THESIS SUMMARY

STUDIES OF ALFALFA MOSAIC VIRUS AND SUBTERRANEAN CLOVER RED LEAF VIRUS

P. B. TEH

(Ph.D. Thesis, University of Canterbury)

Alfalfa mosaic virus (AMV)

AMV was shown to be transmitted by sap, aphids and through lucerne seed, but not by *Cuscuta.* Virus source and test plant influenced transmission frequency. Sap-inoculation tests showed that 20 species of plants were susceptible to this virus. Thirteen species of plants from the fields where AMV had been detected were tested but only three were found to be infected with the virus.

Tests for AMV in lucerne from throughout New Zealand, by sap inoculation of indicator plants, revealed that AMV was present in 35% of fields. 'Incidence within fields ranged from 0 to 16.8% and was greatest in old stands. The incidence was the same for two lucerne cultivars.

AMV multiplication in *Nicotiana tabacum* L. was greater at 24 than either 18 or 30°C. Maximum virus concentration occurred at the same time after inoculation irrespective of temperature. Virus concentration and symptom severity were not correlated, symptoms being most severe at 30°C. AMV concentration in leaves was positively correlated with amount of virus in the inoculum.

Subterranean clover red leaf virus (SCRLV)

Of the 17 possible natural leguminous hosts tested, 16 were found to be infected with SCRLV. *Rumex obtusifolius* L. and *Erodium* spp. could also be infected. Effects of SCRLV on seven hosts were in general more severe at 20 than at *16* or *24°C. Phaseolus vulgaris* L. and *Glycine max* Merr. were stunted and showed reduced Ieaf area and pod number. *Erodium moschatum* L'Her., *Trifolium pratense* L. and *Trifolium repens* L. were less affected. After 10 weeks, infected *Lupinus cosentini* Guss was dwarfed and had reduced petiole length, smaller leaves and reduced pod production, whereas in the case of *Lupinus augustifolius* L. only leaflet length was reduced. In the field, infected plants of *Lupinus albus* were stunted and had leaf size and pod number markedly reduced.

Aulacorthum solani Kltb. was found to be a persistent transmitter of SCRLV. A 12- or 16-hour acquisition period, at 20°C and with nymphs, gave a shorter latent period than a 6-hour acquisition period, at 10°C with apterae and alatae. Inoculation and acquisition thresholds were 1 and 5 'hours, respectively. Apterae transmitted more efficiently than alatae. After the latent period, *A. solani* transmitted irregularly for 24 days, infectivity was retained after ecdysis, but not passed to first instar nymphs. Young or old green leaves were a better virus source than red leaves and petioles. SCRLV was not transmitted through seed of *Clycine max* or *L. albus.*

SCRLV adversely affected symbiosis between *Trifolium subterraneum* and *Rhiiobium trifolii* in plants grown aseptically in boiling tubes. Infected plants had reduced shoot production, nodule fresh and dry weights, nodule number and nitrogenase activity. Most infected plants had a large number of small nodules. If rhizobia were added first, effects were less marked, the longer the period in between rhizobial inoculation and infection with virus, but when SCRLV was introduced first, the reverse was true. Rhizobial cultures derived directly from nodules on diseased plants were less effective on healthy subterranean clover plants than those derived from healthy plants. Subculturing on yeast mannitol agar partially restored effectiveness.

In subterranean clover SCRLV caused a reduction in photosynthesis from the time of symptom appearance, but increased respiration. More soluble carbohydrate and starch accumulated in infected leaves than healthy, but there was no change in carbohydrate composition. Transpiration rate was reduced at the time of symptom appearance; water potential determinations showed that this was not due to water stress, but to change in leaf diffusive resistance, associated with symptom development.