Grower Summary

FV 384

Asparagus – Screening UK crops for virus infection

Final Report 2010

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The results and conclusions in this report may be based on an investigation conducted over one year. Therefore, care must be taken with the interpretation of the results.

Use of pesticides

Only officially approved pesticides may be used in the UK. Approvals are normally granted only in relation to individual products and for specified uses. It is an offence to use non-approved products or to use approved products in a manner that does not comply with the statutory conditions of use, except where the crop or situation is the subject of an off-label extension of use.

Before using all pesticides check the approval status and conditions of use.

Read the label before use: use pesticides safely.

Further information

If you would like a copy of the full report, please email the HDC office (hdc@hdc.org.uk), quoting your HDC number, alternatively contact the HDC at the address below.

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Headline

Results of a short-term study suggest that *Asparagus virus 1* (AV-I) and *Cucumber mosaic virus* (CMV) are present in the majority of UK asparagus. Growers should note however that the presence of these viruses within a crop is not the sole factor responsible for 'asparagus decline'.

Background

Commercial asparagus crops once planted can remain in production for up to 10-15 years if well managed. However, some UK producers have reported a loss in yield and quality in mature crops in recent years. A potential contributing factor of this yield reduction, generally referred to as *asparagus decline*, is the presence of viruses within a crop.

The 3 most important viruses of asparagus are considered to be *AV-I*, *Asparagus virus II* (AV-II) and *Tobacco streak virus* (TSV). In addition, *Cucumber mosaic virus* (CMV), *Arabis mosaic virus* (ArMV), *Strawberry latent ringspot virus* (SLRV) and *Tomato black ring virus* (TBRV) are also known to infect asparagus. *Asparagus virus III* (AV-III) has also been reported on asparagus, but to-date has only been detected in Japan. It is also known that elsewhere crops can be infected with more than one virus and that a combination of viruses can reduce quality and yield significantly (Bandte *et al.*, 2008).

Following an HDC funded literature search on asparagus viruses carried out in 1998 (FV 213) a recommendation was made for a survey of asparagus crops of different ages over 3 successive seasons to determine the presence, distribution and identity of viruses that are potentially responsible for the asparagus yield decline seen in the UK. Up to this point there was no evidence of any formal or detailed studies into virus infection in UK asparagus

The aim of this study was to carry out an initial survey of UK asparagus crops during September and October 2010 to assess the presence of virus infection.

Method

A total of 40 fern samples (2 per field – one from the edge and one from the centre of the crop) were collected from 20 geographically dispersed UK crops from 6 to 8 September 2010. Of samples collected, 85% were cv. Gijnlim and the remaining 15% of were cv. Backlim. All asparagus crowns used to establish the crops were imported from the Netherlands. The youngest crop sampled was planted in 2008, with the oldest having been planted in 2000.

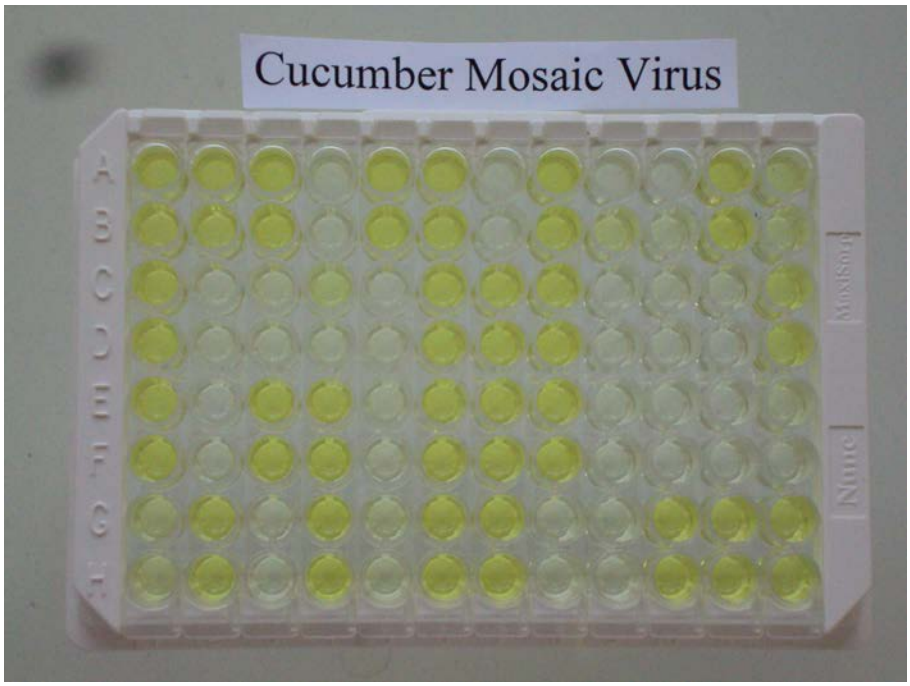
An ELISA technique and a general Potyvirus assay was used to detect and quantify viruses present within samples. Indicator plants were then inoculated with sap from infected samples to confirm the identities of viruses present. The full methodology carried out to sample the crops; detect, quantify and identify the viruses present is given in the science section of the full report.

Results

1) Virus Testing Results

The most commonly detected viruses were AV-I and CMV. When either of the viruses was detected they were present at high concentrations. Only small numbers of crops were found to be infected with AV-II, ArMV, TSV and SLRV. No *Tomato black ring virus* was detected in any crop. No symptom development consistent with AV-III was observed in inoculated indicator plants.

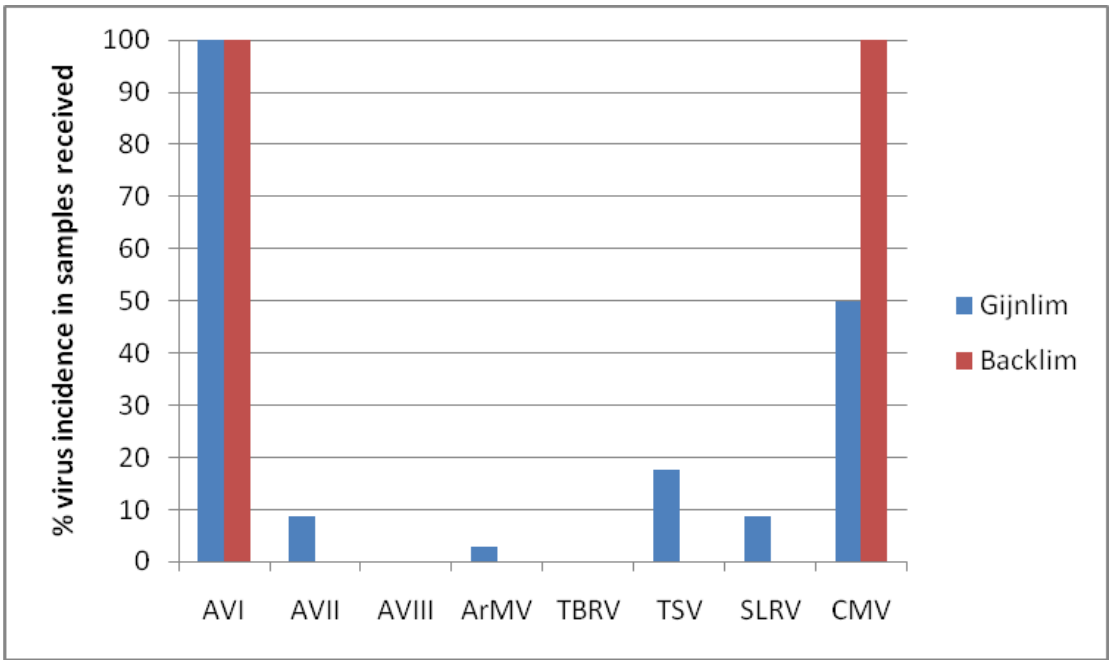
Plate1: Example of ELISA plate test; yellow colouration indicates a positive



Similar levels of AV-I and CMV were detected in samples from field edges and centres. AV-II and ArMV were only detected in a few samples collected from the edge of the crops, whilst TSV and SLRV was only detected in small numbers of samples collected from crop centres. The significance of these findings is not clear due to the relatively low rate of detection of virus in the sampled material.

Although fewer samples of cv. Backlim were received, the detail in Figure 1 shows that all Backlim crops were infected with both AV-I and CMV. No other viruses were detected in this cultivar. All cv. Gijnlim crops sampled were infected with AV-I, with 50% being infected with CMV. Four other viruses affected small percentages of Gijnlim (Figure 1).

Figure 1. The frequency of occurrence of viruses in the two cultivars sample



The table below is a summary of the incidence of viruses relative to the age of the crowns

Virus	Incidence
AV-I	Detected in all samples in each represented age of crop
AV-II	Only detected in 50% of the 2002 planted crops and approx 17% of the 2005 planted crowns.
ArMV	Detected only in the crops planted in 2002
TSV	Not detected in crops planted prior to 2003, but has been detected at varying levels in all planting years since then with the exception of the crops sampled from 2005.
SLRV	Detected at low to moderate levels in the samples from crops planted in 2003, 2006 and 2008.
CMV	All of the sampled crops which were planted in 2000 and 2002 were infected. The virus was also detected in sampled crops from 2003, 2005 and 2006 – but at a reduced incidence.

In addition the majority of the samples tested were found to contain more than one virus; all of the Backlim had AV-I and CMV, as mentioned previously. About 44% of the Gijnlim samples were infected with two viruses, 17% contained three viruses, and almost 3% were infected with four of the viruses tested for.

2) Sap inoculation tests

The sap inoculated plants were held in the glasshouse for 4 weeks and monitored regularly for the development of symptoms consistent with virus infection e.g. local lesions on inoculated leaves of mottling, mosaic symptoms or any other symptoms which might be consistent with the presence of AV-III. No symptoms suggestive of infection were observed on any of the plants.

Conclusions

The results from this initial short-term study suggest that AV-I and CMV are present in the majority of UK crops. The other four viruses detected, AV-II, ArMV, SLRV and TSV, were found in a smaller number of crops, and often at lower virus titres (concentrations). It is likely that many growers will be concerned by the findings reported, however the results should be considered in conjunction with the reported crop performance data, collected as part of the survey (see Table 1 in the full report). Crop performance at the time of sampling was described as 'good', 'moderate' or 'poor' by the growers. Previous knowledge and research suggests a possible correlation between the number of viruses present (i.e. multiple infections) and the susceptibility of the crop to other pathogens, e.g. fungal infection such as *Fusarium, Phytophthora* and *Stemphylium* spp*.,* and the general decline of the crop resulting in poor fern growth and reduced yield.

The results found in this study, albeit on only 40 samples from 20 crops, do not show a correlation in this respect. In the study some crops carrying only one virus infection were reported to be performing only moderately or poorly, whilst other crops where up to four viruses were detected were reported to be performing well. Of course it also has to be taken into account that the various crops were all of different ages and this would also have an impact on their performance. We must therefore conclude that the presence of virus in the crop is not the only factor implicated in the reduction in crop performance.

Action Points

There is no action that growers can take to eradicate viral infection from these crops although some measures may be possible to prevent secondary spread, depending on the individual viruses.

Growers must purchase and plant virus free propagative material and should pay close attention to the presence of aphids in crops with a view to making regular insecticide applications to limit vector spread through the crop.

Improving hygiene standards can limit mechanical infection between crowns, although this is likely to be the hardest area to control, particularly during harvest operations. However, the additional cost of these actions must be off-set against the overall benefit to the crop in terms of increased yield and crop longevity.