Assured Produce

Crop Specific Protocol

LETTUCE (FIELD)

(CROP ID: 35)

February 2009

Control Document No: 00033/09

Acknowledgements

Assured Produce gratefully acknowledges the contribution of all consultees in the preparation of this protocol particularly members of the British Leafy Salads Association and David Norman.

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 **"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 **"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 Products containing substances which have been revoked are shown on the PSD website (http://www.pesticides.gov.uk).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 the PSD website (www.pesticides.gov.uk) advisers, manufacturers, the Assured Produce website 'Newsflashes'. 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)**

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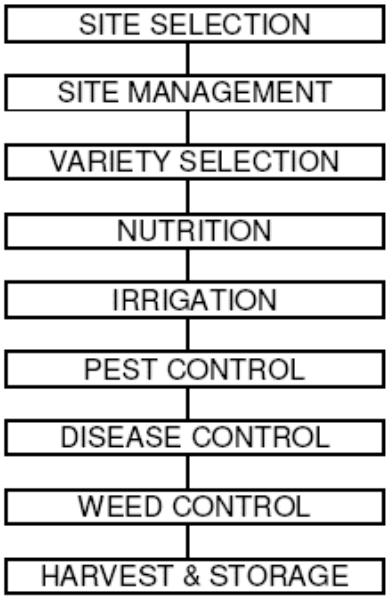
1 General introduction

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

Field grown Lettuce can be grown on a wide variety of soil types. Very heavy soils are best avoided as these present difficulties at both planting and at harvest. Very light soils are best avoided when growing Iceberg Lettuce. Soils for the production of Iceberg and Romaine should ideally possess good water retention properties. On very light soils irrigation often has to be applied right up to harvest and this practise can lead to

significant increases in tipburn and can seriously affect the quality of the final product.

Field grown Lettuce is planted from February onwards. Early crops are frequently covered with fleece or polythene. The covering of early crops provides an ideal opportunity to reduce chemical inputs, especially pesticides. The physical barrier of a covering of fleece or polythene will help prevent against infestation from pests.

Every effort **must** be made that every effort is made to recover and recycle plastics and fleece materials. If recycling is not possible plastics should be disposed of at a registered landfill site. At the present time there is not a suitable method available for recycling fleece.

3.2 Crop rotation

Crop rotation will help reduce the build up of pests and diseases. The length of the rotation will depend on several factors such as availability and suitability of site, water resources and management available.

So many factors influence the production of field-grown Lettuce that although one year breaks between Lettuce crops are generally attainable, the more beneficial longer breaks are not always achievable.

4 Site management

See Generic Standards and/or Generic Guidance Notes.

5 Variety selection

5.1 Choice of variety

Over the last few years the range of Lettuce types grown has widened considerably. Most other types of Lettuce listed below have shorter growing periods than iceberg Lettuces, therefore, it is especially important to take particular note of the harvesting intervals required when using pesticides on speciality Lettuces.

All the pesticides referred to in this document have been used safely on speciality Lettuces but as new cultivars are constantly being developed and introduced to the market, it is important to test crop protection chemicals on small areas of new cultivars before adopting them for more widespread use.

As a general rule, all speciality Lettuces require less nitrogen than iceberg. Indeed too much nitrogen can lead to excessive tipburn in the Romaine and Cos types and lead to loss of colour in the coloured varieties.

Continental/Speciality Lettuce

These include Lollo Bionda, Lollo Rossa, Batavia, Red and Green Oak Leaf.

Lollo Rosso will generally have the best colour when produced at the beginning and end of the outdoor season i.e. May and October harvest. In fast growing conditions during higher temperatures and especially if it is given excessive nitrogen, it tends to lose its colour.

One of the main problems with speciality Lettuces is "mud splash". Close plant spacing to ensure good ground cover is worth considering. Some growers wash the finished product.

Romaine and Cos

These Lettuces have regained considerable popularity over the past few years. The major problem with this type of Lettuce is tip burn. The problem is especially severe if the crop has to suffer extremes of and dry weather. The aim should be to ensure an adequate and even supply of water to the crop and to harvest the

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product before it becomes over mature. Calcium sprays have been tried in an attempt to alleviate the problem, but with very little success. The problem tends to be worse during the summer months. Some of the cultivars which have recently been introduced have some tolerance to tip burn.

'Crisp' Lettuces

Most seed catalogues treat iceberg and crisphead as one and the same. However, in the selection of a crisp variety, consideration should be given to varieties suitable for bagged presentation.

Endive

The escarole or smoothed-leafed endive and the frisee type both require consistent watering otherwise tip burn will become a serious problem.

Little Gem

There are some excellent strains of Little Gem Lettuce available with good disease resistance. A fast maturing Lettuce, Little Gem is very sensitive to hot, dry conditions and an adequate amount of moisture must be available at all times.

Flat or butterhead Lettuces

Although far less widely grown outside than a few years ago, there is still a market for this type of Lettuce. There have been considerable advances in plant breeding over the last few years due to use of this lettuce type under protection and some of the new cultivars of flat Lettuce have resistance to most races of downy mildew.

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 Plant raising

It is preferable that growers use a plant raiser who is a member of the Plant Propagators Association.

6 Nutrition

6.1 Nutrient requirement

Nitrogen

On the whole, the Lettuce crop is not particularly responsive to large quantities of nitrogen. Particular attention should be given to the preceding crop, especially during the warm summer months, when nitrification is at its most efficient.

Excess nitrogen will result in a high nitrate content at harvest. It is very important to avoid high nitrate levels particularly in speciality Lettuce, which tend to be harvested when they are less mature than Iceberg types.

All applications of phosphate, potash and magnesium should be applied according to soil analysis.

Typical fertiliser recommendations are given in Appendix 1.

Soil pH is particularly important as the Lettuce crop is sensitive to acidity. Results obtained as a result of a composite sample can be misleading. One of the best methods of checking pH is to use a GPS generated grid and test on a regular grid pattern. GPS waypoints can then be used to direct liming operations. In this way, any acid patches can be identified and spot treated accordingly.

Unless there is a well-defined 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. Avoid overliming, especially on farms which grow scab sensitive crops such as potatoes, radish and redbeet, as high pH will encourage the development of scab.

When there is a need for lime and magnesium, magnesian limestone should be considered.

Control of nitrate levels.

As part of its programme on agricultural contaminants in food, the European Commission put forward proposals for a Commission Regulation specifying maximum limits for the nitrate content of vegetables, including Lettuce.

Commission Regulation (EC) No.563/2002 set maximum levels for nitrates. These are summarised on the next page

The UK has a derogation exempting production for the domestic market provided the growers follow an industry code of good practice. This code is given in full in Appendix 2. However, this derogation is currently under review. It is most important to check the Assured Produce web site at regular intervals in order to obtain the very latest information.

The proposals arose as a result of concerns over the possible health effects of high dietary intakes of nitrate, to which vegetables make the single greatest contribution. It is proposed that limits are placed on the nitrate content of Lettuce and Spinach since these crops accumulate greater nitrate concentrations in their leaves than most other vegetables.

The EC's Scientific Committee reviewed the toxicology of nitrate for Food (SCF) in 1990, as part of the considerations on the use of nitrate as a food additive in the manufacture of certain food products such as ham, bacon and some cheeses. The SCF set an acceptable daily intake (ADI) for nitrates which is rarely, if ever, exceeded by consumers in the UK although this is not the case in some other member states.

It was necessary to develop the code of good agricultural practice which will help avoid excessive levels of nitrate in Lettuce whilst recognising the need to produce a commercially acceptable crop. The health benefits of eating a vegetable-rich diet are recognised.

This approach will also serve to limit the dispersal of nitrates into the environment generally, and into water supplies specifically.

Current maximum nitrate levels in Lettuce

Product	Harvesting Dates	Maximum Level (mgNO_3/kg)
Fresh Lettuce (protected and open grown Lettuce excluding Lettuce listed below)	Harvested 1st October to 31st March and grown under cover. Grown in the open. Harvested 1st April to 30th September Lettuce grown under cover Lettuce grown in the open air	4500 4000 3500 2500
'Iceberg type' Lettuce	Harvested 1st October to 31st March Harvested 1st April to 30th September	2500 2000

(Revised) Growers **must** be aware of current EC legislation with respect to nitrate levels and they monitor nitrate levels in their lettuce on a regular basis. For sampling, a minimum of 10 units per laboratory sample is required. Samples should be sent to a laboratory participating in FAPAS. The Food Standards Agency recommend that a method based on hot water extraction (BS EN12014-2/1997) should be used.

A project funded by HDC and undertaken by Warwick HRI has demonstrated a suitable method for monitoring nitrate levels at farm level. Details of this may be obtained from the HDC. This method can be used to supplement the monitoring carried out by the grower using accredited laboratories.

Trace elements

Manganese

Some soils, especially those high in pH and/or those with high levels of organic matter, can suffer from manganese deficiency. This deficiency often shows in the younger leaves as an inter-veinal chlorosis. The best way to correct a manganese deficiency is by applying manganese sulphate or to use one of the proprietary formulations that are on the market. Other trace element deficiencies may show from time to time but all trace element deficiencies should best be identified by tissue analysis.

7 Irrigation

Correct management of irrigation is an integral part of growing outdoor Lettuce. When Lettuce is grown from blocks or modules, it is essential that rapid establishment is achieved. This invariably means that suitable quantities of water are applied to the crop soon after planting.

Once the crop is established, irrigation requirements will vary according to soil type, crop growth stage and prevailing weather conditions. Deciding on the amount of irrigation and when the irrigation is to be applied is an acquired skill. The use of a spade to determine available moisture is often helpful. However, there are other more scientific methods of determining moisture requirements, such as electrical capacitance devices, neutron probes, tensiometers etc. These instruments are helpful, if only to back up the grower's own judgement.

Water is a valuable resource and the use of drip irrigation should be considered, , especially for crops sensitive to tipburn, where overhead irrigation close to harvest will cause head breakdown.

8 Crop protection

8.1 The basic approach to crop protection

Non-chemical methods

See Generic Standards and/or Generic Guidance Notes.

Integrated pest management (IPM)

IPM involves the production of quality crops with the minimum use of pesticides. To achieve this aim, it is important to monitor crops carefully at every stage of production in order to assess the need for crop protection products, whilst at the same time selecting products which will do least harm to the environment. In order to achieve these aims those responsible for monitoring crops must have a thorough knowledge of crop protection, especially of beneficial insects and the need to protect wildlife.

As field grown Lettuces are grown throughout the UK it would be impossible to lay down absolute guidelines for IPM, as these will vary with growing techniques and the particular geographic location. Some growers will find they have greater pest and disease pressure than others do; what is required is an awareness of the conditions prevailing at any one time. These conditions will not just apply to visible pests or disease, but should encompass other factors such as pest and disease forecasting and meteorological conditions.

8.2 Plant protection product choice

See Generic Standards and/or Generic Guidance Notes.

Selection of insecticides

A list of insecticides currently approved for use on Lettuce is given in Appendix 3.

Great care must be taken to read the product label. This is particularly important in respect of the number of applications permitted on a crop. The use of water traps and coloured sticky traps is especially useful in helping monitoring not only pests but also predators.

Regular inspection of crops is essential. Early treatment with a suitable insecticide can result in early elimination of the pest with the minimum use of pesticide. Established infestations of pests, especially aphids, can often be difficult to deal with and can result in extra pesticide applications.

When selecting a pesticide, consideration must always be given to the effect the product will have on predators. Products such as those based on *Bacillus thuringiensis* to control caterpillars and pirimicarb to control aphids are examples of products least likely to harm predators.

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.

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

Recognition of pests, diseases, weeds and beneficial insects

See Generic Standards and/or Generic Guidance Notes.

Training of sprayer operators

See Generic Standards and/or Generic Guidance Notes.

Instructions for sprayer operators

See Generic Standards and/or Generic Guidance Notes.

Mixing of pesticides

Manufacturers list on their label compatible mixtures with other pesticides. These are referred to as approved tank mixtures. Not all mixtures of pesticides a grower may wish to use are so approved. A grower may mix two or more pesticides together without a label recommendation, providing 'no person shall combine or mix for use, two or more acetyl-cholinesterase compounds unless the approved label of at least one of the pesticides products states that the mixture can be made'. A list of Anticholinestrase compounds which are recommended for Lettuce, are included in Appendix 3.

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 . See Appendix 9 for the pesticide targets and guidance on this crop.

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 the timing of fungicides and insecticides to the edible part of the crop**

- **Optimising the use of post harvest treatments**
- **Ensuring at least the minimum harvest intervals are followed**
- **Ensuring that application equipment is regularly calibrated and applying products correctly**

Pesticide residue testing programme

See Generic Standards and/or Generic Guidance Notes.

Pesticide residue testing traceability

See Generic Standards and/or Generic Guidance Notes.

Action plan

See Generic Standards and/or Generic Guidance Notes.

Harvest intervals

If a product has a "harvest interval" of 14 days this refers to the interval between the time that the crop was sprayed until the time when the product is harvested. Growers must adhere strictly to stated intervals.

It is most important that a grower establishes a visual procedure to help identify harvesting intervals within the crop. Some growers prefer coloured markers, other use labels to indicate when the crop is clear or the harvest interval. A visual field system often has greater practical value than a record book that may not be seen by everyone involved with the crop. The establishment of a visual system in addition to written records does make everyone aware of harvest intervals and avoids costly mistakes. A positive harvest release system is strongly advised, where harvest crews are not permitted into a particular block of crop for harvest without a specific written instruction from the crop manager.

8.10 Pest, disease, physiological disorder and weed control

8.10.1 Pest control

8.10.1.1 Aphids

A number of aphid species attack Lettuce. Aphids can make lettuce totally unmarketable as well as spreading virus diseases. The two most commonly occurring species are the lettuce currant aphid *(Nasonovia ribisnigri)* and the peach-potato aphid *(Myzus persicae).* The lettuce root aphid is also a serious pest in some areas. There are now several cultivars of lettuce which offer resistance to the lettuce currant aphid. These cultivars are already widely available for 'iceberg' types and some are gradually becoming available for other types of lettuce such as Romaine and Little Gem.

Cultural control:*Removal of infested trash, which might carry aphid infestations, is important. Removal of weeds from within the crop is important, as aphid transfer from weed to crop can be significant. Select varieties resistant to Nasonovia ribisnigri when expected pressure from this aphid is likely to be high.*

Chemical control: There are a number of effective materials available for the control of aphids and these are listed in Appendix 3. It is important to monitor the crop very regularly, as aphid infestations that become established in the lettuce crop are extremely difficult to remove. Care should always be taken to select a pesticide, wherever possible, which will be least harmful to beneficial insects. Complete control of aphids is

not possible without the use of insecticidal seed treatments, the actives imidacloprid(approval UK application) and thiamethoxam (approval Holland application) will give control for at least some of the life of the crop and should be used during periods of high aphid risk. Use of these seed treatments will reduce the subsequent need for spraying in the field.

8.10.1.2 Lettuce root aphid (Pemphigus bursarius)

Lettuce root aphid (LRA) is a difficult pest to control. Conventionally LRA overwinters as eggs on black and Lombardy poplars. In the spring the newly hatched insects live inside characteristic flask-shaped galls on the leaf stalks. They then migrate to their summer hosts, including Lettuce, although the timing of the migration varies from year to year. Lettuces, especially young plants, are vulnerable to attack.

If Lettuces are grown intensively on the same land, wingless aphids from the previous crops may survive in the soil and attack successive crops, although in practice, this is rare.

Cultural control:*Serious attacks of LRA generally only occur if enough aphids migrate from poplars and the conditions then favour their development on lettuce. In particular they require dry soil conditions to survive. In many years few aphids survive on poplar, possibly because few eggs were laid the previous year. In other seasons numbers decline rapidly just before migration takes place. Predators (e.g. anthocorids) are often believed to be responsible.*

By monitoring poplar trees in May for LRA, useful information can be gained about the size and timings of the attacks. A number of aphids closely related to LRA, but which do not attack Lettuce, also live on poplars. It is therefore important to identify the species correctly; this is not difficult as each species produces characteristic shaped galls.

Yellow water traps placed in lettuce crops just before emergence is expected to take place provides additional information about how many aphids complete the migration successfully. Although migration can last up to four weeks, the main flight usually lasts between 10-14 days. Irrigation of dry soils is important both before and after migration. It is however, appreciated, that this must fit in with normal commercial practice.

There is a difference in the ability within cultivars to withstand attacks of LRA. These should be fully investigated by the grower. Furthermore, new cultivars are becoming available which exhibit a very high tolerance to LRA. These should be grown in trials alongside existing cultivars.

Chemical control: Options for chemical control of this pest have increased since the granting of a specific off-label approval for the use of imidacloprid (Gaucho) as a seed dressing. Control is only feasible by seed treatments.

Not more than one application of treated seed may be sown, nor more than one planting of transplants grown from treated seed made, to any area of soil in any one calendar year. It must be emphasised that the vigour of the seed as well as the quality of the pill containing the seed is important. A check may occur during the propagation stage of the treated seed and this check is likely to be more serious if the seed is of poor vigour and the pill of poor quality.

8.10.1.3 Caterpillars

Certain species attack Lettuce, particularly certain tortricid moths.

Cultural control:*Very little can be done to control this pest by cultural means. Early crops that are covered with fleece or polythene will give a high degree of protection. Silver Y moths can also cause considerable damage to Lettuce crops. These pests can be successful monitored with pheromone traps which help the accurate timing of pesticide applications.*

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Chemical control: A list of approved materials is given in Appendix 3. It is important to control these pests before they enter the heart of the plant where control is virtually impossible. Although pyrethroids are effective materials when used to control caterpillars, they are very broad spectrum products which kill a wide range of insects, including predators. Materials based on *Bacillus thuringiensis*, diflubenzuron or spinosad should be considered as they are more specific and are less broad-spectrum insecticides.

8.10.1.4 Cutworm

Cutworms are the caterpillars of noctuid moths, the most common of which is the turnip moth *(Agrotis segetum).* The chemical treatments for surface feeding caterpillars will also control cutworms.

Cultural control:*By applying irrigation, cutworms can often be controlled successfully. Irrigation must be timed in conjunction with cutworm warning systems early in the life cycle of the pest.* If the catches are used in conjunction with weather data, control by irrigation or sprays can be timed precisely. HDC provide cutworm warnings to grower members in their weekly pest bulletin service. *Keeping the crop free from weeds will help in reducing cutworm attacks.*

Chemical control: Spray timing for cutworms is critical. Monitoring the arrival and build up of the turnip moth by the use of pheromone traps is an excellent way of assessing risk.. If control by irrigation or rainfall is not possible then all materials recommended for caterpillars will control the larvae of the cutworm when it is feeding on the aerial parts of the plant. Once cutworms enter the soil, no chemical method of control is effective.

The important aspect of accurate monitoring is that pesticide application can be kept to a minimum.

8.10.1.5 Leatherjackets and wireworms

Occasional damage can occur, especially when infested grassland is back into cultivation.

Leatherjackets are the larvae of the crane fly *(Tipula spp.)* whilst wireworms are the larvae of the click beetle *(Agriotes spp.).*

Although these two pests are quite different in appearance, both attack the roots of the crop and both are often found where grassland, particularly long term grassland, has recently been ploughed. During the last few years, there has been an increase in the amount of wireworm damage and this may be due to the fact that some of the more persistent materials, which were once recommended for their control, are no longer available.

Due to the lack of chemicals recommended for the control of wireworms and leatherjackets, it is important that the suggestions made under cultural control are put into practice if serious damage is to be avoided.

Cultural control:*In the case of wireworm and leatherjackets an effective method of control following long term grassland is to plough up the grassland in February or March, and fallow the land during the summer months.*

Chemical control: At present, there are no chemicals approved for use in lettuce.

8.10.1.6 Slugs

Slugs have become an increasingly important pest of field grown lettuces over the last few years. A succession of mild winters has ensured high survival rates and the straw burning ban has meant that those growers in a cereal rotation face dealing with increasing amounts of trash which encourages overwintering populations.

Cultural control:*Removal of infected trash and keeping the crop as free from weeds as possible will help. Where a weedy or wet headland is known to harbour a high slug population, a wide sterile strip*

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between the headland and the first planting should be maintained.

New biological methods of control using the nematode Phasmarhabditis hermaphrodita are now available for commercial use. Such treatments may also be used in organic systems. Ferric phosphate may now also be used in organic systems, although this will need to be cleared with the relevant accreditation body before use.

Chemical control: Control is best achieved by baiting with slug pellets. Materials based on methiocarb, ferric phosphate or metaldehyde are effective, *but from an integrated pest management point of view, pellets based on metaldehyde or ferric phosphate are less harmful to ground beetles than methiocarb.* Test baiting must be carried out in order to establish population levels and to ascertain whether baiting is necessary. It is especially important to avoid spreading pellets into hedgerows or other conservation areas.

Growers should be aware of the **new** restrictions which apply to methiocarb following a review carried out by the Pesticide Safety Directorate. It is important to check the label of any ***new*** stock of methiocarb based products, rates of application also vary widely with different products.

8.10.2 Disease control

8.10.2.1 Downy mildew *(Bremia lactucae)*

This is a particularly damaging disease of Lettuce, especially in the late summer and autumn when conditions are favourable to the spread of the disease. Leaf wetness is necessary for the germination of D.mildew spores. It is characterised by yellow patches on the upper surface of the leaves and the fluffy white spores on the under surface of the leaves.

Cultural control:*Rapid disposal of trash is particularly important. This prevents transfer of the disease from wind-blown spores . It can also help by preventing the formation of the D.mildew oospores, the resting body of the disease. Cultivars vary in their resistance to Downy mildew. It is important to select cultivars which have resistance to as many races of the disease as possible in order to minimise pesticide inputs. e.g.: BL 1-24 . New strains of mildew are frequently being isolated and it is important to check with your advisor as to the latest situation in respect of resistance to Downy mildew.*

Chemical control: A multi-site dithiocarbamate fungicide such as mancozeb will offer some protection and provides a good base for a control programme. Combinations of a dithiocarbamate and metalaxyl M will also give some control but resistance to metalaxyl does exist. Fosetyl-aluminium has off-label approval but there is a risk of phytotoxicity when the chemical is applied in high temperatures or in mixtures with other products. Fosetyl-aluminium can also be applied in the propagation stage. Products based on propamocarb hydrochloride and dimethomorph will also offer control. The **new** strobilurin fungicides will also offer a degree of control of D.mildew Computer models are now available which assess the risk of downy mildew infection periods in conjunction with weather data. By using these models and identifying high risk infection periods, it is hoped that fungicide timing can be more specific consequently, and more effective that the conventional programmed approach.

8.10.2.2 Grey mould *(Botrytis cinerea)*

Botrytis can attack the crop at any stage. The disease can invade as a secondary infection following physical damage or an attack of *Rhizoctonia* .

Cultural control:*Damage from Botrytis can be reduced by avoiding deep planting, not planting very large plants, avoiding damaging seedling plants and not overwatering. Rapid destruction of infected trash following crop removal is important.*

Chemical control: Several fungicides are now available for controlling this disease. A range of fungicides

which offer good control of botrytis are listed in the appendix. In all cases, the disease is best controlled if the fungicide is applied early in the life of the plant

8.10.2.3 Rhizoctonia

Rhizoctonia solani is a soil-borne disease that can be serious in cold, wet conditions. Rhizoctonia is difficult to distinguish from *Botrytis* in the field.

Cultural control ***:*** *The same cultural methods that apply to Botrytis will also help reduce Rhizoctonia.*

Chemical control: Iprodione will give some suppression of this disease if applied at an early stage. Fungicides based on the strobilurins also offer some control of this disease.

8.10.2.4 *Sclerotinia* (*S. sclerotium* and *S. minor*)

A disease, which is becoming more widespread, that can be a serious problem especially when warm, damp conditions prevail in the spring and autumn. The fluffy white fungal growth occurs at the base of the Lettuce, accompanied by the small black resting sclerotia which are about 0.75 - 1.0 cm long. In the more advanced stages of the disease the whole of the base becomes rotten and the plant quickly wilts and dies. The sclerotia can remain dormant in the ground for several years. A new system is under development for predicting the germination of sclerotinia inoculum in the soil.

Cultural control ***:*** *Avoid fields and adjacent fields that have a history of Sclerotinia. Diseased plant material should ideally be removed from the field although it is appreciated that this is not always practical. Certain other crops such as carrots, dwarf beans and peas and beans are also affected by S. sclerotiorum and these are best avoided in the Lettuce rotation, as are fields which have recently grown oil seed rape and peas*

Chemical control: Iprodione will have some effect on *Sclerotinia* although the degree of control of *Sclerotinia* is extremely variable. However, fungicides based on boscalid and pyraclostrobin appear to give improved control of sclerotinia. More work is needed to determine the optimum time as to when the product should be applied, in order to obtain maximum suppression of the disease. *Sclerotinia* is often particularly serious when the crop is grown under covers as the protected environment often encourages the germination of the sclerotia. Fungicides based on strobilurins also offer a degree of control of *Sclerotinia.* An early application of strobilurin fungicides is necessary to obtain the maximum degree of control.

Note on the use of strobilurin based fungicides. At present, products based on strobilurin based fungicides are effective. However, over-use will inevitably lead to resistance. It would be sensible to apply no more than two applications of *any* strobilurin based fungicide to any one crop of lettuce.

8.10.2.5 Beet western yellow virus

This virus disease causes interveinal yellowing and is sometimes confused with magnesium deficiency. Aphids spread the virus and as the virus is retained by the aphid for long periods widespread and long distance infection can take place.

Cultural control:*It is important to keep the crop as free from weeds as possible and in particular, to keep the crop free of weeds which are a host to the disease such as shepherd's purse and groundsel.*

Chemical control: Efficient control of aphids must be maintained. Materials based on pirimicarb will control aphids effectively, although resistance does exist in some areas. Pirimicarb has a less damaging effect on ladybirds than some other insecticides. Pymetrozine is another effective insecticide but MUST be applied at the first sign of aphid. An insecticidial seed treatment offers a good level of control for this problem

8.10.2.6 Butt rot

A sudden collapse of the plant may well be due to butt rot. However, the disease is not always easy to identify, as there are many other diseases that can affect the base of the plant.

Cultural control:*Removal of trash after harvest may help to prevent carryover of the disease. Preventing over-watering is the other factor that will help reduce the incidence of disease.*

Chemical control: There are no chemical control measures as the main cause , *(Erwinia* spp .*),* are bacteria and no effective materials have been found for their control in Lettuce.

8.10.2.7 Ringspot *(Microdochium panattonianum)*

This disease is sometimes referred to as lettuce rust. It can occasionally be serious, especially on Little Gem and Cos-type Lettuces. Plants exhibit small sunken brown spots on the leaves and midribs, which is occasionally mistaken for slug grazing. The disease is particularly bad in wet, mild seasons.

Cultural control:*As the fungus is carried on plant debris, crop hygiene is extremely important and it is imperative that infected debris is removed as soon as possible.*

Chemical control: Although not specifically recommended for the control of Ringspot, fungicides based on strobilurins have been said to give some control of this disease. Octave ® , which contains prochloraz, has given some control of this disease. A recent HDC trial suggests that fungicides based on boscalid and pyraclostrobin give good levels of control. This research also suggests that strobilurin based fungicides have an effect on this disease.

8.10.2.8 Big vein

Big vein is a widespread virus disease of Lettuce, which is carried by the fungus , *Olpidium brassicae.* The problem is often most evident in early and late season Lettuce, ie. when the temperature is cooler.

Cultural control:*Scrupulous hygiene is required the propagator. If the disease is identified in a particular field, great care must be exercised in order to prevent big vein spreading to other fields. Thorough removal of soil from tractor and trailers working in contaminated fields will help prevent transfer of the disease, although there is no guarantee that this will be 100% effective. Resting spores of Olpidium can persist in the ground for many years. Rotation is also very important, as successional Lettuce crops grown in a field which has a history of big vein, will exhibit increasingly severe symptoms of the disease.*

Chemical control: No chemical control is currently available for this disease which emphasises that strict hygiene measures are critical.

8.10.2.9 Lettuce mosaic virus

This disease causes crinkling and necrotic spotting of the leaves. Aphids spread the virus.

Cultural control:*Virus-tested seed, with under 0.01% infection, must be used. The crop should be kept free of host weeds, especially groundsel.*

Chemical control: The same remarks about aphid control apply as with beet western yellows virus.

8.10.3 Weed control

A list of approved materials that may be used for weed control in outdoor Lettuce is given in Appendix 5.

Care must be taken in using these materials in respect of a following crop other than Lettuce, as some of the materials are persistent.

The use of propachlor post-planting, especially on Little Gem and Romaine type lettuce may result in a fusion of the leaves. This can affect the marketability of the finished product.

In many cases, mechanical or hand weeding is used as a supplement to chemical weed control. This practice is especially useful in removing weeds that are resistant to herbicide treatments.

9 Harvesting and storage

See Generic Standards and/or Generic Guidance Notes.

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 issues

See Generic Standards and/or Generic Guidance Notes.

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Appendix 1 Fertilizer requirements for Lettuce (kg/ha)

Nutrient (kg/ha)	Soil Index					
	0	**1**	**2**	**3**	**4**	**5**
Nitrogen[1]	250	200	150	100	25	0[2]
Phosphate(P2O5)	250	200	150	100	25	0
Potash (K2O)	250	200	150(2-)	50	0	0
			100(2+)			
Magnesium 3(asMgO)	150	100	0	-	-	-

Notes:

1. The recommendations assume overall application, a starter fertiliser containing nitrogen and phosphate may be beneficial even at high N and P indices.

2. A small amount of nitrogen may be beneficial if SMN levels in the top 10cm are low.

3. Even at a P Index of 4 or more up to 60kg/ha of phosphate as a starter fertiliser maybe beneficial.

Nitrogen levels may need to be reduced for babyleaf crops, some speciality/continental and little gem lettuce types and some Romaine lettuce types
There should be sufficient reserves of phosphate and potash for successional sowings in the same season, in some seasons, additional potash may be required especially following heavy rainfall

This table is a general guide for mineral soils only. Soil mineral analysis will give a useful guide as to the nitrogen requirement. For more detailed recommendations consult the 'Fertiliser recommendations RB209' available from HMSO and published by DEFRA.

Appendix 2 Industry code of good practice to minimise nitrate content of Lettuce grown under outdoor cropping culture in UK

1. Legislative Background

1.1 As part of its programme on agricultural contaminants in food, the European Commission is putting forward a series of proposals that set maximum limits for contaminants in foods. The first proposal agreed; European Commission Regulation (EC) No. 194/97 specifies the maximum concentration of nitrate in Lettuce *(Lactuca sativa)* and Spinach *(Spinacia oleracea).* The Regulation came into force in EU on 15 February 1997. A Statutory Instrument (< biblio >) under the Food Safety Act 1990 entered the Regulation into UK legislation. . The Food Standards Agency will carry out the enforcement.

1.2 The Regulation arose as a result of concerns in certain EU States over the possible health effects of high dietary intakes of nitrates to which vegetables as a group of foods makes the single greatest contribution. MAFF Food Surveillance Paper No. 32 reported on the findings in UK and paragraph 15.1 page 42 concludes "We are satisfied that there is no cause for concern in respect of current dietary intake of nitrate and nitrite in the general population."

1.3 The EU Scientific Committee reviewed in 1990 and again in 1995 the toxicology of nitrate for Food (SCF) as part of its consideration on the use of nitrate as a food additive in the manufacture of certain food products such as ham, bacon and some cheeses. The report of the latest SCF Opinion on Nitrate (CS/CNTM/No3/20 - FINAL) makes a number of recommendations including the following:

The ADI for nitrate of 3.7 mg/kg body weight/day should be retained and it should apply to all sources of dietary exposure:

- efforts to reduce exposure to nitrates via food and water should continue;
- there was currently insufficient data on the consumption of those vegetables which are the primary source of nitrate in individual Member States to judge whether setting maximum limits on nitrate levels in certain vegetables would have a significant impact on overall intakes;
- that good agricultural practices should be adopted to ensure that nitrate levels are as low as possible;
- concerns over nitrate should not discourage increased consumption of vegetables, a class of foodstuffs which is recognised as providing a major role in health protection, including possibly a reduction in the risk of cancer.

The Review of the Regulation in January 2005 required a further review of nitrate toxicity to be carried out by the European Foods Standards Agency. Evidence for this review is being carried out by the UK Foods Standards Agency.

1.4 Regulation 194/97 lays down maximum limits for nitrates in Lettuce and Spinach within the EU. These limits apply to these products when put on the market in any Member State. However, Article 2 of the Regulation provides for an optional derogation for Lettuce and Spinach grown in and intended for consumption in individual Member States. This will allow for a transitional period, such produce to be exempt from the limits provided that growers follow Codes of Good Agricultural Practice to achieve progress towards the levels laid down at Community level and requires Member States to inform the Commission each year of the steps taken. The UK is taking advantage of such derogation under this Article for both lettuce and spinach..

1.5 A Code of Good Practice lays out the actions to be taken and monitored by the UK Industry. As knowledge is gained the Code will be revised and updated.

2. Nitrate in plants

2.1 Nitrogen is an essential constituent of proteins on which all life depends. Plants take up most of their nitrogen in the nitrate form before converting it to proteins via amino acids. Energy is required to convert nitrate to amino acids and this is supplied by sunlight through the process of photosynthesis. Thus in winter, when light levels are lower, higher levels of nitrate accumulate in the plant. Older leaves contain more nitrate than younger leaves because the site of nitrate conversion to amino acids is in the actively growing, younger tissue. Nitrate is also used by plants to regulate the turgidity of cell sap and therefore will be at lower concentrations when rapid growth is occurring. For these reasons the levels of Nitrate in plant leaves varies considerably, both over time and between leaves of different ages.

3. Background to action by UK industry

3.1 A significant programme of monitoring by growers and MAFF in 1994/95 confirmed that the major problem in achieving consistent limits of nitrate content of individual Lettuce was the high level of variability shown in test results.

3.2 There was variability between seasons as expected; however, there was also variability between crops and indeed between Lettuce within the crop including Lettuce growing adjacent to each other. There was also variability in results being achieved by different testing laboratories. The variability of these results has decreased since all laboratories have been advised to use the hot water extraction method for nitrate analysis.

3.3 This first version of the Code of Good Practice has been written to include the most likely actions, using present scientific knowledge that should minimise nitrate content.

3.4 All sectors of the Industry namely Defra, Warwick Horticultural Research International, Horticultural Development Council, NFU, growers and the British Retail Consortium will be contributing to further research and monitoring programmes to both improve on the predictability of advice to growers as well as monitor levels of nitrate in Lettuce reaching the consumer. The remainder of this document lays out more detail of this work.

3.5 The NFU working with Assured Produce and the Food Standards Agency will ensure all UK Lettuce growers are aware of this Code of Good Practice. They will be aided in this by the Technical Departments of the Multiple Retailers who will require their suppliers under Food Safety Act contractual agreements to follow the Code together with its monitoring requirements.

4. Research

4.1 **Medical research:** Research is ongoing into the potentially beneficial medical effects of nitrates in the diet.

5. Monitoring of nitrate levels

5.1 A considerable programme of monitoring of nitrate levels in Lettuce will be carried out. Samples for testing will be taken at harvest, during the distribution chain and at retail outlets.

5.2 The UK Monitoring Programme for Nitrate in Lettuce and Spinach began in May 1996 in accordance with Article 3 of Commission Regulation (EC) No. 194/97. This monitoring continues. The samples are representative of production and geographic distribution of growers in the UK. The programme is supervised by the Food Standard Agency. Samples are taken by Trading Standards Officers and analysed by the appropriate Public Analysts. All the analysts participating in the Monitoring Programme meet the criteria laid down by European Commission paper (doc. VI/4800/96) 'Guidelines for Laboratories Carrying Out the Determination of Nitrate in Lettuce and Spinach: EC Monitoring Programme' and have demonstrated satisfactory performances for nitrate analyses in the Food Analysis Performance Assessment Scheme (FAPAS). The results of the present Monitoring Programme will be reported to the European Commission in May 1997.

5.3 Multiple retailers will be monitoring samples of Lettuce taken from their distribution depots. The major retail groups account for some 70-80% of all Lettuce sold.

5.4 Grower monitoring. All major marketing and co-operative groups together with growers will carry out monitoring as detailed later in this Code of Good Practice.

5.5 The MAFF Food Contaminants Division will collect and co-ordinate all the monitoring results so that a large and representative sample of nitrate levels in UK Lettuce will be compiled. This reference data will add to that already collected by MAFF since 1995.

6. Cultural advice to growers

6.1 This cultural advice has been prepared using research knowledge acquired to date including that from other EU Member States particularly The Netherlands. All growers must follow this cultural advice. It is a requirement of the Food

Safety Act, the controlling Act for the nitrate regulation that a grower must be able to provide written records that they have complied with this Code and they will be required to provide this for Assured Produce auditors, their customers and Local Authority Food Act inspectors. It will be a legal offence that may lead to prosecution if a grower fails to provide the information required. It is advised growers incorporate this Code under their HACCP programmes to ensure they are complying.

6.2 **Light maximisation:** The objective is to maximise light availability. Out-door crops are naturally subject to the "weather". However growers who use woven or polythene covers in their early plantings (February to May) should make every effort to maximise light availability, due diligence must be used with regard to the gram weight of the cover material used. Due regard must be given to allowing a period of natural light (no covers) prior to harvest. New material must be used where there is doubt as to sufficient light transmission through existing cover material.

6.3 **Nutrition:**

6.3.1 Analysis of the soil for nitrate-nitrogen content can indicate the available amount of nitrogen reserves in the soil. For spring crops this should be done in January/February. After this time any testing could be inaccurate due to the rise in soil temperatures. For any subsequent crops, the grower should use all the relevant data to ascertain what his nitrate nitrogen levels are i.e.

- amount of fertiliser applied to first crop
- amount of rainfall
- crop uptake of fertiliser
- preceding cropping (particularly if ploughed-in.)

6.3.2 Apply no more than 150 kg N/hectare at time of planting. If necessary, apply any further requirement at full establishment.

6.3.3 If organic manure is applied for soil conditioning it should be applied in the autumn before the outdoor season commences.

6.3.4 If liquid feeding is applied, to ensure that nitrate nitrogen levels are minimised, sap testing or any such other test should be done before any application is made.

6.3.5 The outer leaves of Lettuce naturally contain higher nitrate levels. Consequently growers should aim to achieve high head weights to allow some trimming where appropriate.

6.4 **Lettuce variety:** Although there is variation in nitrate residues between varieties and types of lettuce no variety offers at present a consistent means of achieving the proposed levels. Some varieties with claims for low nitrate content exhibit other agronomic shortcomings. Nevertheless growers should keep trials in this area under review.

6.5 **Post-harvest handling:** The interval between harvest and sale should be as short as possible to avoid water loss which would be expected to "concentrate" the nitrate content of the fresh product. An interval of 48 hours should be the targeted maximum. Research into the effect of distribution through the food chain is ongoing and any appropriate results will be built into this code when being updated.

6.6 **Nitrate monitoring samples:**

6.6.1 Sampling and analytical procedures are essential elements of due diligence. A competent laboratory using a validated method of analysis should conduct analysis of samples. This would normally require the laboratory to be accredited by UKAS and participate in FAPAS or similar proficiency testing scheme. For example, laboratories should be able to demonstrate that they achieve a satisfactory performance (ie z-scores between +2 and -2) in FAPAS nitrate rounds.

6.6.2 Samples taken immediately prior to harvest for the purposes of monitoring the effectiveness of this code should be taken one per eight hectares of each crop, and a further sample (or samples) should be taken if there is a prolonged spell of unseasonably dull weather, since these conditions are likely to result in higher nitrate levels than would usually be expected.

This sampling requirement is in addition to any samples demanded by customers or enforcement authorities for their own purposes.

6.7 **Records required:**

6.7.1 The following records must be kept for all crops, and retained for 2 years.

a. Soil analysis results, date and location.
b. Date of nitrogen fertiliser applications per crop, to include base and liquid feed. The results of sap testing, or any other such test, if carried out, before the application of a liquid feed. The type and total nitrogen content of fertiliser should be recorded together with application rate.
c. Date of any application of organic manure or soil conditioner with an estimate of total nitrogen applied.
d. Date of planting and variety together with date of harvest.
e. Previous crops grown.

6.7.2 In addition, the following records must be kept for crops being sampled, and analysis results retained for 2 years:

a. Date and time of taking plant samples.
b. Weather conditions on days prior to taking of samples.
c. Results of sample analysis and name of laboratory/analyst performing the analysis.

6.7.3 The grower should keep all these results and a copy supplied to, and kept for reference by, the grower's marketing organisation if one is being used. They will be made available to any authorised person, eg. enforcement officers, on request.

7. Status of this code

The National Farmers Union in consultation with Defra and others, originally prepared this Code of Good Practice. It was revised in 2006 by Assured Produce and the Food Standard Agency.

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Appendix 3 Insecticides currently approved for use on field grown Lettuces

Active Ingredient	Product Features	LERAP Category	Harvest Interval	MRL mg/kg
Acetamiprid (2)	A contact, translaminar and systemic insecticide	B	3 days	5.0
bacillus thuringiensis (2)	a bacterial insecticide for the control of caterpillars	none stated	nil	none set
cypermethrin	A contact and stomach acting pyrethroid insecticide	A	zero	2.0
deltamethrin	A pyrethroid insecticide with contact and some residual activity	A	zero	0.5
diflubenzoron	a selective persistent, contact and stomach acting insecticide for the control of caterpillars	B	7 days	0.2
Lambda-cyhalothrin	A contact and ingested pyrethroid insecticide	B	7 days	0.5
lambda-cyhalothrin + pirimicarb(1)	a contact and ingested pyrethroid plus a contact, fumigant and translaminar carbamate to control caterpillars and aphids	A	3 days	0.5
nicotine	a general purpose, non persistent, contact alkaloid insecticide to control aphids	none stated	2 days	none set
pirimicarb (1)	a contact, fumigant and translaminar carbamate insecticide to control aphids Kind to some predators, especially ladybirds. .	none stated	7 days	5.0
pymetrozine(2)	an azomethine insecticide for the control of aphids.	none stated	7 days	2.0
imidacloprid	A fully systemic neonicotinoid insecticide used as a seed treatment	None stated	Seed treatment	2.0

Notes:

(1) anti-cholinesterase compound

Not all products containing these active ingredients may be currently approved for use on outdoor lettuces.

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

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Appendix 4 Fungicides currently approved for use on field-grown Lettuces

Active Ingredients	Product Features	LERAP Category	Harvest Interval (1)	MRL mg/kg
azoxystrobin (2)	a systemic translaminar and protectant strobilurin fungicide for the control of downy mildew, *Sclerotinia* and botrytis.	none stated	14 days	3.0
boscalid and pyraclostrobin (2)	a protectant and systemic fungicide for the control of botrytis, rhyzoctonia and sclerotinia	none stated	14 days	10.0 2.0
Copper(2) oxychloride	a protectant copper fungicide and bactericide	None stated	14 days	100.0
Cyprodinil and fludioxonil	A systemic and protectant fungicide for the control of botrytis	B	7 days	10.0 10.0
Dimethomorph and mancozeb	a systemic and protectant fungicide	B	21 days	10.0 5.0
fenhexamid (2)	a protectant fungicide for the control of *Botrytis*	none stated	3 days	30.0
fosetyl- (2) aluminium	a systemic phosphonic acid fungicide against downy mildew	none stated	14 days	75.0
Fosetyl-aluminium/ Propamocarb hydorchloride	A systemic phosphonic acid fungicide with systemic and protective fungicide	none stated	14 days	75.00 50.0
iprodione (2)	WG formulation.	none stated	21 days	10.0
mancozeb	a protectant dithiocarbamate fungicide	none stated	14 days	5.0 (dithiocarbamates)
mancozeb metalaxyl-M	systemic and protectant fungicide for downy mildew control.	none stated	14 days	5.0 2.0
prochloraz (2)	a broad-spectrum protectant and eradicant conazole fungicide for the control of *Botrytis* and ringspot	none stated	21 days	5.0
propamocarb (2) hydrochloride	a translocated protectant carbamate fungicide for downy mildew	none stated	14 days	50.0
thiram	protectant dithiocarbamate material with useful activity against *Botrytis*	none stated	14 days	5.0 (dithiocarbamates)

Notes:

(1) or latest time of application

(2) SOLA - see Appendix 7 for specific product and expiry dates

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

Appendix 5 Herbicides currently approved for use in field-grown Lettuces

Active Ingredient	Product Feature	LERAP Category	Harvest Interval (1)	MRL (mg/kg)
chlorpropham	a residual carbamate herbicide.	none stated	none stated	0.05
glufosinate-ammonium	a pre-emergence non-selective, non residual phosphonic acid contact herbicide.	none stated	none stated	none set
glyphosate	a translocated non-residual phosphonic acid herbicide	none stated	none stated	0.1
diquat	a non-selective non-residual bipyridyl herbicide.	none stated	none stated	none set
pendimethalin (2)	a residual dinitroaniline herbicide.	none stated	none stated	0.05
phenmedipham	A selective contact herbicide	None stated	21 days	3.0
Propachlor (2)***	an amide herbicide for pre and early post emergent use.	none stated	none stated	0.1
propyzamide	a residual amide herbicide. Persistent and care must be taken when planting following crops.	none stated	24 days if used at the 1.5kg rate 6 weeks when used at rates *above* 1.5kg/ha	1.0
trifluralin****	a soil incorporated d-initroaniline herbicide. A 'Red List' substance.	none stated	none stated	0.50

Notes:

*** Please note all products containing propachlor are to be withdrawn from sale on 18th March 2009 and carry a final use up date of 18th March 2010.

****Please note all products containing trifluralin have a final use up date of the 20th march 2009.

(1) or latest time of application

(2) SOLA - see Appendix 7 for the specific product and expiry dates

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

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Appendix 6 Molluscicides currently approved for use on field grown Lettuces

Active Ingredient	Product Features	LERAP Category	Harvest Interval	MRL mg/kg
Ferric phosphate	A molluscicide bait for controlling slugs and snails.	none stated	none stated	none stated
metaldehyde	a molluscicide bait for controlling slugs and snails	none stated	zero	1.0
methiocarb	a stomach acting carbamate molluscicide and insecticide **	none stated	14 days	1.0

Notes

** New regulations exist in respect of the application rates, number of applications and harvest dates for methiocarb based products. Please refer to notes under Slugs **8.10.1.6**

Appendix 7 Specific off-label approvals for use on field-grown Lettuce

Number	Product Name	Ingredient	Expiry
0792/07	Agrichem Flowable Thirum	Thirum	31/12/13
3522/06	Aliette 80WG®	fosetyl-aluminium	31/12/13
2540/07 2564/08	Alpha Propachlor 50 SC®	propachlor	18/03/10 18/03/10
1465/01	Amistar®	azoxystobin	31/12/11
1612/07	Bandu	deltamethrin	31/12/13
3517/07	Cleancrop Chicane	Fosetyl-aluminium	31/05/09
1640/07	Cleancrop Decathlon	deltamethrin	31/12/13
1695/07	Decis®	deltamethrin	31/12/13
1158/07, 1652/07	Decis Protech®	deltamethrin	31/12/13
3924/02	Dimilin 25 WP®	diflubenzuron	31/12/13
1321/05	Dimilin Flo	diflubenzuron	31/12/13
2063/04	Dipel DF®	Bacillus thuringiensis	31/12/13
0625/04	Filex®	propamocarb hydroxide	31/12/13
2142/03, 2141/03	Fubol Gold WG®	mancozeb and metalaxyl-M	31/12/13
1886/03	Gaucho®	imidacloprid	31/12/13
2234/08 2233/08	Gazelle SG Gazelle	acetamiprid	10/09/11 31/12/14
0157/08	Headland Inoganic copper®	Copper oxychloride	31/12/13
3044/06	Invader	Dimethomorph plus mancozeb	30/08/11
2650/05	Kerb 50W® (under covers)	propyzamide	31/03/09
2410/08 2411/08	Kerb flo	Propyzamide	31/03/14 31/03/14
0382/08	Metman 680	Mancozeb+ metalaxyl	30/06/11

Notes for Appendix 7:

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 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 7 Specific off-label approvals for use on field-grown Lettuce (Cont'd)

Number	Product Name	Ingredient	Expiry
1662/07, 1659/07	Pearl Micro®	deltamethrin	31/12/13
0060/07	Plenum WG®	pymetrozine	31/10/11
2947/07	Previcur Energy	Fosetyl-aluminium and propamocarb hydrochloride	31/12/13
3425/07 2947/07	Proplant®	propamocarb hydroxide	30/09/09 31/12/13
0269/08	Standon Fullstop	fosetyl-aluminium	31/12/13
1159/02 2564/08	Ramrod Flowable®	propachlor	31/12/13
0650/01	Scotts Octave®	prochloraz	31/12/13
2102/08 2101/08 1432/07	Stomp 400SC®	pendimethalin	31/12/08 31/12/08 31/12/13
1931/08	Switch	Cyprodinil and fludioxonil	31/12/13
0026/05	Teldor	fenhexamid	31/05/11
2039/07 1290/08	Tracer	spinosad	31/07/17

Notes for Appendix 7:

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 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 8 Seed treatments approved for use on field grown Lettuces

A specific off-label approval for the use of imidacloprid as a seed dressing on Lettuce has been granted.

The rate of application of imidacloprid depends on the planting density of the crop. No more than 125 g of active may be applied to be applied to one hectare of land per calendar year. You should check before planting that your planned planting density allows the rate of seed treatment planned.

The maximum permitted rate of Gaucho is 257gm per 100,000 seeds, this is equivalent to 180gm per 100,000 seeds of the active ingredient imidacloprid as Gaucho is 70% imidacloprid.

No more than one application of treated seed may be sown, nor more than one planting of transplants grown from treated seed made, to any given area of soil in any one calendar year.

The product will assist in the control of both lettuce root aphid and leaf feeding aphids.

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Appendix 9 Guidelines on minimising pesticide residues

These guidelines have been produced after consultation between crop stakeholders and the Assured Produce crop author. They will be developed over the coming seasons as knowledge on minimising residues develops. Growers should consult with their crop protection adviser to ensure other best practices are not compromised before considering these guidelines. The table below lists the active ingredients that may give rise to crop residues and details potential alternative strategies.

Active ingredient	**Target: pest, weed, disease**	**Current position**	**Suggested guidelines**
cypermethrin	caterpillar	nil harvest interval	Increase to 5 day self-imposed harvesting interval.
Lambda-cyhalothrin	caterpillar	7 days	Increase to 10 days self imposed harvest interval
dithiocarbamates	downy mildew	14 day harvest interval	Use a maximum of 2.5 kg/ha straight mancozeb (Karamate). No more than two applications per crop. No more than three applications of products containing dithiocarbamates.
iprodione	*Botrytis/Sclerotinia*	21 day harvest interval	Use within 21 days of planting.
Cyprodinil & fludioxonil	*Botrytis/Sclerotinia*	7 days harvest interval	Use within 28 days of planting
Boscalid & pyraclostrobin	*Botrytis/Sclerotinia*	14 day harvest interval	Use within 28 days of planting
propamocarb hydrochloride	downy mildew	14 day harvest interval	Use within 28 days of planting.

* Ensure any guidance given to use use within a certain number of days of planting allows at least the minimum harvest interval, especially during Summer months and on fast growing lettuce types such as continental/speciality/little gem types.

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Appendix 10 Control Points: Lettuce (Field)

CS.35 **LETTUCE (FIELD)**

CS.35.1 You must be aware of current EC legislation in respect of levels of nitrate and you must monitor the nitrate levels in your lettuces on a regular basis

- Protocol reference: Section 6.1 **(Revised 2005)**

CS.35.2 You should demonstrate that you consider leaf analysis before applying micro nutrients

- Protocol reference: Section 6.1

CS.35.3 You should ensure that plastic film and fleece materials used as crop covers are recovered and recycled or disposed of in an appropriate manner

- Protocol reference: Section 3.1

CS.35.4 You should time your application of trace elements to avoid damage to the crop

- Protocol reference: Section 6.1