



# Plant Health Propagation Scheme

## Explanatory guide to Hop certification

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# 1. Introduction

## Special conditions for the certification of:

**Elite Permanent Layer Beds (PLB)**

**Health-Permanent Layer Beds (H-PLB)**

**A+ Misted Cuttings (MC)**

**A+ Bedded Setts (BSN) grade**

**Parent plants (PP)**

# 2. Applications

The scheme is open to any grower in England and Wales who can meet the general conditions for entry and comply with the specific conditions of entry. Applications for entry of material to be submitted through the approved administrator, presently the Nuclear Stock Association Limited. Visit <http://nsa-plants.co.uk>

For PP submit by 18 February, for PLB, H-PLB and MC submit by 1 May and 1 July for BSN

# 3. Crops inspected for

**PLB and H-PLB** Trueness to variety, health and vigour

**MC, BSN and PP** Health and vigour only

# 4. Grades and stock eligibility

## **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 H-PLB status, for a maximum of 2 years provided they meet the requirements for Elite (PLB). H-PLB stocks may not be propagated further within the PHPS.

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.

## **MC**

Plants may be produced from parent plants or directly from Elite PLB only.

## **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.

## **PP**

Plants must be established from Elite certified PLB's each year. Plants cannot be propagated directly from nuclear stock plants.

See section 17 for details of varieties and groupings.

# **5. Growing conditions**

## **MC**

Cuttings should be grown in a soil free or other sterilised medium. If the growing medium contains soil, it must be sampled for virus vectors prior to planting. All plants and pots must be kept free from contact with soil.

## **BSN**

Nursery beds should normally only be retained for 24 months.

## **PP**

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. All plants and pots must be kept free from contact with soil.

# **6. Freedom from soil-borne diseases**

Crops must not be grown on land known to have been infected by potato wart disease, potato cyst nematode, Rhizomania, strawberry red core or verticillium wilt disease of hops.

## 7. Soil sampling requirements

### PLB and H-PLB ONLY

Soil sampling of the proposed field and its boundary hedge is required for freedom from the soil living nematode *Xiphinema diversicaudatum*, prior to the planting and entry of material for certification. Applications should be submitted through the approved administrator, presently the Nuclear Stock Association Ltd. Visit <http://nsa-plants.co.uk>

Fields found to be infested cannot be used for planting unless **one** of the following requirements has been met:

- (a) the field must be treated with an approved soil fumigant
- (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
- (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)

No stock may be planted within 10 metres of any hedge found to be infested.

## 8. Rotation

### PLB, H-PLB and BSN

The land must have been free from hops and other hosts of *Verticillium albo-atrum* and *Verticillium dahlia* e.g raspberries, strawberries, Lucerne, potatoes, linseed and certain weed species for 2 growing seasons prior to planting.

## 9. Isolation

### PLB, H-PLB and BSN

**Plants must be:**

- (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 (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 on Groups 2. Group 2 (Goldings) should be kept separate from the other Groups.

Varieties must be kept 1 metre apart.

**Licensed trial material:** The same conditions as above apply.

**In addition:**

**PLB's** require a 40 metre isolation between Elite and Health grade.

**BSN** require a 10 metre isolation between Elite and Health grade.

**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.

**PP**

Varieties must be kept in separate blocks physically separated from adjacent stocks.

## 10. Identification of stocks

**PLB, H-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.

**MC**

Each variety and box of cuttings must be clearly identified and permanently labelled.

**PP**

All pots and plants must be clearly and permanently labelled.

## 11. 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 / approved where records have not been kept.

## 12. Gapping-up

### **PLB, H-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 by PHSI.

## 13. Number of inspections

### **PLB and H-PLB**

Two, normally during May and late summer.

### **MC**

One, normally immediately prior to dispatch. Growers must inform PHSI 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.

### **BSN**

One, during September.

### **PP**

One, normally when the plants are in full and active growth and before any cuttings are taken.

## 14. Standards to be met

There is a separate summary of tolerances for pests and diseases at section 20. 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.

### **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.

## 15. Quarantine diseases

Under, in England, the Plant Health (England) Order 2015, or in Wales, the Plant Health (Wales) Order 2006, growers who become aware of or suspect the presence of any quarantine diseases on their premises must immediately notify PHSI.

All plants must be free from *Verticillium albo-atrum* or *Verticillium dahliae*.

Growers should consult PHSI about the use of soil from land that is scheduled for soil-borne quarantine diseases.

## 16. Validity of certificates

### PLB and H-PLB

Plants may be described as Elite grade PLB or Health grade PLB for a period of 12 months from the date of the certificate / approval, subject to satisfactory completion of any further inspections.

### MC

Plants may be described as A+ misted cuttings for 4 weeks from the date of the certificate.

### BSN

Plants may be described as A+ bedded setts until 31 May in the year following certification.

## 17. Varieties and groupings of eligible plants

ELIGIBLE VARIETIES	
Group 1 Verticillium wilt sensitive Hop mosaic virus tolerant	Fuggle (Fords), Northern Brewer, Wye Challenger and 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, Pioneer (including 'new'), Progress, Sovereign, Whitbread Golding variety (1147), Wye Target, Males 25/68/173 (early season), 12/67/65 (mid-season), and 18/67/20 (late-season)
Licensed trial varieties Verticillium wilt tolerant Hop mosaic virus tolerant	Endeavour, 21/06/21 (aka 37/15) 15/10/23 (aka GI41)

## 18. Summary of disease tolerances

ORGANISM	CERTIFIED	HEALTH
+Verticillium wilt <i>V. albo-atrum</i> or <i>V. dahliae</i>	NIL	NIL
Arabis mosaic virus Prunus necrotic ringspot virus	NIL NIL	NIL Present
Hop stunt viroid	NIL	NIL
Hop mosaic virus	NIL for Group 2 varieties. Substantially free of virus symptoms for Group 1 and Group 3	NIL for Group 2 varieties. Substantially free of virus symptoms for Group 1 and Group 3
Hop latent viroid	Substantially free	Substantially free
Powdery mildew, downy mildew and other quality pests and diseases	Substantially free and / or adequate treatment programme ongoing	Substantially free and / or adequate treatment programme ongoing

+ This disease is notifiable under, in England. The Plant Health (England) Order 2015, or in Wales, the Plant Health (Wales) Order 2006. Growers must inform PHSI if they suspect the presence of this disease on their premises.

## 19. 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

Nuclear stock plants must have been maintained in a suitably designed insect-proof glasshouse containing only hop nuclear stock plants or other hop material of equivalent tested status. The location and responsibility for this glasshouse to be notified to PHSI through the approved administrator, presently the Nuclear Stock Association Limited.

Strict precautions should be taken to prevent the introduction of pests and diseases, especially those diseases listed in section 20. Quality pests and diseases such as red spider mite or powdery mildew should be kept at a low level as practically possible. Aphids should be controlled at all times. Records should be kept of all treatments.

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.

Varieties sensitive to hop mosaic virus must be physically isolated from other varieties by insect-proof material.

#### Pests and diseases

At least every two years the nuclear stock mother plants must have been individually tested and found free from the diseases listed in section 20 using the test methods described. Regular visual inspections should be made.

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 in section 20 Part A.(except hop latent carlavirus where freedom is optional).

The diseases in section 20 Part B need not be tested for until licenced trial varieties are to be certified or approved under the PHPS.

Any plants found to be infected with the diseases listed in section 20 or exhibiting suspicious symptoms should be removed immediately. Records should be kept of all plants removed.

### Documentation

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. 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.

### Reference for further details

EPPO Certification scheme for Hops Bulletin 39, 278-283. 2009. Recommended procedures for detection of viruses in small fruit crops. Proceedings of the Tenth International Symposium on Small Fruit Virus Diseases. Acta Hort. 656: 199-207, 2004.

## 20. Required methods of testing for diseases for hop nuclear stock material

DISEASE	TEST METHODS
<p><b>PART A</b></p> <p>Diseases for which testing is required every 2 years.</p> <p>Prunus necrotic ringspot ilavirus (PNRSV) 1</p> <p>Hop mosaic carlavirus (HMV) 2</p> <p>Hop latent carlavirus (HLC) 3</p> <p>Hop latent viroid</p> <p><i>Fusarium sambucinum</i> (canker)</p> <p><i>Verticillium albo-atrum</i> (wilt)</p> <p><i>Verticillium dahlia</i> (wilt)</p>	<p>ELISA or sap inoculation to <i>Chenopodium quinoa</i> or cucumber</p> <p>} ELISA or sap inoculation to <i>Chenopodium quinoa</i> or cucumber</p> <p>TaqMan (real time PCR)</p> <p>} Maintain strict hygiene to prevent Introduction. Incubation, isolation and identification of any suspect material.</p>

Hop stunt viroid	PCR
<b>PART B</b>	
Diseases for which testing is required on candidate nuclear stock. 4	
Arabis mosaic nepovirus (AMV)	} ELISA or sap inoculation to <i>Chenopodium quinoa</i> or cucumber
Cherry leaf-roll nepovirus	
Cucumber mosaic cucumovirus	
Petunia asteroid mosaic tombusvirus	
Tobacco necrosis virus	
Hop stunt viroid	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 Health–Permanent Layer Bed status.



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