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THE STORY OF VIRUSES IN ROSES IN NEW ZEALAND¹

PHIL GARDNER

*Avenue Nurseries Ltd.
Waikare Inlet, Opuā*

The term “high health”, as used here, means “free of known virus and virus-like diseases (FKV)”. Where the term “virus” is subsequently used in a general sense, it includes virus-like diseases.

THE VIRUS AND VIRUS-LIKE DISEASES

Three viruses have been serologically detected and partially characterised from roses in New Zealand. These are *Prunus* necrotic ringspot virus (PNRSV), apple mosaic virus (ApMV), and *Arabis* mosaic virus (ArMV). Of these only the first, PNRSV, has become widespread. ApMV was detected in only one plant and ArMV was detected in a few plants of one cultivar.

Two virus-like diseases affecting rose flowers can be indexed by double budding with a sensitive indicator cultivar. Rose petal fleck (RPF) is widespread in New Zealand but rose colour break (RCB), although not uncommon, is largely confined to greenhouse forcing roses.

A further virus, rose wilt virus (RWV), has been recorded as occurring in New Zealand but it has been subsequently shown that the symptoms attributed to RWV in New Zealand are, in fact, two completely unrelated diseases. The symptoms of short shoot growth, or rosetting and die back, which occur in mature plants have been shown to be associated with PNRSV and the symptoms known as proliferation, occurring on the first growth from grafted buds, are not caused by viral infection.

Roses infected with PNRSV show a wide range of one or more symptoms or may be symptomless. Symptoms include various

¹ This paper is based upon: Gardner, P. C. 1983. Virus and virus-like diseases of roses in New Zealand. Ph.D. Dissertation. Massey University, Palmerston North.

chlorotic mottles, blotches, line patterns, vein netting, and vein banding as well as short shoots forming rosettes from buds on old wood, die back of old canes, general decline, and reduction of flower numbers.

The symptoms of ApMV are larger chlorotic blotches and more severe decline. Plants infected with ArMV may show a chlorotic chevron pattern about the main lateral veins on a few leaves, or they may be symptomless.

The virus-like flower diseases seriously impair the quality of the blooms. The flecking of RPF is characterised by an irregular shrinking of veins of the petals usually in areas towards the petal margins or in severe cases over most of the petals.

This is accompanied by darkening of colour of the shrunken veins in red, scarlet and most pink cultivars. In lighter coloured yellow and white flowered cultivars the symptoms may be virtually indiscernible but in all cases there is a loss of petal texture and a reduction in vase life.

The flowers of plants infected with RCB are virtually unusable. The outer petals or even the whole flower becomes grossly distorted with prominent green veins. A general virescence of the petal may make it assume the appearance of a crisp lettuce leaf. These symptoms are suggestive of a disease caused by mycoplasma-like organisms.

INTRODUCTION AND SPREAD

With roses, as has been the case with many vegetatively propagated horticultural subjects, the occasional virus infection has been perpetuated and spread by the use of infected material for propagation.

For many years it was standard nursery practice in New Zealand to bud-graft rose cultivars onto rooted cuttings of *Rosa multiflora* taken during winter from the stock tops of plants budded the previous summer. Budwood for grafting onto these understocks the following summer was also taken from the same crop as the understock cuttings. Not only may budwood from an infected plant produce a number of infected plants of that cultivar the following season, but also infected stock cuttings from that plant may be budded with buds of previously uninfected cultivars. Over a number of years this practice may result in widespread infection in the whole crop.

In those countries where roses are produced by budding onto seedling understocks, viruses have been less of a problem, whereas in countries, such as the United States, where the use of cutting-grown understocks had been normal practice, viruses became widespread.

It is interesting to speculate and difficult to prove, but cer-

tainly worth recording, some personal thoughts on the introduction and spread of these diseases in New Zealand.

Certainly by 1950 PNRSV was widespread through the understock and crops of most, if not all, nurseries in New Zealand. It was the first on the scene and was probably introduced from western United States where it was already widespread.

About this time, or shortly after, RPF started to become apparent, particularly in nurseries that propagated or had propagated old fashioned roses. Many of these old roses are 100% infected with RPF and the flecking is considered a normal characteristic of the cultivar. Almost certainly the use of infected stock tops which had been budded with old cultivars served to introduce this disease into crops of modern roses.

By the early 1960's these two diseases had built up to such an extent that not only were roses declining but also was the public's interest in them.

The other three diseases have never become widespread. Apple mosaic virus was detected in one plant of the cultivar, 'Masquerade', in a public rose garden. With respect to its possible introduction it is interesting to note that in the United States PNRSV is the predominant virus in the western states whereas ApMV occurs with greater frequency in the eastern states. 'Masquerade' was bred and distributed from the eastern states. This virus never became widespread probably because it was introduced much later than PNRSV and also because the symptoms are considerably more pronounced, hence infected plants would be less likely to be used for propagation.

The introduction of ArMV can be traced from Holland to Northern Ireland and from there to New Zealand. This virus was only found on some plants of 'Molly McGredy', propagated from budwood which had been obtained from the raiser in endeavor to obtain virus-free material. The raiser advised at the time that the material was of doubtful virus status as his only source of budwood was from standard plants budded on to *R. rugosa* understock imported from Holland. It was known that some *R. rugosa* from Holland was infected with either ArMV or strawberry latent ringspot virus. This was subsequently shown to be the case when some of the plants in New Zealand were found to be infected with ArMV, which is frequently symptomless.

The origin of RCB in New Zealand is less certain but with few exceptions it appears to be confined to greenhouse forcing cultivars. As a number of different rootstocks have been used for greenhouse forcing roses it could have been introduced from one of these other understock species.

"HIGH HEALTH"

Rose viruses are not generally transmitted by seed. By 1970 a few practical rose growers became aware that healthy budwood obtained directly from rose breeders and budded onto seedling understocks, or cuttings from seedlings, produced vastly superior plants and blooms compared to those budded onto commercial understocks. The late John Simpson did much to popularise this concept by growing a range of healthy cultivars and competing at rose shows where his blooms were obviously superior to those generally available at the time.

My own company also imported over 100 of the best cultivars from major hybridists requesting propagating wood as close to the original hybrid seedling as possible. These were, of course, budded onto healthy understocks and the four best of the resultant plants of each cultivar permanently planted as mother blocks for a source of healthy scions. Most of these mother blocks are still in use today.

In this manner a wide range of cultivars were imported from as healthy a source as possible. They were initially tested by observation for symptoms and by double budding with indicators. Subsequently with the development of a rapid, sensitive, serological test applicable to the detection of rose viruses, that is the enzyme-linked immunosorbent assay (ELISA), it has been possible to check the virus status of mother plants of the majority of commercial cultivars as well as understocks. Any found to be infected were destroyed. Virus-free propagating wood of most commercial cultivars, as well as a number of understock clones, has been readily available to the trade for the last eight years, either free or at nominal cost.

The Nursery Research Centre at Massey University offers a service to index any new cultivars or doubtful material as a precaution against reintroduction of viruses.

There is now no reason why all nurseries in New Zealand should not be selling only "High Health" or free of known viruses (FKV) roses with superior performance and better flower quality.

SO WHAT!

My own company, followed by a few others, together with strong support from the National Rose Society of New Zealand popularised the concept of planting only superior "High Health" roses.

Here is the rub. The terms "High Health" or FKV or "virus-free" are difficult to legally define. Few virused plants supplied by a nursery could be deemed to be a chance accidental infection corrected by a refund of money or replacement of plants.

The production of genuine "High Health" plants is more expensive with the maintenance of both scion and understock mother

blocks than short cut, less hygienic, production techniques. The result, knowing human nature, is probably inevitable. Cheap roses of doubtful virus status flood the market, claiming to be "High Health", or budded on "High Health" understocks. The buying public, always looking for a bargain, becomes disillusioned with the concept of "High Health", with the result that those nurseries who are endeavoring to produce the genuine article are forced to either lower their standards and compete pricewise or cater for a very limited discerning clientele.

The dream of "High Health" roses in every nursery in New Zealand becomes a nightmare.

I have told the story of viruses in roses in New Zealand because I believe no matter what line of plants you propagate you are likely to find parallel situations. Striving for worthwhile improvements in your product can easily be overcome by economic expediency.

SELECTION AND PROPAGATION OF NEW ZEALAND NATIVE PLANTS

GRAEME C. PLATT

*Platt's Nursery
Albany Highway, R.D. 4, Albany*

"Trust not authority, pay no heed to books, but go to the plants themselves". This quotation by Mr. R. Brown to Dr. Leonard Cochane, who prefaced his great work, "New Zealand Plants and Their Story" (1910) with it, should be permanently enshrined into the minds of all plantmen. Furthermore, through experience I have established that it is not advisable to rely too much even on your own conclusions when it comes to dealing with plants and nature.

The inherent genetic diversity of every species makes it impossible to be precise. For example, to conclude that *Pittosporum crassifolium* seed germinates in three months is basically a sound assumption, because in most cases that is correct. However, we have had a couple of batches of seed that took 15 months. To state that you could obtain 60% strike rate in *Metrosideros excelsus* cuttings by carrying out certain propagating procedures is only correct if you are referring to a specific cultivar or clone. I have discovered, to my cost, that any superior variety that warrants special attention generally proves the hardest to propagate. The genetic diversity of a plant definitely extends to its ability to grow from cuttings. This genetic diversity, when properly understood, gives the plant propagator the opportunity to select a superior cultivar for cultivation.

One of the rewards of collecting all our own seed each year for