1 Introduction

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

Good management and planning

a. *Careful site selection to avoid potential or previous problems thereby enhancing plant health.*
b. *Sensible crop rotations to avoid build-up of problems.*
c. *Inclusion of resistant varieties (where available) in cropping programmes whilst respecting the need to meet the required quality parameters and eating requirements.*
d. *Establish the need to take corrective action by regular monitoring referring to thresholds where established. Trained staff should carry this out. The effect of prevailing weather conditions should also be considered.*

Cultural preventative techniques

a. *Good crop and field hygiene, promoting crop health by maximising nutrient availability through soil analysis and accurate application to avoid excess nutrient application.*
b. *Utilise irrigation as a control measure wherever appropriate and feasible.*
c. *Enable biological and natural methods of pest control to flourish in the crop environment.*

Corrective action

If the above actions fail to prevent or control pests, the following approach should be adopted:

a. Where corrective action is required, additional biological and natural methods of pest and disease control (if available) should be considered first.
b. If chemical control is needed, the following points should be considered, whilst ensuring effective control is achieved:

- *Use the least toxic and persistent product.*
- *Use the most selective product to reduce the impact on naturally occurring beneficial organisms.*
- *Use minimum effective dose rate.*
- *Use appropriate application methods with effectively maintained equipment, and spot treating wherever possible.*
- *Exceeding the recommended dose rate is wasteful, gives no benefit in terms of control, and is also illegal under COPR.*

All residues from previous Allium crops should be thoroughly destroyed or ploughed-in as soon as cropping is complete.

The use of pest monitoring and forecasting techniques should be adopted where possible as an adjunct to crop inspection.

Field margins can provide a reservoir of insect predators, including ladybird larvae, hoverflies, ground beetles etc. Care must be taken to avoid spray drift from the crop into these areas.

8.10.1.2 Aphids

Various species of aphid (black bean aphid most common) are seen from time to time on Leek crops, especially during times when growth is rapid and the leaf is soft. Aphids do little or no damage to the Leek crop and control is invariably uneconomic.

8.10.1.3 Cutworms

Cutworms are one of the most serious pests to attack Leeks. The attacks are particularly severe in dry summers and the losses from these attacks can be substantial.

The caterpillar of the turnip moth *(Agrostis segetum)* is responsible for the greater proportion of the damage incurred. The caterpillars feed on the roots of the Leek plant causing severe damage. In the case of young seedlings, the plants are severed at the base. The turnip moths emerge during May and June and lay their eggs on the foliage. The caterpillars hatch out and initially feed on the leaves of the Leek plant. They then go down to the soil and once they have entered the soil are almost impossible to kill. Attacks are often most serious on light soils.

Monitoring the arrival of the turnip moth is best done with pheromone traps. This method provides an excellent guide to risk assessment. If the information gained by using the traps is used in conjunction with weather data such as temperature and rainfall, accurate control of the pest by sprays or irrigation can be timed precisely.

Cultural control:*Keeping the crop weed free will help discourage cutworm attacks. Cutworms are well controlled by irrigation. Irrigation must be applied while the young caterpillar is still feeding on the aerial parts of the plant. Once the caterpillar has entered the soil, no amount of irrigation will control it successfully. At least 10mm of irrigation must be applied to obtain satisfactory control of this pest.*

Chemical control: Chemicals currently approved for the control of cutworm on Leeks are listed in Appendix 2. The chemicals must be applied before the caterpillars enter the soil. Chemical applications should be made when cutworm warnings are given and routine applications of pesticides must be avoided at all costs.

8.10.1.4 Bean seed fly (*Delia platura*)

The amount of damage to germinating Leek seedlings caused by the larvae of this pest has increased in recent years. Later drilling, largely due to the introduction of hybrid Leeks, seem to suit this opportunist pest.

Cultural control:*The larvae of the bean seed fly are attracted by decaying trash. Avoid drilling Leeks in situations where this is likely to occur.*

Chemical control: Treatment of the seed with tefluthrin offers useful control of both bean seed fly and onion fly.

8.10.1.5 Leek moth

Attacks from leek moth *(Acrolepiopsis assectella)* are rare and tend to occur in coastal regions in the south and east. There is very rarely any need for treatment and no chemical is specifically recommended for this pest. Insecticides, which are used for cutworm control, will give control of this pest.

8.10.1.6 Onion fly

Onion fly *(Delia antigua)* can be a serious pest of drilled leeks. The bean seed fly *(Delia platura)* which is a close relative of the onion fly also causes damage. Although the most serious damage is caused to young seedling leeks, these flies can also cause significant damage to more mature crops.

Cultural control:*A good rotational policy will help reduce the severity of attacks from onion fly. However, there is no really successful method of reducing attacks by the maggots of this pest, as attacks are sporadic and unpredictable.*

Chemical control: Treatment of the seed with tefluthrin offers useful control of both bean seed fly and onion fly.

8.10.1.7 Spider mite

The two-spotted spider mite *(Tetranychus urticae)* is seen on leek crops, especially in hot, dry summers. Although the pest can cause damage in isolated patches, it does not warrant treatment.

Cultural control: *The best method of control is rotation and hygiene as this pest overwinters on debris in the soil. There are a number of predators, which attack this pest that is why careful consideration must always be given to application of pesticides that will have an effect upon these predators.*

8.10.1.8 Stem eelworm

Although a comparatively rare pest of leeks, stem eelworm *(Ditylenchus dipsaci)* can occasionally be a problem in intensive vegetable growing areas, especially where Onions, Carrots or Parsnips have been grown in the same rotation.

Cultural control:*As nematodes become dormant and are able to survive on infested plant tissue, it is important to remove as much trash from the field as is practical. Rotation will also help as it restricts the build up of the pest.*

Chemical control: There is no chemical control available at the present time .

8.10.1.9Thrips

The onion thrip *(Thrips tabaci)* has become a serious pest of leeks in recent years and is one of the most difficult pests to control satisfactorily. Damage can occur very early in the life of the crop, almost before it is noticed. Early treatment is advised, as established colonies can be difficult to eradicate.

Cultural control:*Very little can be achieved in respect of cultural control. Although rotation will help to a certain extent, there is no guarantee that crops grown on virgin land will be unaffected. Overhead irrigation discourages the pest*

Chemical control: The new spinosad material, 'Tracer', offers the best chemical control of this pest. Dursban wg will aso help control the pest. Deltamethrin has 'off-label' approval for up to five applications. The use of a silicon wetter will improve control. Lambda cyhalothrin may also help control this pest and a SOLA to cover the use of this chemical has just been issued. A new 'day-degree' model which will hopefully optimise timing of chemical sprays, is being evaluated at the present time. This is a Defra sponsored project. It has been established with Hri Warwick research that thrips have become resistant to pyrethroids and therefore should be used with caution.

8.10.2 Disease control

8.10.2.1 Introduction

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

Good management and planning

a. *Careful site selection to avoid potential or previous problems thereby enhancing plant health.*
b. *Sensible crop rotations to avoid build-up of problems.*
c. *Inclusion of resistant varieties (where available) in cropping programmes whilst respecting the need to meet the required quality parameters and eating requirements.*
d. *Establish the need to take corrective action by regular monitoring referring to thresholds where established. Trained staff should carry this out. The effect of prevailing weather conditions should also be considered.*

Cultural preventative techniques

a. *Good crop and field hygiene, promoting crop health by maximising nutrient availability through soil analysis and accurate application to avoid excess nutrient application.*
b. *Utilising irrigation as a control measure wherever appropriate and feasible.*
c. *Enable biological and natural methods of disease control flourish in the crop environment.*

Corrective action

If the above actions fail to prevent or control diseases, the following approach should be adopted:

a. *Where corrective action is required, additional biological and natural methods of disease control (if available) should be considered first.*
b. *If chemical control is needed, the following points should be considered, whilst ensuring effective control is achieved:*

- *Use the least toxic and persistent product.*
- *Use the most selective product to reduce the impact on naturally occurring beneficial organisms.*
- *Use minimum effective dose rate.*
- *Use appropriate application methods with effectively maintained equipment, and spot treating wherever possible.*
- *Exceeding the recommended dose rate is wasteful, gives no benefit in terms of control, and is also illegal under COPR.*

All residues from previous Allium crops should be thoroughly destroyed or ploughed-in as soon as cropping is complete.

The use of disease monitoring and forecasting techniques should be adopted where available as an adjunct to crop inspection, thus minimising fungicide use.

Disease levels are minimised by good rotations. Where land is overcropped with leeks, there is a likelihood that disease levels will increase.

On many farms, leeks are present in the ground for twelve months of the year. Leeks drilled in March will be emerging before the crop planted or drilled the previous season, has been harvested. As a consequence, there is often a source of inoculum to infect the new crop.

As long a rotation as possible and practical should be allowed between crops. Siting mature crops away from newly emerging crops will help to reduce the risk of disease. Disease is frequently carried over on leek trash. Where most trimming is carried out in the packhouse, ensure that the waste is not transferred back to fields intended for leek production. Where rigs are used to harvest the crop, thought should be given to ways of removing at least some of the waste crop unless a very long rotation can be practised.

8.10.2.2 Seedling diseases

Diseases such as damping off are to some extent controlled by seed treatments. Seed treatment is an environmentally sound way of controlling diseases. Seed merchants should be consulted as to which materials or combination of materials are suitable for a particular purpose.

8.10.2.3 Foot rot *(Fusarium culmorum)*

Hot summers combined with an intensity of cropping will accentuate this disease. When the leek is pulled, it is often rotten and the base and stems often have a distinct pink colour. It is particularly important when planting bare root transplants to ensure that the plants come from a seedbed which is free from *Fusarium* .

8.10.2.4 Leaf blotch *(Cladosporium allii)*

A disease encouraged by damp, mild weather and short day length. It can be effectively controlled if treated in the early stages with conazolefungicides.

8.10.2.5 Purple blotch (*Alternaria porri*)

This disease is sometimes confused with leaf blotch, as the symptoms are somewhat similar. The individual blotches develop a purple centre. The disease has become more prevalent in leek crops in recent years. t cannot be regarded as a disease of economic fungicide will have a suppressant effect upon the disease.

The fungicide based on azoxystrobin will also offer some control of this disease.

8.10.2.6 Rust (Puccinia allii)

This is possibly the most serious disease of leeks. Some varieties are more sensitive to the disease than others. The disease tends to be worse in coastal areas although all areas of the UK experience this problem to a greater or lesser extent.

It is important to diagnose rust in the very early stages, as there are some effective fungicides that will offer good control of the disease.

It is extremely important to alternate fungicides from different chemical groups when treating rust, as this will help to avoid resistance to a particular compound. Guidance is given in Appendix 3.

8.10.2.7 White tip *(Phytophthora porri)*

A disease that is endemic on land which has a long history of leek growing. However, it can occur on new land, although this is less common. It is especially important to avoid badly drained areas, as this is often where the disease starts. Good rotations will help reduce disease levels and it is particularly important to remove as much trash as possible from the field as the disease will carry over in the soil. This is however, a serious disease of over-wintered leeks and one for which this is limited effective chemical control.

There are now a number of fungicides which offer good control of this disease. It is important when applying these fungicides, to alternate the chemical group to which these fungicides belong, in order to minimise resistance.

8.10.2.8 White rot *(Sclerotium cepi v orum)*

Although not as susceptible as Onions, this disease can seriously affect crops in situations where there is a history of the disease. There is no chemical cure and the only way of avoiding this disease is not to grow crops where there is a history of white rot. Even long rotations are no guarantee of avoiding the disease.

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8.10.3 Weed control

Leeks do not offer much crop competition to weed development because of the nature of their growth. If weeds are not kept under control, difficulty will be experienced with harvesting, especially mechanical harvesting.

There is a wide range of approved herbicides available which have a label recommendation for leeks. These are listed in Appendix 4. When applying herbicides to the leek crop, especially direct drilled leeks, it should be born in mind that repeat low doses of herbicides are often the most effective way of controlling early weed growth. Applying repeat low doses of herbicide will often do less damage to the crop than applying products at the recommended dose.

Cultural control: *Mechanical methods of weed control are often complementary with the use of herbicides. Direct drilled crops of leeks, which are in the ground for several months, need sequential herbicides to maintain good weed control. The use of mechanical cultivations can reduce the number of herbicide applications that have to be made to the crop. Operations such as hoeing or ridging also prevent capping on some soils, thereby allowing better distribution of fertiliser that has been applied to the crop.*

On certain soils that are prone to capping, cultivations help prevent anaerobic conditions occurring just below the soil surface.

9 Harvesting and storage

Leeks are sometimes undercut before lifting. Care must be exercised to ensure that the undercutter is set to the correct depth so as not to damage the base plate of the leeks.

The leeks are sometimes trimmed mechanically prior to lifting. Care must be taken that this operation is not carried out too far in advance otherwise de-lamination of the leeks may take place.

Packhouse and Field Rigs

Washing should take place initially in fresh or re-circulated water. The final rinse must be in water that is of a potable standard. A microbiological analysis of the final washing water must be provided and made available for inspection.

Make sure that water used for washing harvested product is adequately cleaned and conservation of water is undertaken (See Generic Protocol 9.3.1)

No chemical additives should be added to the washing water.

Leek waste should not be spread on fields where leek production is destined to take place, as this will encourage the spread of diseases such as white tip.

Cooling

Leeks should be stored at between 2° and 10°C prior to despatch.

Storage

During the months of May and June it is becoming common practice to place leeks in controlled atmosphere stores. It is important that the store is dedicated to leeks as storing other fresh produce in the same store may lead to rapid deterioration of the leeks.

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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 and Safety

See Generic Standards and/or Generic Guidance Notes

13 Conservation

See Generic Standards and/or Generic Guidance Notes

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Appendix 1 Fertilizer requirements for minerals soils (kg/ha)

Nutrient (kg/ha)	Soil Index					
	0	**1**	**2**	**3**	**4**	**5**
Nitrogen [1]	200	150	100	50	nil	nil
Phosphate	200	150	100	50	25	nil
Potassium	250	200	125	0	nil	nil
Magnesium	150	100	nil	nil	nil	nil

Notes:

[1] crops grown on fen peats will require less nitrogen than those crops grown on mineral soils. Additional nitrogen top dressings will be required on most crops. These will vary with such factors as soil type, rainfall and irrigation and time of year when the crop is harvested

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Appendix 2 Insecticides currently approved for use on Leeks

Active Ingredient	Product Features	LERAP Category	Harvest Interval (1)	Hazard Rating	MRL (mg/kg)
bacillus thuringiensis	a bacterial insecticide for the control of caterpillar	none stated	zero	None stated	None set
Chlorpyriphos (2)	An organophosphorus systemic insecticide	A	21 days	Harmful Dangerous to bees	0.5
deltamethrin (2)	a contact synthetic pyrethroid with some residual activity	A	3 days	Harmful Irritant	0.2
Pyrethrins	A contact natural pyrethroid	None Stated	None or 1 day	Harmful Irritant	1.0
lambda-cyhalothrin(2)	A pyrethoid insecticide which is an ingested and contact material.	B	7 days	Harmful Irritant	0.3
spinosad	a selectrive insecticide for the control of thrips	B	7 days	None stated	0.5
tefluthrin (2)	applied as a seed dressing only as Force ST.	none stated	none stated	Irritant	0.05

Notes:

(2) SOLA - see Appendix 6 for the specific product and expiry dates

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

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Appendix 3 Fungicides currently approved for use on Leeks

Active Ingredient	Product Features	LERAP Category	Harvest Interval[1]	Hazard Rating	MRL (mg/kg)
[2] Azoxystrobin	a systemic, protectant and trans-laminar strobilurin fungicide	none	21 days	Dangerous to fish	2.0
Azoxystrobin plus difenoconazole	A systemic and protectant fungicide	none stated	21 days	Harmful	2.0 0.5
copper oxychloride[2]	a protectant fungicide and bactericide. .	none stated	14 days	none stated Harmful to fish	20
Rudis	A contact and systemic triazolinthione fungicide used for control of rust and purple blotch.	B	21 DAYS	Dangerous to fish	0.05
dimethomorph plus mancozeb [2]	a fungicide with both protectant and translaminar action.=	B	21 days	Irritant	0.2 dimethomorph 3.0 dithiocarbamate
metalaxyl M* + chlorothalonil**	maximum number of applications 3 per crop. Used specifically for control of white tip.	B	14 days	Irritating to eyes. Harmful to fish	0.2* 10.0**
pyraclostrobin plus boscalid [2]	protectant and systemic fungicide	B	14 days	Harmful	0.5 (pyraclostrobin) boscalid 5.0
Mancozeb[2]	maximum number of application 3 per crop. Used for the prevention of white tip	None stated	14 days	Toxic to aquatic organisms	3.0
tebuconazole	a systemic conazole fungicide.	none stated	14 days	Irritant Harmful Risk of serious damage to the eyes.	1.0
tebuconazole plus trifloxystrobin	a systemic and protectant fungicide	None	21 days	Harmful	1.0 0.2

Notes:

[2] SOLA - see Appendix 6 for the specific product and expiry dates.

Not all formulations of each active ingredient may be currently approved for use on Leeks.

Check before use. Label recommendations are revised regularly, read a current label before use.

Appendix 4 Herbicides currently approved for use on Leeks

Active Ingredient	Product Features	LERAP Category	Harvest Interval[1]	Hazard Rating	MRL (mg/kg)
bentazone [2]	a contact herbicide effective on Mayweed spp. and fool's parsley	none stated	before the three true leaf growth stage	Harmful Risk of serious damage to eyes	0.1
chlorpropham	a residual carbamate herbicide	none stated	none stated	Harmful Irritant. Harmful to fish.	0.05
chloridazon[2]	a residual pyridazone herbicide.	none stated	none stated	Harmful Irritant.Harmful to fish.	0.5
Clopyralid (2))	A foliar translocated herbicide	none stated	42 days	None stated	0.5
chlorthal-dimethyl	a residual benzoic herbicide. Used mainly in mixtures with propachlor.	none stated	none stated	none stated	0.1
chlorthal-dimethyl and propachlor	a combination of two residual herbicides.	none stated	none stated	Irritant	0.1 0.2
cycloxydim	a translocated post-emergent herbicide for grass weed control. Harmful to fish.	none stated	8 weeks	Irritant	0.5
prosulfocarb[2]	A residual herbicide for the control of some grasses and broad-leaved weeds	B	To be applied before the fifth leaf.	Irritant	0.05
fluroxypr [2]	a contact herbicide. It is particularly important to read the label regarding following crops following the use of this material.	none stated	11 weeks	Flammable Harmful to fish	0.05
ioxynil	contact only. Can be used at repeat low doses.	none stated	14 days	Harmful	3.0
	a contact and residual herbicide	B	16 weeks	Irritating to eyes and skin Dangerous to fish	
metazachlor [2]	A residual herbicide for use on planted leeks	none stared	None stated	Harmful Irritant	0.3
pendimethalin[2]	a residual dinitroaniline herbicide. Label recommendation for use pre-emergent on certain soil types. A specific off label approval exists for its use post emergent on both drilled and transplanted Leeks.	none stated	none stated	Harmful to fish.	0.05
propachlor	residual only	none stated	none stated	Irritant Harmful	0.2
propachlor + chloridazon [2]	recommended for use pre-emergent. Specific off-label approval exists for early post emergent use.	none stated	none stated	Irritant Harmful to fish.	0.2 0.5
propaquizafop [2]	a foliar acting grass herbicide	B	4 weeks	Harmful to eyes and skin Harmful to fish	0.05
tepraloxydim	a systemic herbicide for the control of annual meadow grass	None stated	4 weeks	Harmful to fish Irritating to skin	0.3

Notes:

(2) SOLA - see Appendix 6 for the specific product and expiry dates.

****** Not all formulations of each active ingredient may be currently approved for use on Leeks. As label recommendations are revised regularly, read a current label before use.

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Appendix 5 The LGA crop monitoring chart

LGA Crop Monitoring Chart					Date		
Field	**White Rot**	**Fusarium –red stripe**	**Rust**	**White Tip**	**Leaf Blotch**	**Thrip**	**Cutworm**

Notes:

Score 1 to 5 (1 = slight problem, 5 = severe problem).

Enter an x where a field has been inspected but no problem exists.

Appendix 6 Products with 'specific off-label approval' for use on Leeks

Number	Product Name	Active Ingredients	Expiry
1415/08	Alpha Metazachlor 50SC	Metazachlor	31/12/13
2575/08	Ashlade CP®	chloridazan+propachlor	31/12/08 18/03/10
1614/07	Bandu	Deltamethrin	31/12/13
1630/06	Basagran SG®	bentazone	31/07/11
2570/01	Better DF®	chloridazon	31/12/13
0860/08	Bulldog®	propaquizafop	31/12/13
3698/06	Butisan S	metazachlor	31/12/13
1383/08	Cercobin WG	Thiophanate-methyl	28/02/11
3756/06	Clayton Lanark	Lambda-cyhalothrin	13/10/09
1632/07	Cleancrop Decathlon	deltamethrin	31/12/13
0949/08	Cleancrop Gallifrey 200	Fluroxypyr	09/05/10
0864/08	Cleancrop GYR®	propaquizafop	31/12/13
1287/07	Cleancrop Silo	Lambda cyhalothrin	31/11/09
1127/99	Cuprokylt®	copper oxychloride	31/12/13
1699/07	Decis	deltamethrin	31/12/13
1652/07 and 1158/07	Decis Protech®	deltamethrin	31/12/13 31/12/13
0436/07	Dipel DF	Bacillus thuringiensis	31/12/13 31/12/12
2638/06	Dow Shield	clopyralid	31/12/13
3776/07	Defy	prosulfocarb	01/08/10
1469/08	Dursban WG	Chlorpyriphos	30/06/11
0148/020871/08	Falcon®	propaquizafop	31/12/13
0533/04 and 0546/05	Force ST®	tefluthrin	31/12/13

Notes to Appendix 6 :

Specific off-label approvals (SOLAs) provide for the use of the product named in respect of crops, situations or prests 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 which would otherwise apply.

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

Appendix 6 Products with 'specific off-label approval' for use on Leeks

0730/06	Hallmark with Zeon Technology®	lambda-cylahothrin	13/11/09
0156/08	Headland Inoganic copper®**	copper oxychloride	31/12/13
3434/07	Invader	dimethomorph/mancozeb	30/09/12
1819/02	Lidazone 65 WG	chloridazon	31/12/13
3256/07	Markate 50	Lambda cyhalothrin	28/06/11
1662/07 1659/07	Pearl Micro®	deltamethrin	31/12/13
1479/05	Penncozeb	mancozeb	31/12/13
0732/97	Pyramin DF ®	chloridazon	31/12/13
0881/08	Raptor®	propaquizafop	31/12/13
0887/08	Shogun®	propaquizafop	31/12/13
2848/06	Signum	Boscalid/pyroclostrobin	30/09/13
0987/04	Starane 2®	fluroxypyr	31/12/11
1438/07	Stomp 400SC®	pendimethalin	31/12/13
1421/08	Sultan 50SC	Metazachlor	31/12/13
0849/01	Trimanzone	Mancozeb	31/12/13

Notes to Appendix 6 :

** 2007 A new formulation of Headland Inoganic Cooper is being manufactured. A new SOLA will be applied for. For up to date information, please consult the Assured Produce web site.

Specific off-label approvals (SOLAs) provide for the use of the product named in respect of crops, situations or prests 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 which would otherwise apply.

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

Appendix 7 Control Points: Leeks

CS.33 **LEEKS**

CS.33.1	You should monitor soil nutrient levels during the life of the crop by carrying out leaf/sap analysis - (Protocol reference: Section 6)

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