



Assured Produce

Crop Specific Protocol

HOPS

(CROP ID: 26)



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Acknowledgements

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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: 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 Products containing substances which have been revoked are shown on the PSD website (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 other changes for a variety of reasons. For instance:

- At re-registration stage after Annex 1 listing there may be: reductions of dose rates; changes in timings and/or number of applications for some products.

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

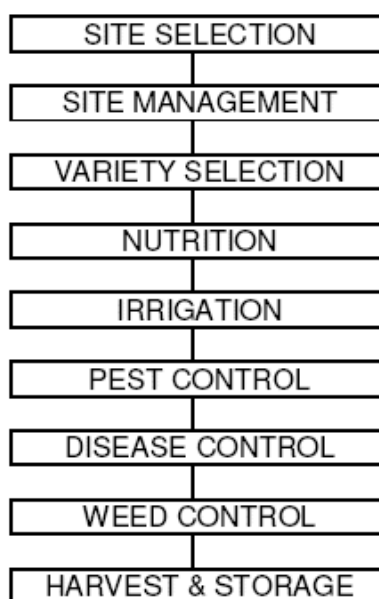
For pesticides on-label, only active substances are shown.

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

1 General introduction

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

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



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

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

4 Site management

See Generic Standards and/or Generic Guidance Notes.

5 Variety selection

Planting records **must** 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 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, Producer Organisations **should** 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

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 only part complete to date. Replacement SOLAs are entered on the PSD website as 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.

However, the PSD website does not distinguish between these new SOLAs converted from LTAEU and those available for use on the harvested crop. The only way to be certain is to check the *Other Specific*

Restrictions listed at the end of individual approval notices. Almost all of these new SOLAs intended for Nursery hops and those not being harvested within 12 months of treatment, have been listed in the PSD website as Outdoor Hops. If in any doubt please check with the NHA by emailing PG@hops.co.uk

Since these arrangements cover hops not harvested for human or animal consumption within 12 months of treatment, they may also include 'idling'.

9 Harvesting and storage

All Hops must be 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 **must** be 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

The crop **must** conform 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.

The following measures **must** be implemented:

- 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.

HSE directives on machinery safeguards and hearing protection **must** be met.

13 Conservation issues

See Generic Standards and/or Generic Guidance Notes.

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 occurred.
- **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	EC MRL in ppm
BIFENTHRIN	100 g/l	TALSTAR		5	1125 mls	5.6 litres	10	ns	Kills beneficial insects.	31-Dec-2013	10
CYPERMETHRIN	100g/l	TOPPEL 10			0.7 litres			ns	Kills beneficial insects.	28-Feb-2011	30
DELTAMETHRIN	25g/l	DECIS	800 mls		1.2 litres		10	ns	Kills beneficial insects.	31-Dec-2013	5
IMIDACLOPRID	70% w/w	ADMIRE		1	178 grams	0.178 kg			Aphid tolerance building. Note that MRL for thiacloprid is 0.05*ppm.	31-Dec-2013	10
PYMETROZINE	50% w/w	PLENUM WG		3	0.4 kg		7	14	SOL.A. Not a knock down aphicide so do not delay and ensure good spray coverage.	31-Oct-2011	15
TEBUFENPYRAD	20% w/w	MASAI 20WP	3 kg			6 kg		21	Resistance widespread.	31-Dec-2013	0.5

List compiled by Peter Glendinning, National Hop Association of England. Any comments please to PG@hops.co.uk

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 & aluminium ammonium sulphate, metaldehyde & methiocarb, fatty acids & pyrethrins, 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.

Note: * = limit of detection

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 & harvest (in days)	Comment	Grower final use date	EC MRL in ppm
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	10
CHLOROTHALONIL	500 g/l	BRAVO 500			3.7 litres		7	10	21 day harvest interval suggested to reduce risk of detectable (yet legal) crop residues. Residues in soft fruit led to loss of approvals in 2008.	31-Dec-2013	50
COPPER OXYCHLORIDE	50 % w/w	CUPROKYL T	3 kg		5 kg			ns		31-Dec-2013	1000
COPPER OXYCHLORIDE	270 g/l	CUPROKYL T FL	3 litres		4 litres			ns		31-Dec-2013	1000
FENPROPIMORPH	750 g/l	CORBEL	500 mls	6			7	10	SOLA. EC MRL confirmed at 10ppm.	31-Dec-2013	10
FOSETYL-ALUMINIUM	80 % w/w	ALIETTE 80WG		8			14	14		31-Dec-2013	1500
METALAXYL - M	480 g/l	SL 567A	310 mls	6	0.31 litres		10	14	SOLA	30-Sep-2012	10
MYCLOBUTANIL	200 g/l	SYSTHANE 20EW	300 mls		0.9 litres	3.6 litres	7	14	SOLA	31-Dec-2013	2
PENCONAZOLE	100 g/l	TOPAS 100EC		6	0.75 litres		10	14		31-Dec-2013	0.5
POTASSIUM HYDROGEN CARBONATE	99.5+%	POTASSIUM BICARBONATE	20 kg		60 kg			ns	Commodity Approval. Normal spray rate is 0.5% (5kg per 1000 litres water).	?	none set
PROPINEB	70 % w/w	ANTRACOL	2 kg		4.5 kg			ns	Approval expires 31 March 2009.	31-Mar-2009	25 but brewers limit is 15
QUINOXYFEN	500 g/l	FORTRESS			0.3 litres	2 litres	10	28	SOLA. LERAP 20 metre buffer zone.	01-Sep-2014	0.5
SULFUR	800 g/l	SULPHUR FLOW	6 litres		11 litres		10	ns	apply before cone development	31-Dec-2013	100
SULFUR	80% w/w	THIOVIT	6 kg		11 kg		10	ns	apply before cone development	31-Dec-2013	100

Notes:

* = limit of detection.

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 & aluminium ammonium sulphate, metaldehyde & methiocarb, fatty acids & pyrethrins, 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.

Comments please to PG@hops.co.uk

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

ACTIVE INGREDIENT	active content	PRODUCT NAME (typical)	max product per 1000 litres for high volume applications	max no. of sprays per season	max dose per individual hectare	max dose per hectare per season	min interval between sprays (days)	min interval between treatment & harvest (days)	Comment	Grower final use date	EC MRL in ppm
ASULAM	400g/l	ASULOX		1	4.2 litres	4.2 litres	ns	ns	in 200 - 400 l /ha spray	31-Dec-2013	0.5
DIQUAT	200g/l	MISSION		1	1.8 litres			ns	Hops removed from Reglone label, but not other diquat products. Note reduced use pattern.	31-Dec-2011	0.1*
FLUAZIFOP-P-BUTYL		FUSILADE MAX		1	3 litres	3 litres			use before burr	31-Dec-2013	0.1
ISOXABEN		FLEXIDOR		1	0.5 litres	0.5 litres			apply before 1st April.	31-Dec-2013	0.05
OXADIAZON	250 g/l	RONSTAR LIQUID		2	8 litres	8 litres			latest application timing is July	31-Dec-2013	0.05*
PROPYZAMIDE	50% w/w	KERB 50W		1	3.4 kg* see comment	3.4 kg *		ns	SOLA renewed. Rates over 0.5 kg/ha can cause damage to hops. Apply before the end of January.	31-Mar-2014	0.05*

Note:

* = limit of detection

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 & aluminium ammonium sulphate, metaldehyde & methiocarb, fatty acids & pyrethrins, 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. Any comments please to PG@hops.co.uk

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	Bravo 500	aluminium ammonium sulphate	#	carfentrazone-ethyl	# Shark
chlorothalonil	Repulse	bifenthrin	Brigade 80 SC	carfentrazone-ethyl	# Spotlight Plus
Coniothyrium Minitans	# Contans WG	bifenthrin	Gyro	diquat	Clayton Diquat
copper ammonium carbonate	# Cromptex Fungex	bifenthrin	Starion Flo	diquat	Mission
copper oxychloride	Cuprokyt	bifenthrin	Talstar 80 Flo	diquat	Reglone
copper oxychloride	Cuprokyt FL	bifenthrin	UPL Bifenthrin	fluazifop-P-butyl	Fusilade 250 EW
copper oxychloride	Headland Liquid Copper	copper silicate	Socusil Slug Spray	fluazifop-P-butyl	Fusilade Max
fenpropimorph	S CleanCrop Fenpro	cypermethrin	Sherpa 100 EC	glufosinate-ammonium	Basta
fenpropimorph	S CleanCrop Fenpropimorph	cypermethrin	Toppel 100 EC	glufosinate-ammonium	Challenge
fenpropimorph	S Corbel	dazomet	Basamid	glufosinate-ammonium	Harvest
fosetyl-aluminium	Aliette 80 WG	deltamethrin	Decis	glyphosate	Glyphosate 360
metalaxyl-M	S SL 567A	deltamethrin	Pearl Micro	glyphosate	Roundup
myclobutanil	S Systhane 20 EW	fatty acids	Safer's Insecticidal Soap	isoxaben	Agriguard Isoxaben
penconazole	Agrovista Penco	ferric phosphate	Sluggo	isoxaben	Flexidor
penconazole	RouteOne Penco 10	imidacloprid	Admire	oxadiazon	Ronstar Liquid
penconazole	Topas	imidacloprid	Neptune	propyzamide	Kerb 50 W
potassium hydrogen carbonate	# Potassium Bicarbonate	metalddehyde	Slug Pellets	propyzamide	Kerb Flo
propineb	Rm Antracol	methiocarb	New Draza	Notes: S = Specific Off Label Approval R = Revoked Approvals in 2009; m = 31 March; o = 10 October # - denotes that there is NOT a specific label for the use of this substance on hops, but its use may be permitted by virtue of its approval for use on all edible crops. Last updated January 2009 Comments please to PG@hops.co.uk.	
quinoxifen	S Fortress	pepper	Pepper Dust		
sulphur	Kumulus DF	pymetrozine	Plenum WG		
sulphur	Microthiol Special	pyrethrins	Pyrethrum 5 EC		
sulphur	SOLFA WG	rotenone	Derris Dust		
sulphur	Sulphur Flowable	tebufenpyrad	Masai		
sulphur	Thiovit Jet	tebufenpyrad	Masai G		

Please note that there is not the space to list all the approved product names here for asulam, chlorothalonil, deltamethrin, diquat, fluazifop, fosetyl, oxadiazon & sulphur. 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.

Disclaimer: This information is sourced from PSD databases and compiled by the National Hop Association of England for reference purposes only.

Appendix 7 Pesticide products permitted for use on UK Hops

PRODUCT NAME	ACTIVE SUBSTANCE	PRODUCT NAME	ACTIVE SUBSTANCE	PRODUCT NAME	ACTIVE SUBSTANCE
Admire	imidacloprid	Fortress	S	Repulse	chlorothalonil
Agriguard Isoxaben	isoxaben	Fusilade 250 EW		Ronstar Liquid	oxadiazon
Agrovista Penco	penconazole	Fusilade Max		Roundup	# glyphosate
Aliette 80 WG	fosetyl-aluminium	Glyphosate 360	#	RouteOne Pencon 10	penconazole
Animal Repellent	aluminium ammonium sulphate	Gyro		Safer's Insecticidal Soap	# fatty acids
Antracol	propineb	Harvest	#	Shark	# carfentrazone-ethyl
Asulox	asulam	Headland Liquid Copper		Sherpa 100 EC	cypermethrin
Basamid	dazomet	Kerb 50 W	S Rm	SL 567A	S metalaxyl-M
Basta	glufosinate-ammonium	Kerb Flo	S	Slug Pellets	# metaldehyde
Bravo 500	chlorothalonil	Kumulus DF		Sluggo	# ferric phosphate
Brigade 80 SC	bifenthrin	Masai		Soculil Slug Spray	# copper silicate
Challenge	glufosinate-ammonium	Masai G		SOLFA WG	sulphur
Clayton Diquat	diquat	Microthiol Special		Spotlight Plus	# carfentrazone-ethyl
CleanCrop Fenpro	fenpropimorph	Misson		Starion Flo	bifenthrin
CleanCrop Fenpropimorph	fenpropimorph	Neptune		Sulphur Flowable	sulphur
Contans WG	Coniothyrium Mimitans	New Draza	# Ro	Systhane 20 EW	S myclobutanil
Corbel	fenpropimorph	Nimrod		Talstar-80 Flo	bifenthrin
Croptex Fungex	copper ammonium carbonate	Pearl Micro		Telone II	Rm 1,3-dichloropropene
Cuprokylt	copper oxychloride	Pepper Dust	#	Thiovit Jet	sulphur
Cuprokylt FL	copper oxychloride	Plenum WG	S	Topas	penconazole
Decis	deltamethrin	Potassium Bicarbonate	#	Toppel 100 EC	cypermethrin
Derris Dust	rotenone	Pyrethrum 5 EC	#	UPL Bifenthrin	bifenthrin
Flexidor	isoxaben	Reglone	#	R = Revoked Approvals in 2009; m = 31 March; o = 10 October	
NOTES:		LAST UPDATED January 2009			
Disclaimer: This information is sourced from PSD databases and compiled by the National Hop Association of England for reference purposes only.					
# - denotes that there is NOT a specific label for the use of this substance on hops, but its use may be permitted by virtue of its approval for use on all edible crops.					
Please note that there is not the space to list all the approved product names here for asulam, chlorothalonil, deltamethrin, diquat, fluzifop, fosetyl, oxadiazon & sulphur.					
Comments please to PG@hops.co.uk					

Appendix 8a Specific Off Label Approvals for Hops

Please refer to the conditions on the Approval Notices, which can be accessed on the PSD website by clicking the SOLA number listed below.

SOLA number	PRODUCT	Active Substance	target	Final Use Date	Comment
20023761	CleanCrop Fenpro	fenpropimorph	powdery mildew	31 December 2013	EC MRL 10ppm.
20051702	CleanCrop Fenpropimorph	fenpropimorph	powdery mildew	31 December 2013	EC MRL 10ppm.
20023759	Corbel	fenpropimorph	powdery mildew	31 December 2013	EC MRL 10ppm.
20061579	Fortress	quinoxifen	powdery mildew	1 September 2014	expiry date extended
20052650	Kerb 50 W	propyzamide	weed control	31 March 2009	revocation imminent
20082414	Kerb Flo	propyzamide	weed control	31 March 2014	New SOLA to replace Kerb 50W
20031423	Plenum WG	pymetrozine	damson hop aphid	31 October 2011	
20051500	SL 567A	metalaxyl-M	downy mildew	30 September 2012	
20021412	Sythane 20 EW	myclobutanil	powdery mildew	31 December 2013	expiry date extended

Comments please to Peter Glendinning, NHA tel: 01432 851226. email: PG@hops.co.uk

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 reminded to abide by the registered label for each product.

Appendix 8b Additional new SOLAs for Nursery hops only*

IMPORTANT NOTE * Hops may not be harvested for consumption within 12 months of applying any of these products. Check all conditions of use on individual approvals, which are available from the PSD website.

SOLA number	PRODUCT	Active Substance	Final Use Date
20082812	Amistar	azoxystrobin	31-Dec-11
20082813	Aramo	tepraloxydim	31-May-15
20082819	Basagran SG	bentazone	31-Jul-11
20082822	Bellis	boscalid and pyraclostrobin	30-Sep-13
20082829	Cadou Star	flufenacet and Isoxaflutole	30-Sep-13
20082831	Calypso	Thiacloprid	31-Dec-14
20082832	Centric	thiamethoxam	12-Sep-11
20082833	Cercobin WG	thiophanate-methyl	28-Feb-16
20082834	Chess WG	pymetrozine	31-Oct-11
20082915	Cyflamid	Cyflufenamid	30-Apr-14
20082845	Envidor	spiroadiclofen	9-Mar-12
20082848	Fazor	maleic hydrazide	31-Dec-13
20082851	Floramite 240 SC	bifenazate	30-Nov-15
20082854	Fungaflor 100 EC	imazalil	30-Jun-10
20082856	Gazelle	Acetamiprid	31-Dec-14
20082857	Gazelle SG	acetamiprid	10-Sep-11
20082897	Guillotine	flumioxazine	24-May-11
20082944	Hallmark with Zeon Technology	lambda-cyhalothrin	31-Dec-11
20082943	Kerb 50 W	propyzamide	17-Mar-10
20082898	Mainman	flonicamid	31-May-14
20082912	Nemathorin 10G	fosthiazate	13-Dec-13
20082899	Nirvana	Imazamox and pendimethalin	28-Nov-10
20082920	Plenum WG	pymetrozine	31-Oct-11
20082918	Ranman Twinpack	cyazofamid	30-Jun-13
20082866	Regalis	prohexadione calcium	1-Oct-10
20082868	Roundup	glyphosate	30-Jun-12
20082887	Roundup Ace	glyphosate	30-Jun-12
20082869	Roundup Biactive	glyphosate	30-Jun-12
20082888	Roundup Energy	glyphosate	30-Jun-12
20082889	Roundup Klik	glyphosate	30-Jun-12
20082891	Roundup Max	glyphosate	30-Jun-12
20082892	Roundup Ultimate	glyphosate	30-Jun-12
20082902	Rovral WG	iprodione	31-Dec-13
20082903	Runner	methoxyfenozide	31-Mar-15
20082924	Signum	Boscalid and Pyraclostrobin	30-Sep-13
20082905	Steward	Indoxacarb	31-Mar-16
20082923	Stomp 400 SC	pendimethalin	31-Dec-13
20082917	Stroby WG	kresoxim-methyl	31-Dec-11
20082881	Sumimax	flumioxazine	24-May-11
20082926	Teldor	fenhexamid	31-May-11
20082908	Tracer	Spinosad	31-Jan-17
20082945	Twist	trifloxystrobin	30-Sep-13

Comments please to Peter Glendinning, email: PG@hops.co.uk 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 reminded to abide by the registered label for each product.

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								
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Comments	Authentication signature
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(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			

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'			
<ul style="list-style-type: none"> ● maximum moisture 12% ● maximum leaf and stem content 6% ● maximum waste content 3% ● maximum seed content for seedless Hops 2% ● freedom from extraneous matter 			
<i>The permitted dimensions and weights for bales are defined in each Hop Group's 'Common Rules of Production'</i>			
Confirm that labelling of bales/pockets is marked as follows:			
<ul style="list-style-type: none"> ● 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:			
<ul style="list-style-type: none"> ● 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 You should keep planting records to ensure variety purity is maintained -
Protocol reference: Section 5