

Plant Health Propagation Scheme (PHPS)

PHPS Explanatory Leaflet Hops

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Special conditions for the certification of: Elite Permanent Layer Beds (PLB), Approved-Permanent Layer Beds (A-PLB), A+ Misted Cuttings (MC) and A+ Bedded Setts (BSN) grade

Inspected for	<p>PLB and A-PLB Trueness to variety, health and vigour.</p> <p>MC and BSN Health and vigour only.</p>
Applications	To be made to a PHPS Franchise holder by 1 May or by 1 July for BSN. Please submit a map or a plan with each application except BSN.
Eligible material	<p>PLB Plants must be produced directly from nuclear stock plants, or supplied from a source approved by APHA or have been certified at Elite grade in the previous year. Other varieties may be entered for inspection only to meet isolation requirements but will not be certified. Once the full range of nuclear stock testing has been completed on such trial varieties they are eligible for A-PLB status, for a maximum of 2 years provided they meet the requirements for Elite (PLB). A-PLB Stocks may not be propagated further within the PHPS.</p> <p>Plants may only be entered for 10 growing seasons from the planting of the original nuclear stock and must be certified annually or approved by PHSI in advance.</p> <p>MC Plants can be produced from parent plants or directly from Elite PLB only.</p> <p>BSN Plants can be produced from misted cuttings, parent plants or layered setts produced directly from Elite PLB only. Other varieties may be entered for inspection only to meet isolation requirements but will not be certified.</p> <p>N.B. See page 6 for details of varieties and groupings.</p>
Growing conditions	<p>MC Cuttings should be grown in a soil free or other sterilised medium. If the growing medium contains soil, it must be samples for virus vectors prior to planting. All plants & pots must be kept free from contact with soil.</p> <p>BSN Nursery beds should normally only be retained for 24 months.</p>
Freedom from soil-borne diseases (PLB, A-PLB and BSN)	Crops must not be grown on land know to have been infected by potato wart disease, potato cyst nematode, Rhizomania, strawberry red-core, or verticillium wilt disease of hops.

<p>Soil sampling (PLB and A-PLB only)</p>	<p>Soil sampling of the proposed field and its boundary hedge is required for freedom from the soil living virus nematode <i>Xiphinema diversicaudatum</i> (dagger Nematode), prior to the planting and entry of material for certification. Applications should be submitted through the PHPS franchise holder as soon as the field to be used is known. Fields found to be infested cannot be used for planting unless one of the following requirements has been complied with:</p> <p>(a) the field must be treated with an approved soil fumigant; or (b) a soil bait test must be carried out for the relevant viruses. If the result is negative for virus, treatment with a soil fumigant will not be required. If virus is found, treatment will be required; or (c) the field may be left bare fallow with no weed covering for 1 year or before a soil bait test and further action as at (b)</p> <p>No stock may be planted within 10 metres of any hedge found to be infested.</p>
<p>Rotation (PLB, A-PLB and BSN)</p>	<p>The land must have been free from hops and other hosts of <i>Verticillium albo-atrum</i> and <i>V.dahliae</i> (e.g. raspberries, strawberries, lucerne, potatoes, linseed and certain weed species) for 2 growing seasons prior to planting.</p>
<p>Isolation</p>	<p>PLB, A-PLB and BSN Plants must be:</p> <p>(a) At least 15 km from commercial hop plantings (b) At least 400m from hop plants not entered for certification, wild hops and plants of the opposite sex (i.e. males) unless the flowers have been removed. (c) Plants in Groups 1 and 3 must not be grown in the same field as plants listed in Group 2. Group 2 (Goldings) should be kept separate from the other Groups.</p> <p>Licensed trial material: The same conditions as above apply.</p> <p>BSN of all groups may be grown in the same field provided they are kept separated by a 1m gap.</p> <p>MC Where possible, only one variety should be placed on each bench. Where this is not possible, there must be a physical isolation between each variety. Where other plants are grown within a mist unit, these must be kept isolated from all hop plants.</p>
<p>Identification of stocks</p>	<p>PLB, A-PLB and BSN Beds and rows of different varieties must be clearly and permanently labelled. A gap of at least one planting station must be left between each variety.</p> <p>MC Each variety and box of cuttings must be clearly identified and permanently labelled.</p>
<p>Roguing</p>	<p>Limited roguing is permissible provided that records are kept of stocks rogued and the reason for roguing i.e. pest, disease or impurity. Stocks may not be certified / approved where records have not been kept.</p>

Gapping-up (PLB, A-PLB and BSN)	Gapping-up may be permitted provided that any material used is of the same health standard. Growers must keep records of this procedure and make them available if requested to do so.
Number of Inspections	<p>PLB and A-PLB Two, normally during May and late summer.</p> <p>MC One, normally immediately prior to despatch. Growers must inform their local Plant Health and Seeds Inspectors of their intention to move plants at least 5 days in advance so that inspections can be arranged. If plants are moved prior to inspection certification will be declined.</p> <p>BSN One, during September.</p>
Standards to be met	<p>There is a separate summary of tolerances for pests and diseases on page 6. The control of pests and diseases must be of the highest standard and failure to achieve this will need to be rectified and a further inspection undertaken before plants can be certified.</p> <p>MC and BSN Where a significant mixture of varieties is identified, a grower may be asked to rogue, if practicable, or certification may be withheld.</p>
Quarantine diseases	<p>Under, in England, the Plant Health (England) Order 2005, or in Wales, the Plant Health (Wales) Order 2006, growers who become aware of or suspect the presence of any quarantine disease on their premises must immediately notify their local Plant Health Inspector.</p> <p>All plants must be free from Verticillium wilt (caused by <i>V. Albo-atrum</i> or <i>V. dahliae</i>).</p> <p>MC Growers should consult their Plant Health Inspector about the use of soil from land that is scheduled for soil-borne quarantine diseases.</p>
Validity of certificates	<p>PLB and A-PLB Plants may be described as Elite grade PLB or Approved grade PLB for a period of 12 months from the date of the certificate / approval, subject to satisfactory completion of any further inspections.</p> <p>MC Plants may be described as A+ misted cuttings for 4 weeks from the date of the certificate.</p> <p>BSN Plants may be described as A+ bedded setts until 31 May in the year following certification.</p>

Special conditions for the inspection of Parent Plants (PP)

Inspected for	Health and vigour only.
Applications	To be made to a PHPS franchise holder by 18 February.
Material eligible for entry	Plants must be established from Elite certified PLBs each year. Plants cannot be propagated directly from nuclear stock plants. See page 6 for list for full details of varieties and groupings.
Growing conditions	Plants should be grown in a soil free or other sterilised medium. If the growing medium contains soil, it must be sterilised and sampled for virus vectors prior to planting. Plants can only be retained for one growing season. Plants and pots must be kept free from contact with soil.
Isolation	Varieties must be kept in separate blocks physically separated from adjacent stocks.
Identification of stocks	All pots & plants must be clearly and permanently labelled.
Roguing	Limited roguing is permissible provided that records are kept of stocks rogued and the reason for roguing i.e. pest, disease or impurity. Stocks may not be certified where records are not kept.
Number of inspections	One, normally when the plants are in full and active growth and before any cuttings are taken.
Standards to be met	There is a separate summary of tolerances for pests and diseases. The control of pests and diseases must be of the highest standard and failure to achieve this will need to be rectified and a further inspection undertaken before plants can be certified.
Quarantine diseases	Under, in England, the Plant Health (England) Order 2005, or in Wales, the Plant Health (Wales) Order 2006, growers who become aware of or suspect the presence of any quarantine disease on their premises must immediately notify their local Plant Health inspector. Growers should consult their Plant Health inspector about the use of soil from land that is scheduled for soil-borne quarantine diseases. Plants must be free from Verticillium wilt (caused by <i>V. Albo-atrum</i> or <i>v. dahlia</i>).
Validity of certificates	Parent plants will not be certified, unless requested.

Varieties and groupings of eligible plants

	ELIGIBLE VARIETIES
Group 1 Verticillium wilt sensitive, hop mosaic virus tolerant	Fuggle (Fords), Northern Brewer, Wye Challenger & Wye Northdown
Group 2 Verticillium wilt sensitive, hop mosaic virus sensitive	Silks B, Silks C, True Goldings (Calais Goldings, Cobbs, Early Bird, Redsells Eastwell, Mathon)
Group 3 Verticillium wilt tolerant, hop mosaic virus tolerant	Admiral, Boadicea, Bramling Cross (OT 48), First Gold, Herald, Phoenix, Pilgrim, Pilot, Pioneer (including 'new'), Progress, Sovereign, Whitbread Golding variety (1147), Wye Target, Males 25/68/173 (early season), 12/67/65 (mid-season) & 18/67/20 (late season)
Licensed trial varieties Verticillium wilt tolerant, hop mosaic virus tolerant	Endeavor, 29/02/10 (Flyer)

Summary of disease tolerances

ORGANISM	LEVEL
+Verticillium wilt (caused by <i>V. albo atrum</i> or <i>V. dahliae</i>)	NIL
Arabis mosaic virus Prunus necrotic ringspot virus	} NIL
Hop Stunt viroid	NIL
Hop mosaic virus	NIL for Group 2 varieties Substantially free of virus symptoms for Group 1 and Group 3
Hop latent viroid	Substantially free
Powdery mildew, downy mildew, other quality pests and diseases	Substantially free and /or adequate treatment programme ongoing

+ This disease is notifiable under, in England, the Plant Health (England) Order 2005, or in Wales, the Plant Health (Wales) Order 2006. Growers must inform PHSI if they suspect the presence of this disease on their premises.

Nuclear stock material

Special requirements for hop plants to qualify as nuclear stock

Eligible material	Any new or established variety or candidate material of potential new varieties can be entered. The progeny of nuclear stock is eligible as parent material to plant field grown Elite permanent layer beds.
Growing conditions	<p>Nuclear stock plants must have been maintained in a suitably designed insect-proof glasshouse or gauzehouse containing only hop nuclear stock plants or other hop material of equivalent tested status.</p> <p>Strict precautions should be taken to prevent the introduction of pests and diseases, especially those diseases listed on page 8. Quality pests and diseases such as red spider mite or powdery mildew should be kept at as low a level as practically possible. Aphids should be strictly controlled at all times. Records should be kept of all treatments.</p> <p>All plants must be grown singly in sterilised growing medium and in individual, permanently labelled containers. They must be kept free from contact with soil.</p> <p>Varieties sensitive to hop mosaic virus must be physically isolated from other varieties by insect-proof material.</p>
Pests & Diseases	<p>At least every two years the nuclear stock mother plants must have been individually tested and found free from the diseases listed on page 8 using the test methods described. Regular visual inspections should be made.</p> <p>New candidate nuclear stock plants to be entered into the nuclear stock house must have been tested and found free from all the diseases listed on page 8 Part A (except hop latent carlavirus where freedom is optional).</p> <p>The diseases on page 8 Part B need not be tested for until licensed trial varieties are to be certified or approved under the PHPS.</p> <p>Any plants found to be infected with the diseases listed on page 8 or exhibiting suspicious symptoms should be removed immediately. Records should be kept of all plants removed.</p>
Documentation	<p>The Director or other person responsible for the production of the plants must provide documentary evidence to show that the material has been produced under the conditions described above and that all the necessary tests were carried out and no evidence of infection was found.</p> <p>This evidence must be provided to the purchaser of the nuclear stock material before it can be used as parent material to plant Elite permanent layer beds.</p>
Reference for further details	<p>EPPO Certification scheme for Hops EPPO Bulletin 39,278-283. 2009. Recommended procedures for detection of viruses in small fruit crops. Proceedings of Tenth International Symposium on Small Fruit Virus Diseases. Acta Hort. 656:199-207, 2004.</p>

Required methods of testing for diseases for hop nuclear stock material

DISEASE		TEST METHODS
PART A Diseases for which testing is required every 2 years.	Prunus necrotic ringspot ilavirus (PNRSV) 1	ELISA or sap inoculation to Chenopodium quinoa or cucumber
	Hop mosaic carlavirus (HMV) 2 Hop latent carlavirus (HLC) 3	} ELISA
	Hop Latent viroid	Nuclear acid hybridisation
	Fusarium sambucinum (canker) Verticillium albo-atrum (wilt) Verticillium dahliae (wilt)	} Maintain strict hygiene to prevent introduction. Incubation, isolation and identification of any suspect material.
PART B Diseases for which testing is required on candidate nuclear stock. 4	Arabis mosaic nepovirus (AMV) Cherry leaf-roll nepovirus Cucumber mosaic cucumovirus Petunia asteroid mosaic tomosvirus Tobacco necrosis virus	} ELISA or sap inoculation to Chenopodium quinoa or Cucumber
	Hop stunt viroid	Nuclear acid hybridisation and PCR

Notes

1. The alternative name Apple mosaic virus (hop strain) is given in the EPPO scheme.
2. Hop mosaic carlavirus need only be tested for in sensitive hop varieties. Those varieties that are tolerant need not be tested but must be kept physically isolated in a separate cubicle or by insect-proof material.
3. Testing for hop latent carlavirus in nuclear stock is optional.
4. These tests are not required for candidate nuclear stock of licensed trial varieties, but have to be completed and found negative before material can be eligible for Permanent Layer Beds or Approved – Permanent Layer Bed status.