

## PRUNUS NECROTIC RINGSPOT VIRUS IN HOP

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Prunus necrotic ringspot virus (NRSV) is so called because it was first recorded in peach and cherry but it is now known to occur in various forms and in many countries infecting a wide range of plants including apple, cherry, plum, hop, raspberry, birch, and rose.

### Detection and distribution in hop

NRSV does not usually cause any obvious symptoms in hop plants but the presence of the virus can be detected by rubbing sap from hop leaves to cotyledons of young cucumber plants specially raised in a glasshouse. Cucumber plants are highly sensitive to infection and develop conspicuous symptoms within a few days. Such tests have shown that NRSV is present in all stocks of the older commercial varieties grown in England. Hence, it has been impossible in the past to avoid infection or to assess any possible effect on yield or content of alpha-acid.

### Development of improved planting material

The present unsatisfactory situation has been changed as a result of two important developments.

1. Clones of the three new Wye College varieties (Wye Northdown, Wye Challenger, Wye Target) have been specially selected for their freedom from NRSV. These NRSV-free clones have been used exclusively to supply the 'A plus' propagators. The stocks originally released to the hop-growing areas for farm trials and local propagation outside the 'A plus' certificate scheme were largely unselected and some are now known to be partially infected.
2. Clones of several established varieties have been freed from NRSV and in some instances, other viruses. This work was done at East Malling Research Station by Miss S. J. Vine and more recently by Dr A. N. Adams using a combination of the heat-therapy and meristem-tip techniques used to produce virus-free clones of strawberry and other fruit crops.

### Performance of NRSV-free plants

It has not yet been possible to start yield trials to compare the performance of all the new clones of superior health status against standard infected material. The only available data are for the varieties Fuggle 37, Northern Brewer, and Wye Northdown grown in trials at Wye College. In each instance cones with higher content of alpha-acid were obtained from the NRSV-free plants. There is, therefore, obvious scope for greatly increased alpha-acid production per acre by the general adoption of NRSV-free stocks for new plantings.

### Spread of NRSV

Any benefits of replanting with NRSV-free clones will depend upon the rate of re-infection. Preliminary results indicate that this is variable and generally low. The least infection has occurred at isolated 'A plus' propagation sites in East Anglia, where permanent layer-bed hills have remained almost entirely free of NRSV for four years. Other small plots have been established in hop-growing areas of Hereford and Kent, usually alongside totally infected plantings of older varieties. In these circumstances, the number of infected plants has increased annually, but there has been no instance of very rapid re-infection and over half the plants remained free of NRSV for several years. Even lower rates of re-infection are to be expected in larger plots, especially when NRSV-free male plants are available and entire gardens are replanted with maximum possible isolation from established varieties containing NRSV.

### Method of spread

There is no known insect or other animal vector of NRSV, and it rarely spreads in apple orchards. By contrast, the virus spreads between mature cherry trees and there is good evidence that this is by pollen. There is, as yet, no evidence of spread by pollen in hop plantings and there must be some other method of transmission to account for the observed spread to males and deblossomed female plants. Until further information is available it is impossible to advocate any specific control measures. Moreover, it remains uncertain whether infected apple, plum, or cherry trees are a potential threat to hop plantings and *vice versa*.

### Prospects of exploiting NRSV-free clones

Clearly there are good prospects of exploiting the initial freedom from NRSV of the new clones now available. These are being grown in increasing quantity in isolated areas under the official 'A plus' certification scheme. It is less certain that propagators within the hop-growing areas will be able to produce plants that are substantially free from NRSV unless they buy in freshly certified parent plants at frequent intervals. The best of the locally propagated stocks are likely to be as good as 'A plus' certified material, but the worst will be greatly inferior. Differences in virus status are likely to vary with site and season and will not be apparent from the appearance of the plants. Until the current uncertainties have been resolved it is prudent for growers to insist on 'A plus' material of all available varieties. This will also ensure freedom from arabis mosaic virus and progressive Verticillium wilt. The present large-scale propagation of NRSV-infected material of Wye Target in Kent should be regarded as a temporary and unsatisfactory expedient that should cease when adequate stocks of superior material are available.

### Recommendations

1. Growers planting Wye Northdown, Wye Challenger, or Wye Target should make every effort to obtain 'A plus' certified stocks that are free from NRSV.
2. The chances of subsequent infection are likely to be decreased by growing these plants and those derived from meristems in the largest possible compact blocks as far away as possible from all other hop plantings.
3. If males are required they should be free from NRSV. Wild plants in nearby hedgerows are a potential source of infection and should be destroyed. Wye College is at present selecting and propagating suitable males for distribution to, and further multiplication by, special propagators.