Assured Produce

Crop Specific Protocol

HOPS

(CROP ID: 26)

February 2008

Control Document No: 00031/08

Acknowledgements

Assured Produce gratefully acknowledges the contribution of all consultees in the preparation of this protocol, particularly members of the National Hop Association and Peter Glendinning.

Preface

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

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

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

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

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

Disclaimer and trade mark acknowledgement

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

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

Notes:

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

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 Products containing substances which have been revoked are shown on the PSD website (http://www.pesticides.gov.uk).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

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

There may be changes for the following reasons:

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

Control Document No: 00031/08

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.

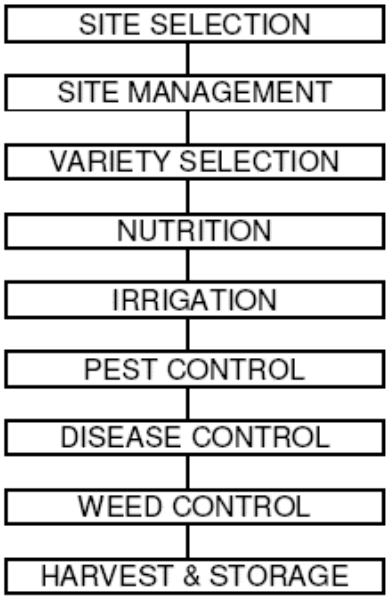
For pesticides on-label, only active substances are shown.

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. Any changes to the text have been highlighted by marking the document with a line in the margin.

2 Planning and records

Records should be kept that demonstrate the purity of the varieties planted in each Hop yard or garden. All purchases of Hop plants should be logged. Full planting records for both new and replacement plants should eliminate any ambiguity as to the purity of all varieties of Hop grown on the farm. Fertiliser and pesticide applications should be recorded and be available for inspection on request.

3 Site selection

See Generic Standards and/or Generic Guidance Notes.

Control Document No: 00031/08

4 Site management

See Generic Standards and/or Generic Guidance Notes.

5 Variety selection

See Generic Standards and/or Generic Guidance Notes.

It is **strongly recommended** that planting records be kept to ensure varietal purity is maintained.

6 Nutrition

As Hops are a long-term perennial crop, it is most important to maintain the soil 'in good heart' by preventing damage to the soil structure and preventing soil nutrient deficiencies. Regular soil inspections and periodic analyses are both necessary to pre-empt potential problems. Although Hops can tolerate acid soil conditions, lime should be applied to maintain a pH of 6.0 to 6.5.

Hops respond well to regular applications of bulky organic manures, which generally improve soil structure and nutrient balance. Applications are best made between May and August, when the soil is warm and the crop growing vigorously. Manures can contribute significant amounts of nutrients, and so should be taken into account when calculating required rates of mineral fertilisers.

Regular yet timely subsoiling is needed to maintain/improve aeration on most soils. Effective subsoiling can greatly improve soil aeration, drainage and nutrition, and can reduce risk of Wilt infection.. The most favourable soil conditions for Wilt infection are poorly aerated, cold wet soils in March and April with a high concentration of free nitrate.

Fertiliser recommendations for hops are based largely upon the DEFRA booklet RB209 (see Appendix 1).

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

A number of growers have found that their Hops respond to applications of phosphate and potash higher than those recommended in these tables despite the soils showing high soil indices for P and K. This is not to be totally unexpected considering the characteristics of the red brick earth soils in which many hops are grown. Recent research has also shown that Hops can respond to extra foliar feeds of P and K.

Over-application of nitrogenous fertilisers can promote the soil borne disease *Verticillium albo-atrum* (Hop Wilt). It is greatly encouraged by high residues of mineral nitrogen in soils lying cold and wet in the early spring. Most hops cannot make use of nitrogenous fertilisers until after the end of May. However, applications of nitrogen may be required in the early spring where grass is grown between hop plants or in the alleyways between the hop rows.

7 Irrigation

See Generic Standards and/or Generic Guidance Notes.

8 Crop protection

8.1 The basic approach to crop protection

Pest and disease recognition

The Hop is a rapidly growing and strongly three-dimensional plant and the thresholds for the presence of the main pests and diseases are at present all set at zero. There are times when certain levels of pest infestation can

be tolerated, but for diseases this is not good practice because Hops are grown as perennial plantations in blocks, in which the plants of each variety are genetically identical.

It is imperative that personnel responsible for crop protection are able to recognise pests and diseases in their early stages. The importance of regular crop inspections for *Verticillium* wilt cannot be over-emphasised.

It is useful to record all field examinations, not only to facilitate the choice of management tools (e.g. fertilisers and pesticides), but also for future reference to compare performances between different fields and seasons.

8.2 Plant protection product choice

See Generic Standards and/or Generic Guidance Notes.

Pesticide approvals

Lists of pesticide products currently approved by DEFRA PSD for use on Hops in the UK can be found in Appendices 3, 4, 5, 6 and 7.

All pesticides carry statutory practical restrictions on their use, and the main points relevant to Hops are listed in Appendices 3, 4 and 5. It is important that all users of pesticides are familiar with the instructions and restrictions of individual pesticide products, and it is to these that the tables in Appendices 3, 4 and 5 must defer.

These lists are updated annually by the National Hop Association of England and circulated to all growers either direct or through their Producer Organisations (for electronic copies contact the NHA).

Where relevant, users must be in possession of copies of 'Off-Label' (SOLA) Approval notices (see Appendix 8). Growers may receive copies of these notices from their Producer Groups, but they can also be obtained by accessing the PSD website e-approvals or by contacting the National Hop Association. The notices contain the necessary rates and restrictions for approved uses on Hops.

Hop growers should be aware that in addition to the statutory restrictions placed on pesticides by DEFRA PSD, there are also industry restrictions imposed by brewers through the British Beer and Pub Association (BBPA). A list showing the conditions for their 'acceptance' of each chemical / pesticide is published every year as a BBPA Technical Circular. This is circulated to the BBPA members in the UK, and is often referred to by hop merchants and Grower Producer Organisations. Although it gives EC MRLs and chemical tolerances for the U.S.A., it is an advisory bulletin not a legal document.

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 that give the statutory conditions of use.

If in any doubt about product approval growers can contact the the NHA, or PSD direct, either on line www.pesticides.gov.uk or by telephone 01904 455775

8.3 Advice on the use of pesticides

See Generic Standards and/or Generic Guidance Notes.

8.4 Application of pesticides

Application methods

Reduced volume spraying is generally regarded as inappropriate for Hops. Growers wishing to adopt lower volumes must ensure that the restrictions on the pesticide labels are adhered to.

8.5 Records of application

Recording and reporting

Records of Pesticide Applications should be available upon request to your Producer Organisation, for its own records or inspection by its (your) customers. These should show a minimum of the following information:

- Title: Record of pesticide application
- Year
- Grower name
- Grower EEC number
- Pocket or bale numbers pertaining to the record
- Variety
- Field name(s)
- For each date of application:
    - Product name(s)
    - Active substance
    - Justification for use
    - Dilution rate of product
    - Spray volume
    - Rate of product used per hectare
- Harvest start and finish dates
- Authentication signature

A copy of an example form can be found in Appendix 9 (for an electronic copy contact the NHA).

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. This 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 with this crop but the awareness needs to be maintained for any future issues.

8.10 Pest, disease and weed control

8.10.1 Pest control

8.10.1.1 Damson hop aphid *(Phorodon humuli)*

A voracious sap sucker with a tolerance threshold of zero.

Aphids migrate into Hops from May to August. They prefer to colonise young growth and breed rapidly with up to eight generations per season. Winged aphids return to *Prunus* species starting in August. The infestation in Hops results in a marked reduction in plant vigour, with premature leaf-drop and yield loss. In addition to direct physical damage, the contamination of Hop cones by the sooty moulds, feeding off the honey-dew, results in a reduction in crop quality. Even a trace of these sooty moulds in a crop can render it unmarketable.

All varieties, except Boadicea (a new variety completely and naturally tolerant) are susceptible to attack by aphids. Control on some varieties is more difficult than on others, the worst being those varieties with early maturing large open cones.

Over the past 30 years the Damson Hop aphid has been one of the most successful in gaining resistance to most groups of insecticides. Control measures MUST NOT rely on only one active substance, as this will encourage the development of resistant populations. Growers now have Plenum (pymetrozine) as well as Admire (imidacloprid) available to use. There is no other effective chemical registered for use in the UK, and no other reliable control technique.

8.10.1.2 Two-spotted spider mite *(Tetranychus urticae)*

Often misnamed 'red spider mite' with a threshold tolerance of zero.

Mites emerge from diapause from early spring to late May (depending upon temperature - for detailed research on this refer to recent papers by Dr. C. Campbell at HRI East Malling). They feed mainly on the underside of leaves initially causing the characteristic light speckling, followed by extensive bronzing and bleaching of leaf tissue and subsequent leaf drop. In severe cases, total defoliation can occur. The breeding rate of this mite is related to temperature and relative humidity, and is most favoured by hot dry conditions. Breeding continues throughout the Hop-growing season and mites return to diapause from mid-September. Favoured sites for diapause are dry and sheltered (cracks in Hop poles, hollow plant tissue like straw and old bine material), but significant numbers over-winter in cracks in the soil surface and between the scales of the buds on surface Hop shoots.

This mite also attacks many other crops in which regular applications of acaricides may also be required. This has contributed to the high level of resistance now possessed by the mites against several groups of acaricides.

Growers have to rely on chemical acaricides to control this persistent pest. Treatments are usually most effective applied in late May / early June, and then repeated after between two to four weeks (depending on circumstances). The choice of effective approved acaricides is now limited to Masai (tebufenpyrad), but resistant populations have already developed.

There is no other technique established for controlling the two-spotted spider mite on Hops. Despite the apparent success in other crops using introductions of predatory mites, further developmental research is required on Hops. Of more benefit to the grower is the fact that numbers of over-wintering mites can be significantly reduced through the practice of rank-bining (removing the first flush of shoots in the spring). Good basal defoliation also benefits mite control.

8.10.2 Disease control

8.10.2.1 Hop wilt *(Verticillium albo airum)*

Responsible for the demise of many Hop Yards, and still no cure in sight!

It is essential that all growers and crop advisers are fully aware of all the symptoms of this, the most pernicious disease of the Hop. Extracts from the DEFRA information sheet ' *Verticillium* Wilt of Hops' can be found in Appendix 2.

In the absence of statutory measures to control the spread of this disease, it is recommended that Producer Organisations take the initiative by demanding best practice of their members. Simple restrictions could be entered into the 'Common Rules of Production' that form part of the legal agreement between each Hop Producer Organisation and its individual grower members.

8.10.2.2 Hop downy mildew *(Pseudoperonospora humuli)*

Almost impossible to eliminate once established in the rootstock; tolerance threshold is zero. Therefore cleanliness of new plants is paramount.

Downy mildew emerges each spring from systemically infected shoots growing from the rootstock. These basal or primary 'spikes' produce spores that infect other shoots and leaves. In warm and humid weather conditions, the disease can infect unprotected plant tissue very rapidly indeed, especially during burr and cone development. The disease may also be able to survive on nettles, using them as a 'green bridge'.

All varieties must be regarded as susceptible, with some like Target, clearly very susceptible to the disease.

Control of downy mildew is best achieved with prophylactic fungicide sprays. Growers tend to use those with systemic activity in the spring to reduce primary spike, and during burr and cone development to protect the crop. Adequate protection of the developing hop cones is crucial. Damage to crop yield through subliminal levels of disease in the plant is not documented. Hop yards with any significant level of infection are a serious hazard to neighbouring crops and must not be tolerated. Infected Hop cones in the 'sample' may render the crop unmarketable.

8.10.2.3 Hop powdery mildew (*Sphaerotheca humuli*)

A disease that can spread in a wide range of conditions (ie. almost every day of the Hop-growing season in the UK); a tolerance threshold of zero.

Powdery mildew is now endemic in almost all Hop-growing regions in the world. Although it favours mild and

damp growing conditions, it can also reach epidemic proportions in desert conditions! Its voracity depends largely upon the susceptibility of the Hop variety grown. Summer (asexual) spores can over-winter between the scales of buds, and these emerge to infect new tissue each spring. The disease can also over-winter as ascospores (held in cleistocarps) that are released in the spring to infect the new growth. Disease inoculation can be significantly reduced by rank-bining, and is discouraged by removal of unwanted basal growth (usually by chemical defoliation). The disease can spread very quickly on young tissue and inadequate control often results in a serious epidemic rendering the crop unmarketable.

The disease mutates readily, and there are now no varieties that can be said to be 'resistant'. It is the degree of both risk and susceptibility that largely determine the programme of control measures taken. It is useful to note that once infection can be spotted with the naked eye (as a small white speck), it has already been sporulating for a few days.

Control measures rely entirely upon fungicides, which are usually applied in a programme of regular (typically fortnightly) sprays, from shoot emergence in the spring until harvest. Breaks in the spray programme usually lead result in increased infection. Growers should aim to eliminate all traces of the disease **before** the onset of burr, because after this time satisfactory control is rarely achievable.

For further information on the nature of these or other pests and diseases, refer to 'Hops' by RA Neve (published by Blackman), or seek advice from your Hop Producer Group, the National Hop Association or your crops adviser.

8.10.2.4 Late Season Diseases (e.g. *Alternaria alternata*)

Infection is usually seen after injury to the delicate developing hop cones (especially Goldings) in August, often following a characteristic late summer storm. *Alternaria* infection usually results from close proximity to wheat and oil seed rape, causing a nondescript brown discolouration to hop cones, and forces an early harvest. The grey mould of *Botrytis* in the cones is rarely seen in the UK, preferring the warmer more humid conditions found in southern Europe in late August. *Fusarium* 'cone tip blight' has recently been identified as a problem in Oregon, but has not been recognised in the UK yet. Protection against all these diseases is reduced where there is powdery mildew infection. Chemical protection is at present the only option for UK growers threatened by *Alternaria* , but applications of chlorothalonil can leave residues in the cones. Some traders have a zero tolerance to such residues and so growers have to be very wary, despite legally established MRLs for similar chemistry in both the EC and USA.

8.11 Revised Long Term Arrangements for Extension of Use

Please refer to the following weblink for the latest news from PSD:

http://www.pesticides.gov.uk/approvals.asp?id=2335

PSD is unable to maintain the Long Term Arrangements for Extension of Use (LTAEU) because they are incompatible with the EC Pesticides Directive 91/414, and so they are being replaced with Specific Off-Label Approvals (SOLAs). This is an enormous task and the work is on-going.

Replacement SOLAs will be shown on the PSD website when they become available.

Growers can continue to use approvals under the LTAEU until such time that all relevant SOLAs have been issued, and/or the arrangements withdrawn by PSD. At that time growers must ensure that they have access to the relevant SOLA notice of approval.

These arrangements refer to hops plants grown in the following circumstances:-

a. Mature stock or mother plants that are kept specifically for the supply of propagation material.

b. Propagation of Hop planting material - propagules prior to final planting out.
c. "Nursery Hops": first year plants not taken to harvest that year, grown in their final planting out position.

These arrangements cover hops not harvested for human or animal consumption within 12 months of treatment, and so include 'idling'.

9 Harvesting and storage

It is **strongly recommended** that all Hops are cleanly picked and transported to the farm so that they are not only free from pest and disease, but also from all extraneous matter. To achieve this the grower follows his or her own procedure for picking, cleaning, drying, packing and storing the crop. It is important that any of these operations do not hinder the traceability of the crop. Each pocket or bale must be correctly labelled or marked.

It is **strongly recommended** that it is possible to trace the following for each bale or pocket of Hops:

- field name, and so the record of pesticide applications for those Hops
- harvest date
- kiln or oast number (if appropriate) and time & date of drying
- weight of pocket or bale (and from which ones samples were taken)
- date put into storage or despatched

It is **strongly recommended** that the crop conforms to EC labelling and Hop certification rules and regulations.

This protocol is not intended to prescribe 'best practice' - it merely lists a number of check points in Appendices 10 and 11.

The list also includes standards and limits that are required by the crop, and are normally included in each grower's 'Common Rules of Production' as part of their agreement with the Producer Organisation.

It is **strongly recommended** that:

- hop picking and cleaning machines, and conveyors of both green and dried hops, are cleaned before harvest each season and that this is recorded.
- kilnburners are regularly serviced to prevent fuel aerosols from fouling the crop and the service recorded.
- smoking is prohibited inside the buildings where hops are being dried, conditioned, pressed and stored.
- control measures are taken to prevent crop spoilage by vermin.

10 Pollution control and waste management

Hop waste should be collected in a covered or enclosed area to reduce the risk of spreading *Verticillium* Wilt.

11 Energy efficiency

See Generic Standards and/or Generic Guidance Notes.

12 Health and Safety

See Generic Standards and/or Generic Guidance Notes.

It is **strongly recommended** that HSE directives on machinery safeguards and hearing protection are met.

13 Conservation issues

See Generic Standards and/or Generic Guidance Notes.

Control Document No: 00031/08

Appendix 1 Fertilizer recommendations for Hops (kg/ha)

For established Hops

Nutrient (kg/ha)	Soil Index					
	0	**1**	**2**	**3**	**4**	**4+**
Phosphate	250	200	150	100	50	0
Potash	425	350	275	200	100	0
Magnesium	165	85	50	0	0	0

Nitrogen	kg/ha
Deep silty soils	180
Clays	200
Other mineral soils	220

It is important to apply less nitrogen where *Verticillium* wilt is present but the rates should not normally be reduced below 125 kg/ha nitrogen.

For more detailed recommendations consult 'Fertiliser Recommendations' (RB209) available from HMSO and published by DEFRA.

Appendix 2 Verticillium Wilt of Hops

Source: DEFRA Horticulture Information Sheet (PB4274)

What is it and why the concern?

Verticillium wilt is the most important disease of Hops. For many years it has been the subject of statutory control; control measures have been modified in response to the disease situation in the UK. Present in the South-East for many years, the disease then spread to the West Midlands, and the previously wilt-tolerant variety Wye Target has succumbed to a new strain of the pathogen at some sites. The disease is now notifiable only on premises registered for plant passporting of Hop propagation material. Commercial Hop producers are now responsible for their own preventative and control measures for this disease. This appendix examines the disease and suggests ways to prevent its introduction and spread.

Where is *Verticillium* wilt disease of Hops found?

Verticillium is a fungus that lives in the soil. There are a number of species, two of which attack Hops. ***V. dahliae*** has a wide host range, but generally does not cause serious problems in Hops. However ***V. albo-atrum*** is the cause of the most serious disease in the crop - ***Verticillium* wilt** . There are different strains of V. albo-atrum, some of which cause 'Fluctuating *Verticillium* Wilt' and others which cause the lethal 'Progressive *Verticillium* Wilt' or **PVW** .

V. albo-atrum exists in the soil as thick-walled strands of 'dark mycelium'. Infection occurs when Hop roots make contact with these structures. Within the plant the fungus grows in the water-conducting xylem tissue, spreading into the bine, and sometimes as far as the leaves. In infected Hop debris the fungus produces spores, called conidia, which can be washed down into the soil. Here they can infect other plants via the roots. However, infected debris blown or otherwise moved around the farm is the key method by which the disease spreads. Within the soil, there is only limited movement of the fungus in water, but movement by normal cultivation of soil is significant.

What are the symptoms?

Although typical symptoms of 'progressive' and 'fluctuating' wilt can still be seen, as described below, it is now accepted that there is a continuous variation in aggressiveness of wilt strains.

Progressive *Verticillium* wilt (PVW)

Bine symptoms can appear from May onwards, and in two to three weeks all of the leaves of affected plants will be withering. Plants that show symptoms early in the season are usually dead before the end of it. Typical symptoms of infection by *Verticillium* are:

a uniform coffee-coloured discoloration of the invaded woody core of the bines, from the base upwards and

a characteristic 'tiger-stripe' wilting of the leaves, also starting at the base. In contrast to *Fusarium* canker (where a swelling usually occurs at the base of the bine), affected bines do not 'knuckle off' at ground level, but if pulled sharply will come away from well below ground level, with a portion of the crown attached. Groups of affected plants are often noticed in the yard or garden.

Fluctuating *Verticillium* wilt

If the Hop is attacked by the less significant 'fluctuating' strains, the symptoms of wilting usually do not appear until July, and the crown is not killed. Symptom intensity varies in the infected plant from season to season, and affected plants are often found at random around the yard or garden.

Plants attacked by *V. dahliae* are rare and symptoms are mild and fluctuating in character.

What action should be taken if wilt is suspected?

Growers should take action where symptoms are first seen, by marking the hill with a conspicuous label and blocking off the ends of affected rows to prevent entry by vehicles or staff.

- **Mark a square around the suspect hill** , taking in at least 5 hills in each of three rows (15 plants in total).
- **Take a sample from the suspect hill** , by cutting a 1-2m (3-6 feet) length of bine from 0.5 metres (20 inches) above the soil level. Place the sample carefully in a plastic bag and seal the bag.
- **Cut down the other bines within the square and destroy (usually by burning) *in situ*** . Any attempt to transport cut down material will undoubtedly spread the disease, unless it is placed in sealed bags or containers which are also destroyed.
- **Spread straw over the cut down area** as this will assist in preventing soil movement out of the area and facilitate burning of the infected trash on the soil surface (eg. dead bines and infected leaves).
- **Send the sample to a laboratory to test for *Verticillium albo-atrum*** . If the result is negative, the hills can be allowed to re-grow.
- **If the test is positive, all access to the area under suspicion must be restricted** . Cutting down more bines (eg. 1+54, 5 rows by 11 hills) will give even greater protection. This should be especially considered where 'progressive' wilt is suspected. It is essential with a first outbreak, but it may be impracticable if there are many sites of infection, where removal of a whole section or complete garden/yard should be considered.
- **All Hop roots must be destroyed *in situ*** . Each hill in the immediate vicinity of the infected one (ie. 1+54) should be drenched with 275 ml (½ pint) of paraffin. With larger areas, a translocating herbicide, such as glyphosate, should be applied with care when a suitable amount of re-growth has occured.
- **It is much better to prevent the disease spreading outside the infected area** , by establishing a grass sward using dwarf grass species. It is essential that the grassed areas are maintained completely free from any Hop re-growth and any broad-leaved weeds as these will provide an alternative host for *Verticillium* .
- **Growers of Hop propagating material** must notify the Ministry when symptoms or suspect symptoms are seen. Plants with symptoms cannot be plant passported. Notifications should be made to the local DEFRA Plant Health & Seeds Inspector, or the PHSI HQ (tel: 01904 455174, fax: 01904 455197).

What precautions can be taken?

- **Always purchase certified stocks from specialist propagators based outside the Hop growing areas.**
- **Practice non-cultivation wherever possible.** Sub-soiling, which can be essential to maintain good soil structure, should be done when good weather conditions allow.
- **Keep all equipment scrupulously clean, removing both soil and plant debris.**
- **If an outbreak is isolated, or is the first occurrence on the farm, ensure that the garden/yard is the last to be sprayed in the spray round, and clean the tractor and sprayer when finished.** This regime should also apply to any other operations done across the Hop farm.
- **Restrict access (vehicular or by foot) where this is possible, particularly for those who have access to other Hop farms.** Labour at stringing, training and harvesting periods is potentially a problem, especially when the workforce travels from farm to farm.
- **Kill all weeds 12 months of the year, as most can act as hosts of wilt.**
- **Take care in the collection and disposal of Hop waste, as this is a major cause of disease spread.** Blowing

Hop waste into open heaps invites spread of wilt and therefore the waste should be blown or heaped in a covered area.

- **Nitrogen applications, particularly in the spring, when the soil is wet and cold, must be kept to the bare minimum.** Where wilt is present, a total of 150 kg/ha (120 units/ac) per season should not be exceeded. If organic manures are used, account of its nitrogen content (both immediately available and residues from previous applications) should be made when calculating applications of fertiliser nitrogen. (Typical available and residual nitrogen values of a range of organic manures can be found in DEFRA Reference Book 209 - Fertiliser Recommendations for Agricultural and Horticultural Crops).

There are growers who are successfully growing susceptible varieties, by paying great attention to hygiene measures in everything to do with their Hops.

What about future options for wilt disease control?

Where the incidence of wilt infection is low, and where farms are in reasonable isolation from other Hop farms, cultural practice, combined with the use of certified planting material, will probably continue to provide adequate control. These practices are based on prompt removal of all infected material and restriction of access into affected areas. Other husbandry techniques are being developed in Poland and Belgium and may be adopted in appropriate sites within the UK.

When wilt infection has progressed to a larger area, control of the fungus in the soil, through removal of all Hop plants and grassing-down with a weed-free sward for a minimum of 2-5 years, is essential if continued cultivation of wilt-susceptible varieties is to be considered.

Planting of resistant varieties is the only option for control when the fungus has become established at high levels on a farm. However, it is still advantageous to allow a season or two of fallow or grass before replanting with a resistant variety. Over the past 30 years the wilt fungus in the UK has developed increasingly virulent strains and no variety is immune from infection when challenged with high inoculum of such strains in the soil.

The recent development of low trellis and dwarf growing systems also gives the grower the option of establishing a Hop area on fresh land which has not grown Hops previously. The fungus can, however, infect other crops, notably potatoes and strawberries, and so the cropping history of the field needs to be considered. Simple wirework systems also have the potential to allow a grower to manage soil-borne diseases through the provision of grass strips and long-term rotation of crops including Hops.

Authors: Dr Tom Locke, ADAS Rosemaund; Keith Worsley, ADAS Rosemaund; Dr Peter Darby, HRI Wye.

Note: This is an extract from DEFRA Horticulture Information Sheet (PB4274) and opinions expressed are not necessarily those of the author.

Appendix 3 Acaricides & Insecticides currently approved for use on UK Hops

ACTIVE INGREDIENT	*active content*	PRODUCT NAME (typical)	maximum product per 1000 litres for high volume applications	maximum number of sprays per season	*maximum individual dose per hectare*	maximum dose per hectare per season	*minimum interval between sprays (in days)*	minimum interval between treatment and harvest (in days)	comment	Grower final use date
BIFENTHRIN	*100 g/l*	TALSTAR		5	0.9 litres	4.5 litres	10	ns	Kills beneficial insects	31-Dec-2013
CYFLUTHRIN	*50 g/l*	BAYTHROID	250 mls	3				7	Neither available nor advisable.	31-Aug-2008
CYPERMETHRIN	*100 g/l*	TOPPEL 10			0.7 litres			ns	Kills beneficial insects.	31-Aug-2008
DELTAMETHRIN	*25 g/l*	DECIS	800 mls		1.2 litres		10	ns	Kills beneficial insects.	01-Nov-2008
IMIDACLOPRID	*70% w/w*	ADMIRE		1	0.178 grams	0.178 kg			Field tolerance progressing.	31-Dec-2013
PYMETROZINE	*50% w/w*	PLENUM WG		3	0.4 kg		7	14	Not a knock down aphicide so do not delay and ensure good spray coverage	31-Oct-2011
TEBUFENPYRAD	*20% w/w*	MASAI 20WP	3 kg			6 kg		21	Resistance becoming widespread	31-Dec-2013

There may be other chemicals / products permitted for use on hops by virtue of general approvals for use on edible crops:
e.g. metaldehyde & methiocarb, fatty acids & pyrethrins, aluminium ammonium sulphate.

Disclaimer: This information has been compiled from PSD databases for reference purposes only by the National Hop Association of England.
It is believed to be correct at the time of writing BUT users of pesticides are legally required to abide by the registered label for each product.

Appendix 4 Fungicides currently approved for use on UK Hops

ACTIVE INGREDIENT	*active Content*	PRODUCT NAME (typical)	maximum product per 1000 litres for high volume applications	maximum number of sprays per season	*maximum individual dose per hectare*	maximum dose per hectare per season	*minimum interval between sprays (in days)*	minimum interval between treatment and harvest (in days)	Comment	Grower final use date
BUPIRIMATE	250 g/l	NIMROD		6	*2.8 litres*	16.8 litres	*10*	14	Max dose 14 l/ha burr to harvest	31-Dec-2013
CHLOROTHALONIL	500 g/l	BRAVO 500			*3.7 litres*		*7*	10	Suggest a 21 day harvest interval to reduce risk of easily detectable (yet perfectly Legal) crop residue	31-Dec-2013
COPPER OXYCHLORIDE	50% w/w	CUPROKYLT	3 kg		*5 kg*			ns		31-Dec-2013
COPPER OXYCHLORIDE	270 g/l	CUPROKYLT FL	3 litres		*4 litres*			ns		31-Dec-2013
FENPROPIMORPH	750 g/l	CORBEL	500 mls	6			*7*	10	Off-label renewed. EC MRL confirmed at 10 ppm	31-Dec-2013
FOSETYL -ALUMINIUM	80% w/w	ALIETTE 80WG		8			*14*	14		31-Dec-2013
METALAXYL - M	480 g/l	SL 567A	310 mls	6	*0.31 litres*		*10*	14	Off-label approval renewed again	30-Sep-2012
MYCLOBUTANIL	200 g/l	SYSTHANE 20EW	300 mls		*0.9 litres*	3.6 litres	*7*	14		31-Dec-2013
PENCONAZOLE	100 g/l	TOPAS 100EC		6	*0.75 litres*		*10*	14		31-Dec-2013
POTASSIUM HYDROGEN CARBONATE	99.5+ 100%	POTASSIUM BICARBONATE	20kg		*60kg*			ns	Commodity Approval will expire & should now be replaced by new regulation on Basic Substances	?
PROPINEB	70% w/w	ANTRACOL	2 kg		*4.5 kg*			ns	Brewers advise not to apply after the start of burr to avoid residues. EC MRL is 25ppm for all dithiocarbamates, but brewers limit is 15ppm.	31-Mar-2009

There may be other chemicals / products permitted for use on hops by virtue of general approvals for use on edible crops:
e.g. cupric ammonium carbonate & copper silicate.
Disclaimer: This information has been compiled from PSD databases for reference purposes only by the National Hop Association of England.
It is believed to be correct at the time of writing BUT users of pesticides are legally required to abide by the registered label for each product.

Appendix 4 Fungicides currently approved for use on UK Hops (cont'd)

ACTIVE INGREDIENT (a.i)	***active content***	**PRODUCT NAME (typical)**	**maximum product per 1000 litres for high volume applications**	**maximum number of sprays per season**	***maximum individual dose per hectare***	**maximum dose per hectare per season**	***minimum interval between sprays (in days)***	**minimum interval between treatment and harvest (in days)**	**comment**	**Grower final use date**
QUINOXYFEN	500 g/l	FORTRESS			*0.3 litres*	2 litres	*10*	28	Off Label approval re-issued again. LERAP 20 metre buffer zone.	01-Sep-2014
SULFUR	800 g/l	SULPHUR FLOW	6 litres		*11 litres*		*10*	ns	apply before cone development	31-Dec-2013
SULFUR	80% w/w	THIOVIT	6 kg		*11 kg*		*10*	ns	Apply before cone development	31-Dec-2013
TOLYFLUANID	50.5% w/w	ELVARON MULTI (1)		3	*4 kg*			14	Off Label approval in 2006	30-Sep-2010

There may be other chemicals / products permitted for use on hops by virtue of general approvals for use on edible crops:
e.g. cupric ammonium carbonate & copper silicate.
Disclaimer: This information has been compiled from PSD databases for reference purposes only by the National Hop Association of England.
It is believed to be correct at the time of writing BUT users of pesticides are legally required to abide by the registered label for each product.

Appendix 5 Herbicides & Defoliants currently approved for use on UK Hops

ACTIVE INGREDIENT	***active content***	**PRODUCT NAME (typical)**	**maximum product per 1000 litres for high volume applications**	**maximum number of sprays per season**	***maximum individual dose per hectare***	**maximum dose per hectare per season**	***minimum interval between sprays (in days)***	**minimum interval between treatment and harvest (in days)**	**Comment**	**Grower final use date**
ASULAM	400 g/l	ASULOX		1	*4.2 litres*	4.2. litres		ns	in 200 – 400 l/ha spray	31-Dec-2013
DIQUAT	200 g/l	MISSION		1	*1.8 litres*			ns	Hops removed from Reglone label, but not other diquat products. Use pattern reduced.	31-Dec-2011
DIQUAT + PARAQUAT	80:120 g/l	PDQ (Off Label)			*5.5 litres*			ns	PDQ has a new SOLA for 2008 but joins all paraquat products being revoked in July 2008>	11-Jul-2008
FLUAZIFOP-P-BUTYL		FUSILADE MAX		1	*3 litres*	3 litres			Use before burr	31-Dec-2013
ISOXABEN		FLEXIDOR		1	*0.5 LITRES*	0.5 LITRES			Apply before 1st April	31-Dec-2013
OXADIAZON	250 g/l	RONSTAR LIQUID		2	*8 litres*	8 litres			Latest application timing is July	31-Dec-2013

There may be other chemicals / products permitted for use on hops by virtue of general approvals for use on edible crops:
e.g. carfentrazone ethyl & diquat, glufosinate ammonium & glyphosate.
Disclaimer: This information has been compiled from PSD databases for reference purposes only by the National Hop Association of England.
It is believed to be correct at the time of writing BUT users of pesticides are legally required to abide by the registered label for each product.

Appendix 5 Herbicides & Defoliants currently approved for use on UK Hops (Cont'd)

ACTIVE INGREDIENT	***active content***	**PRODUCT NAME (typical)**	**maximum product per 1000 litres for high volume applications**	**maximum number of sprays per season**	***maximum individual dose per hectare***	**maximum dose per hectare per season**	***minimum interval between sprays (in days)***	**minimum interval between treatment and harvest (in days)**	**Comment**	**Grower final use date**
PARAQUAT	200 g/l	AGRIGUARD PARAQUAT			*5.5 litres*			ns	Hops now removed from Gramoxone label, but not other products. All being revoked	11-Jul-2007
PENDIMETHALIN	400 g/l	SOVEREIGN		1	*5 litres*	5 litres			Apply before shoot emergence	31-Dec-2008
PROPYZAMIDE	50% w/w	KERB 50W		1	*3.4 kg* see comment*	3.4 kg *		ns	* rates over 0.5 kg/ha can cause damage to hops. Apply before end of January.	31-Mar-2009

There may be other chemicals / products permitted for use on hops by virtue of general approvals for use on edible crops:
e.g. carfentrazone ethyl & diquat, glufosinate ammonium & glyphosate.
Disclaimer: This information has been compiled from PSD databases for reference purposes only by the National Hop Association of England.
It is believed to be correct at the time of writing BUT users of pesticides are legally required to abide by the registered label for each product.

Appendix 6 Active Substance listings of pesticide products for use on UK Hops

DISEASE CONTROL			*PEST CONTROL*			*WEED CONTROL AND DEFOLIATION*		
ACTIVE SUBSTANCE		**PRODUCT NAME**	ACTIVE SUBSTANCE		**PRODUCT NAME**	ACTIVE SUBSTANCE		**PRODUCT NAME**
bupirimate		**Nimrod**	1,3 -dichloropropene		**Telone II**	asulam		**Asulox****
chlorothalonil		**Agriguard Chloronthalonil**	Aluminium annomium sulphate	#	**Animal Repellant****	carfentrazone-ethyl	#	**Shark**
chlorothalonil		**Agrotech Chloronthalonil**	Aluminium sulphate	#	**Slug Killer****	carfentrazone-ethyl	#	**Spotlight Plus**
chlorothalonil		**Bravo 500****	bifenthrin		**Brigade 80 SC**	diquat		**Clayton Diquat**
chlorothalonil		**Repulse****	bifenthrin		**Gyro**	diquat		**Diquanet**
copper ammonium carbonate	#	**Croptex Fungex**	bifenthrin		**Starion Flo**	diquat		**Mission**
copper oxychloride		**Cuprokylt**	bifenthrin		**Talstar 80 Flo**	diquat		**Standon Googly**
copper oxychloride		**Cuprokylt FL**	bifenthrin		**UPL Bifenthrin**	diquat	#	**Reglone****
copper oxychloride		**Headland Liquid Copper**	copper silicate	#	**Socusil Slug Spray**	diquat	#	**Retro****
fenpropimorph	S	**Cleancrop Fenpro**	cyfluthrin	SRa	**Baythroid**	diquat and paraquat	RJ	**ASAP**
fenpropimorph	S	**Cleancrop Fenpropimorph**	cypermethrin	Ra	**Agriguard Cypermethrin**	diquat and paraquat	RJ	**Clayton Paradigm**
fenpropimorph	S	**Corbel**	cypermethrin	Ra	**Clean Crop Pyrimet**	diquat and paraquat	RJ	**Fernpath Pronto**
fosetyl-aluminium		**Aliette 80 WG**	cypermethrin	Ra	**I.T. Cyper**	diquat and paraquat	#RJ	**PDQ****
fosetyl-aluminium	Ra	**Clayton Vite**	cypermethrin		**Sherpa 100 EC**	diquat and paraquat	SRJ	**PDQ****
fosetyl-aluminium		**Clean Crop Chicane**	cypermethrin	Ra	**Toppel 10**	fluzifop-P-butyl		**Fusilade 250 EW****
fosetyl-aluminium		**Fosetyl**	cypermethrin		**Toppel 100 EC**	fluzifop-P-butyl		**Fusilade Max****
fosetyl-aluminium		**I.T Fosetyl-AL**	dazomet	#	**Basamid**	Glufosinate	#	**Challenge****
fosetyl-aluminium		**Routeone Fosetyl 80**	deltamethrin	Rn	**Decis****	Glufosinate	#	**Harvest****

Notes:
LAST UPDATED February 2008 R = Approvals revoked for 2008
a = 31April
n = 1 Nov
d = 31 December
** = examples of product names. Please note a full list of approved product names cannot be given here for chlorothalonil, deltamethrin, asulam, fluazifop & pendimethalin
S = Specific Off Label Approval
# - denotes that there is no specific label for the use of this substance on hops, but its use may be permitted by virtue of it approval for use on edible crops
(1) At the time of this revision, products containing tolyfluanid have been temporarily withdrawn from sale and use, but may still be stored, pending investigations.
Disclaimer
This information is sourced from PSD databases and compiled by the National Hop Association of England for reference purposes only It is believed to be correct at the time of writing BUT users are legally required to abide by the registered label for each product.

Appendix 6 Active Substance listings of pesticide products for use on UK Hops (Cont'd)

DISEASE CONTROL			*PEST CONTROL*			*WEED CONTROL AND DEFOLIATION*		
ACTIVE SUBSTANCE		**PRODUCT NAME**	ACTIVE SUBSTANCE		**PRODUCT NAME**	ACTIVE SUBSTANCE		**PRODUCT NAME**
fosetyl-aluminium	Ra	**Standon Fosetyl-AL**	deltamethrin		**Landgold Deltaland**	glyphosate	#	**Glyphosate 360****
fosetyl-aluminium		**Standon Fullstop**	deltamethrin	Rn	**Pearl Micro****	isoxaban		**Agriguard Isozaben**
metalaxyl-M	S	**SL 567A**	fatty acids	#	**Fatty Acids ****	isoxaban		**Flexidor**
myclobutanil	S	**Systhane 20 EW**	ferric phosphate	#	**Slug Killer****	isoxaban		**Flexidor 125**
penconazole		**RouteOne Pencon 10**	imidacloprid		**Neptune**	oxadiazon		**Clayton Oxen FL**
penconazole		**Topas**	imidacloprid		**Warrent 700 WG**	oxadiazon		**Noble Oxadiazon**
potassium hydrogen carbonate	#	**Potassium Bicarbonate**	methaldehyde	#	**Slug Pellets****	oxadiazon		**Ronstar Liquid**
propineb		**Antracol**	metam-sodium	#	**Vapam****	oxadiazon		**Standon Roxx L**
quinoxyfen	S	**Fortress**	methiocarb	#	**Slug Killer****	paraquat	RJ	**Agriguard Paraquat**
sulphur		**Cosavet DF**	pymetrozine	S	**Plenum WG**	paraquat	RJ	**CleanCrop Parachute**
sulphur		**Headland Sulpher**	pyrethrins	#	**Pyrethrin****	paraquat	RJ	**Fernpath Graminite**
sulphur		**Headland Venus**	rotenone	#	**Bio Liquid Derris Plus**	paraquat	#RJ	**Gramoxone 100****
sulphur		**Kumulus Df**	rotenone	#	**Derris****	pendimethalin	Rd	**Sovereign**
sulphur		**Microthiol Special**	tebufenpyrad		**Masai**	pendimethalin	Rd	**Stomp 400 SC****
sulphur		**Solfa WG**	tebufenpyrad		**Masai G**	propyzamide	S	**Kerb 50 W**
sulphur		**Sulpher Flowable**						
sulphur		**Thiovit Jet**						
sulphur	Ra	**Tripart Imber**						

Notes:
LAST UPDATED February 2008
R = Approvals revoked for 2008
a = 31April
n = 1 Nov
d = 31 December
** = examples of product names. Please note a full list of approved product names cannot be given here for chlorothalonil, deltamethrin, asulam, fluazifop & pendimethalin
S = Specific Off Label Approval
# - denotes that there is no specific label for the use of this substance on hops, but its use may be permitted by virtue of it approval for use on edible crops
(1) At the time of this revision, products containing tolyfluanid have been temporarily withdrawn from sale and use, but may still be stored, pending investigations.
Disclaimer
This information is sourced from PSD databases and compiled by the National Hop Association of England for reference purposes only It is believed to be correct at the time of writing BUT users are legally required to abide by the registered label for each product.

Appendix 7 Pesticide products permitted for use on UK Hops

PRODUCT NAME	ACTIVE SUBSTANCE		PRODUCT NAME	ACTIVE SUBSTANCE		PRODUCT NAME	ACTIVE SUBSTANCE	
Admire		imidacloprid	**Fernpath Pronto**	RJ	diquat + paraquat	**Repulse****		chlorothalonil
Agriguard Chlorothalonil		chlorothalonil	**Flexidor**		isoxaben	**Retro****	#	diquat
Agriguard Cypermethrin	Ra	cypermethrin	**Flexidor 125**	#	isoxaben	**Ronstar Liquid**		oxadiazon
Agriguard Isoxaben		isoxaben	**Flexidor 125**		isoxaben	**Routeone Fosetyl 80**		fosetyl-aluminium
Agriguard Paraquat	RJ	paraquat	**Fortress**	S	quinoxyfen	**RouteOne Pencon 10**		penconazole
Agrotech Chlorthalonil		chlorothalonil	**Fosal**		fosetyl-aluminium	**Shark**	#	carfentrazone-ethyl
Agrovista Penco		penconazole	**Fusilade 250 EW****	S	fluazifop-P-butyl	**Sherpa 100 EC**		Cypermethrin
Aliette 80 WG		fosetyl-aluminium	**Fusilade Max****		fluazifop-P-butyl	**SL 567A**	S	metalaxyl-M
Animal Repellent**		aluminium ammonium sulphate	**Glyphosate 360****	#	glyphosate	**Slug Killer****	#	aluminium sulphate
Antracol		propineb	**Gramoxone 100****	#RJ	paraquat	**Slug Killer****	#	ferric phosphate
ASAP	RJ	diquat + paraquat	**Gyro**		bifenthrin	**Slug Killer****	#	methiocarb
Asulox**		asulam	**Harvest****	#	glufosinate	**Slug Pellets****	#	metaldehyde
Basamid	#	dazomet	**Headland Liquid Copper**		copper oxychloride	**Socusil Slug Spray**	#	copper silicate
Baythroid	SRa	cyfluthrin	**Headland Sulphur**		sulpher	**Solfa WG**		sulphur
Bio Liquid Derris Plus	#	rotenone	**Headland Venus**		sulphur	**Sovereign****	Rd	pendimethalin
Bravo 500**		chlorothalonil	**I.T Cyper**	Ra	cypermethrin	**Spotlight Plus**	#	carfentrazone-ethyl
Brigade 80 SC		bifenthrin	**I.T. Fosetyl-AL**		fosetyl-aluminium	**Standon Fosetyl-AL**	Ra	fosetyl-aluminium

Notes:
LAST UPDATED February 2008
R = Approvals revoked for 2008
a = 31April
n = 1 Nov
d = 31 December
** = examples of product names. Please note a full list of approved product names cannot be given here for chlorothalonil, deltamethrin, asulam, fluazifop & pendimethalin
S = Specific Off Label Approval
# - denotes that there is no specific label for the use of this substance on hops, but its use may be permitted by virtue of it approval for use on edible crops
(1) At the time of this revision, products containing tolyfluanid have been temporarily withdrawn from sale and use, but may still be stored, pending investigations.
Disclaimer
This information is sourced from PSD databases and compiled by the National Hop Association of England for reference purposes only It is believed to be correct at the time of writing BUT users are legally required to abide by the registered label for each product.

Appendix 7 Pesticide products permitted for use on UK Hops(Cont'd)

PRODUCT NAME	ACTIVE SUBSTANCE		PRODUCT NAME	ACTIVE SUBSTANCE		PRODUCT NAME	ACTIVE SUBSTANCE	
Challenge**	#	glufosinate	**Kerb 50 W**	S	propyzamide	**Standon Fullstop**		fosetyl-aluminium
Clayton Diquat		diquat	**Kumulus DF**		sulpher	**Standon Googly**		diquat
Clayton Oxan FL		oxadiazon	**Landgold Deltaland**		deltamethrin	**Standon Roxx L**		oxadiazon
Clayton Paradigm	RJ	diquat + paraquat	**Masai**		tebufenpyrad	**Starion Flo**		bifenthrin
Clayton Vite	Ra	fosetyl -aluminium	**Masai G**		tebufenpyrad	**Stomp 400 SC****	Rd	pendimethalin
Clean Crop Chicane		fosetyl -aluminium	**Microthiol Special**		sulpher	**Sulphur Flowable**		sulpher
Clean Crop Pyrimet	Ra	cypermethrin	**Mission**		diquat	**Systhane 20 EW**	S	myclobutanil
CleanCrop Fenpro	S	fenpropimorph	**Neptune**		imidacloprid	**Talstar 80 Flo**		bifenthrin
CleanCrop Fenpropimorph	S	fenpropimorph	**Nimrod**		bupirimate	**Telone II**		1,3-dichloropropene
Cleancrop Parachute	RJ	Paraquat	**Noble Oxadiazon**		oxadiazon	**Thiovit Jet**		sulphur
Corbel	S	fenpropimorph	**PDQ**	S RJ	diquat + paraquat	**Topas**		penconazole
Cosavet DF		sulphur	**PDQ****	# RJ	diquat + paraquat	**Toppel 10**	Ra	cypermethrin
Croptex Fungtex	#	copper ammonium carbonate	**Pearl Micro****	Rn	deltamethrin	**Toppel 100 EC**		cypermethrin
Cuprokylt		copper oxychloride	**Plenum WG**	S	pymetrozine	**Tripart Imber**	Ra	sulphur
Cuprokylt FL		copper oxychloride	**Potassium Bicarbonate**	#	potassium hydrogen carbonate	**UPL Bifenthrin**		bifenthrin
Dicis**	Rn	deltamethrin	**Pyrethin****	#	pyrethins	**Vapam****	#	metam-sodium
Derris**	#	rotenone	**Reglone****	#	diquat	**Warrent 700 WG**		imidacloprid
Diquanet		diquat						
Fatty Acids**	#	fatty acids						
Fernpath Graminite	RJ	paraquat						

Notes:
LAST UPDATED February 2008
R = Approvals revoked for 2008
a = 31April
n = 1 Nov
d = 31 December
** = examples of product names. Please note a full list of approved product names cannot be given here for chlorothalonil, deltamethrin, asulam, fluazifop & pendimethalin
S = Specific Off Label Approval
# - denotes that there is no specific label for the use of this substance on hops, but its use may be permitted by virtue of it approval for use on edible crops
(1) At the time of this revision, products containing tolyfluanid have been temporarily withdrawn from sale and use, but may still be stored, pending investigations.
Disclaimer
This information is sourced from PSD databases and compiled by the National Hop Association of England for reference purposes only It is believed to be correct at the time of writing BUT users are legally required to abide by the registered label for each product.

Appendix 8 Specific Off Label Approvals for Hops

SOLA number	PRODUCT	Active Substance	Target	Final Use Date
2007/1939	**BAYTHROID**	Cyfluthrin	damson hop aphid	31 August 2008
2007/3750	**PDQ**	diquat & paraquat	weed control	11 July 2008
2002/3759	**Corbel**	Fenpropimorph	powdery mildew	31 December 2013
2002/3761 & 2005/ 1702	**CLEANCROP FENPRO &FENPROPIMORPH**		powdery mildew	31 December 2013
2005/1500	**SL 567A**	Metalaxyl-M	downy mildew	30 September 2012
2002/1412	**SYSTHANE 20 EW**	Myclobutanil	powdery mildew	31 December 2013
2005/2650	**KERB 50W**	Propyzamide	weed control	31 March2009
2003/1423	**PLENUM WG**	Pymetrozine	damson hop aphid	31 October 2011
2006/1579	**FORTRESS**	Quinoxyfen	powdery mildew	1 September 2014

Notes: (last updated 1st Feb 2008)

A Specific Off-Label Approval (SOLA) permits the use of a product on a crop for which it was not originally developed by the manufacturer. Specific conditions of use for the crop (not being on the product label) are issued with the Off-Label Approval. It is essential that those needing to use a product under a SOLA have both read and understood the text of the Approval Notice before commending any spraying operation. It is advisable for growers to have their own copies of these Approval Notices, available from the NHA.

Off-Label Approvals are available on PSD website as e-approvals:-
www.pesticides.gov.uk

All SOLAs are conditional on the continuing registration of each specific product.

Control Document No: 00031/08

Appendix 9 UK hops - record of pesticide applications

For growing season:	
Grower Name:	**To:**
Grower EEC No:	**Contract No:**
Variety:	**Pocket / Bale run:**
Field Name:	**Harvest Date:**

line	Date	Product Name	Active ingredient	Reason for Use	Product Dilution rate per 1000 litres	units	Foliar spray volume in l/ha	Product rate per Hectare
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
Comments					**Authentication signature**			

(Note: Electronic copies of this form are available from the NHA)

Appendix 10 Check lists for Hop harvesting, drying and storage

PRE-HARVEST MAINTENANCE AND CLEANING RECORDS			
Hop Picking Shed	**Signed**	**Dated**	**Comment**
1. Bine track area swept clean			
2. Picking machines maintenance completed:			
- bine track			
- pluckers			
- ASP			
- belts and rollers			
- screeners			
- waste collection			
- after cleaner(s)			
- conveyors			
- leaf belt			
- elevators			
- other			
3. Electricity supply, motors and switches:			
- checked			
- electrician			
4. All tools and spare parts collected up			
5. All conveyors cleaned			
6. All floor areas swept clean			
7. All safety guards replaced			
8. Note of lubricants supplied/used on:			
- bine track			
- drive chains			
- screener			
- waste belt			
- conveyors			
- leafbelt			
- other			

Appendix 10 Check lists for Hop harvesting, drying and storage (Cont'd)

PRE-HARVEST MAINTENANCE AND CLEANING RECORDS			
Hop Drying Facilities and Storage	**Signed**	**Dated**	**Comment**
9. Safety notices and signs posted:			
- Emergency stop buttons clearly marked			
- Health and Safety policy			
- First Aid post			
- No smoking signs			
- No pets/children allowed			
- Safety precaution signs (e.g. ear muffs)			
- Other warning signs (e.g. for switch gear)			
10. Burner maintenance (and guards fitted):			
- No 1			
- No 2			
- No 3			
- No 4			
-			
-			
11. Bale press maintenance			
12. Scales maintenance:			
- checked			
- certificate filed			
13. Floor space swept clean before harvest:			
- ground floor			
- drying floor			
- conditioning/cooling floor			
- Press area			
- Storage area			
- Bale/Pocket Store			
-			

Appendix 10 Check lists for Hop harvesting, drying and storage (Cont'd)

PRE-HARVEST MAINTENANCE AND CLEANING RECORDS			
Hop Drying Facilities and Storage	**Signed**	**Dated**	**Comment**
14. Safety notices and signs posted:			
- Emergency stop buttons clearly marked			
- Health and Safety policy			
- First Aid post			
- No smoking signs			
- No pets/children allowed			
- Safety precaution signs (e.g. ear muffs)			
- Other warning signs			
15. Record of rodent baiting updated			
16. Physical inspection of all areas to check that picked Hops are protected from:			
- rats, mice, birds or others			
- oils, chemicals and baits			
- material contaminants (e.g. glass, straw, mud, dust)			
- rain waters (e.g. roofs, gutters and wind)			
- flood waters (e.g. gulleys, drains)			
- rising/penetrating damp			
- unauthorised personnel			

Control Document No: 00031/08

Appendix 11 Harvest and post-harvest records

Log Keeping and Inspections	Signed	Dated	Comment
A log of harvesting machinery maintenance is kept for events that may pose any risk to crop purity.			
A log of Hop drying machinery maintenance is kept for events that may pose any risk to crop purity.			
A log is kept of Press Weights, date of drying, kiln number for each bale/pocket			
A log is kept of checks that scales and recorded weights are correct (e.g. in pocket book)			
Confirm compliance to standards for 'Prepared Hops'			
• maximum moisture 12% • maximum leaf and stem content 6% • maximum waste content 3% • maximum seed content for seedless Hops 2% • freedom from extraneous matter			
The permitted dimensions and weights for bales are defined in each Hop Group's 'Common Rules of Production'			
Confirm that labelling of bales/pockets is marked as follows:			
• Variety Name (in full) • Bale/Pocket Number • Prepared Hops - seeded (or unseeded) • 26 UK [year e.g. 2002] [grower's EEC No.] e.g. 26UK 2002 987 • Grower's Name (optional) • Parish name (optional) • (County - optional) • Tare Weight in kgs			
A log is kept of physical inspections of Hop Store to confirm that Hops are protected from:			
• rain from roof/gutter leaks or on the wind • floods and blocked drains • rising or penetrating damp • Damp within the bales/pockets (max. moisture 12%) • oils, chemicals and unregistered baits • material contaminants (e.g. glass, straw, mud, dust) • animal activity (e.g. rodents, birds, dogs) • unauthorised personnel			

Appendix 12 Control Points: Hops

CS.26 **HOPS**

CS.26.1 You must take measures to prevent the crop from becoming contaminated during harvesting and in transport to the farm -

Protocol reference: Section 9

CS.26.2 Growers should meet HSE directives on machinery safeguards and hearing protection -

Protocol reference: Section 12

CS.26.3 Growers should ensure that hop picking and cleaning machines, and conveyors of both green and dried hops, are cleaned before harvest each season -

Protocol reference: Section 9

CS.26.4 Kiln burners must be serviced regularly to prevent fuel aerosols from fouling the crop -

Protocol reference: Section 9

CS.26.5 Smoking must be prohibited inside the buildings where the hops are being dried, conditioned, pressed or stored -

Protocol reference: Section 9

CS.26.6 It should be possible for the time and date of drying, the kiln number, the date and field of harvest, the date of storage or dispatch and the weight of packet or bale, be traced back for each package of prepared hops -

Protocol reference: Section 9

CS.26.7 Your should keep planting records to ensure variety purity is maintained -

Protocol reference: Section 5

Control Document No: 00031/08