Crop Pests

POTATO APHIDS IN THE MANAWATU

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Summary

Aphid monitoring in Manawatu potato (*Solanum tuberosum*) crops was conducted at different altitudes over two summers from flight traps and potato foliage. There appeared to be some differences in total numbers of aphids trapped in relation to altitude in the 1976/77 season when generally higher numbers were trapped at lower altitudes. This trend was not apparent in the 1977/78 season when highest aphid numbers were caught at an altitude of 305 m. The green peach aphid (*Myzus persicae*) was more prevalent in both seasons at sites close to Palmerston North but numbers of this species generally showed little relationship to altitude. Aphid infestation levels on potato foliage in both seasons did not vary with altitude. These results are briefly discussed.

INTRODUCTION

Many species of aphids are known to be vectors of virus diseases of crops. Potatoes are susceptible to two aphid transmitted viruses, the leaf roll virus and the potato mosaic virus (Virus Y). Both diseases cause serious reductions in yield when infected tubers are used as seed. The introduction of a seed certification scheme some 40 years ago which restricted the growing of seed potatoes in the North Island to areas 305 m or more above sea level was aimed at controlling these diseases in seed potatoes. It was considered, due to the lower temperatures experienced at these heights, aphid infestations would be less of a problem than at lower altitudes. Of the three main aphids attacking potatoes the green peach aphid is the most important virus vector (Fisken 1959). This species may persist in the viviparous form throughout the year on a wide range of host plants, migrating in spring or early summer into host crops such as potatoes. This flight, coming at a time when the potatoes are most susceptible to virus attack, poses a severe threat to crop health (Fisken 1959). Two other aphid species, the potato aphid (*Macrosiphum euphorbiae*) and the glasshouse potato aphid (*Aulacorthum solani*) also commonly occur on potatoes but both are less efficient vectors of virus Y and are not known to carry leaf roll virus (Fisken 1959).

The aim of this study was to assess the relative numbers of aphids at different altitudes in potato crops.

METHOD

Trapping of aphids in potato crops was conducted at several different altitudes in the Manawatu (Fig. 1) in the 1976/77 and the 1977/78 summer seasons with Moericke water traps (Lamb 1958). Two traps were placed in each crop at a height just above the plants. Trapping commenced in late November in 1976, continuing until the end of March, and then began again in mid November in 1977. By this time the majority of the potato crops in which the traps were sited had just emerged. All traps were checked twice weekly.

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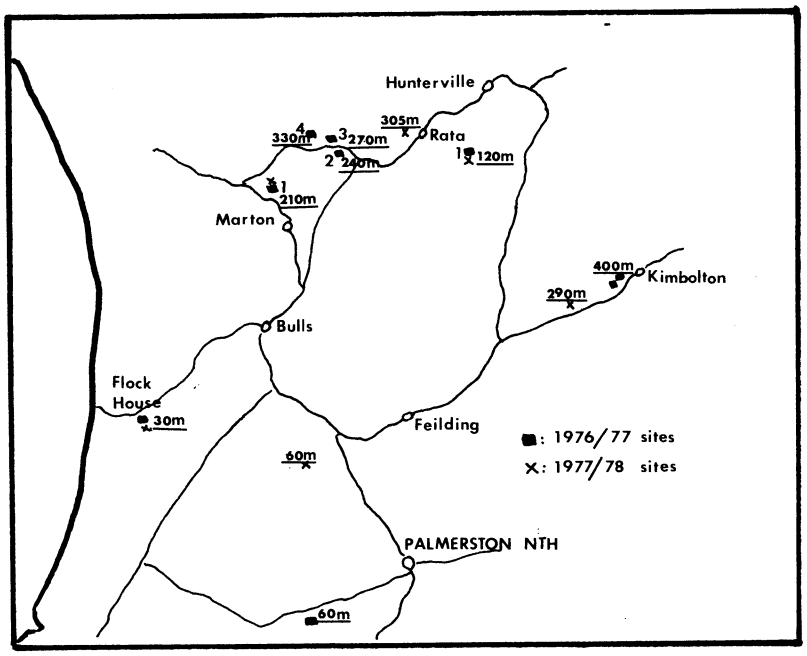
FIG. 1: Location of aphid traps.



Two potato trials comprising three potato cultivars, were planted in 1976 and again in 1977 at a low altitude (50m) near Palmerston North and a high altitude (390m in 1976, 290m in 1977) at Kimbolton . The potatoes were planted in mid November in 1976 and in early November in 1977. Potatoes were sampled regularly for aphids beginning approximately 2 weeks after crop emergence, by taking leaf samples which were weighed and washed through hot water. All aphids caught in traps and sampled from potato foliage were preserved for later identification.

RESULTS

Aphid trapping

The total number of aphids trapped at each site and the numbers of green peach aphid, glasshouse potato aphid and potato aphid, are given in Table 1. The highest numbers of aphids were trapped in the Rata area at altitudes of 120m and 305m in 1976/77 and 1977/78 respectively. High numbers were caught at the former site again in 1977/78 but due to the early harvest of this crop the trapping period was shorter than at other sites.

In the 1976/77 season with the exception of the Flock House and Rata areas numbers of aphids trapped decreased as altitude increased (Table 1). In the following season this trend was not apparent with the two highest sites, Rata and Kimbolton, both recording large flights of aphids.

The aphids of concern in this study, particularly the green peach aphid, only formed a relatively small proportion of the total aphids trapped. In the 1976/77 season the green peach aphid was trapped in large numbers only near Palmerston North and Marton at altitudes of 60m and

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TABLE 1: Aphids trapped in 1976/1977 and 1977/1978 seasons.

Location	Altitude (m)	Total all species	Green peach aphid	Glasshouse potato aphid	Potato aphid	Total 3 species
1976/77						
Flock House	30	466	11	17	1	29
Palmerston North	60	745	66	4	0	70
* Rata	120	1167	17	84	0	101
* Marton 1	210	485	11	18	2	31
Marton 2	240	385	43	11	1	55
Marton 3	270	333	21	28	0	49
Marton 4	330	276	29	14	0	43
Kimbolton	400	235	5	9	0	14
Kimbolton	400	203	8	2	0	10
1977/78						
* Flock House	30	564	16	11	10	37
Palmerston North	60	770	66	57	1	124
* Rata	120	(890)	(13)	(12)	(2)	(27)
* Marton 1	210	453	18	8	0	26
Rata	305	1282	30	26	6	62
Kimbolton	290	745	48	10	0	58

* Denotes trapping sites the same in both years.
( ) Trapping incomplete.

270m respectively. At all sites in that season the majority of this aphid was trapped in February and March when the danger of virus transmission is much less. In contrast many more green peach aphids were trapped in the early summer of the 1977/78 season in all areas with the Palmerston North (60m) and Kimbolton (290m) sites, recording the highest numbers.

The peak flight period in the 1977/78 season occurred at all sites in the first week of December. Numbers at Flock House and Palmerston North declined rapidly over the following fortnight whereas major aphid flights extended throughout December in all other areas, ceasing abruptly in early January (Fig. 2). This extended flight period appeared to be unrelated to altitude and common to most inland areas. Instead of this extended flight, in the previous season peak flight periods occurred later in the Marton, Rata and Kimbolton areas than at Flock House and Palmerston North. At the Kimbolton site, in particular, major flights were not recorded until late December and early January.

Sampling of potato trials

Few aphids were found in the potato trials in the 1976/77 season at either site (Fig. 3). Late planting of the trials, particularly near Palmerston North, may have prevented the development of higher infestations. Initial aphid levels in the low altitude trial near Palmerston North in 1977/78 were high but declined rapidly thereafter and by early January few aphids were found (Fig. 3). Numbers at the high altitude trial reached a peak slightly later but by mid January had also declined to low levels.

Sixty percent of the aphids sampled at the Palmerston North site were the glasshouse potato aphid, and only 35% were the green peach aphid. In contrast to this at the Kimbolton site 72% of the aphids sampled from the foliage were of the latter species.

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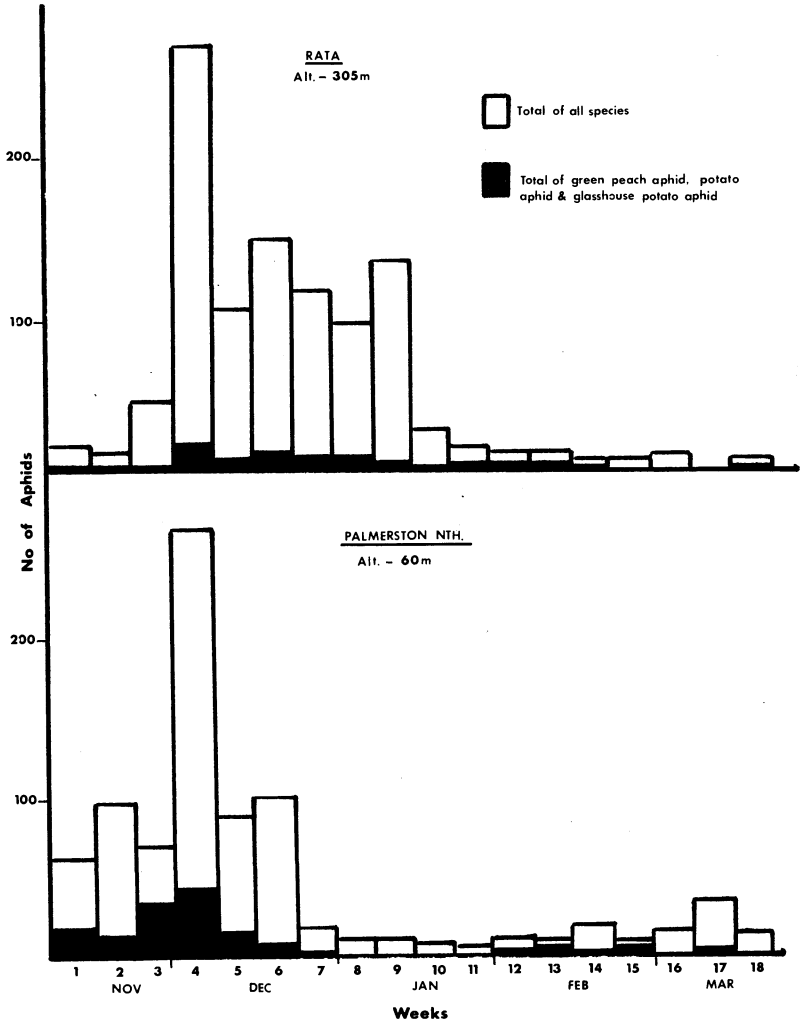
FIG. 2: Weekly aphid trap catches at two sites in the 1977/78 season.



DISCUSSION

Aphid numbers, particularly those of the green peach aphid, bear no direct relationship to altitude (Table 1), but are probably determined by a complex of factors. Overwintering success is known to be one important factor determining the size of the spring migrations of the green peach aphid into potato crops (Fisken 1959; Taylor 1977). Overwintering sites are confined to areas where host plants, particularly brassicas, are available

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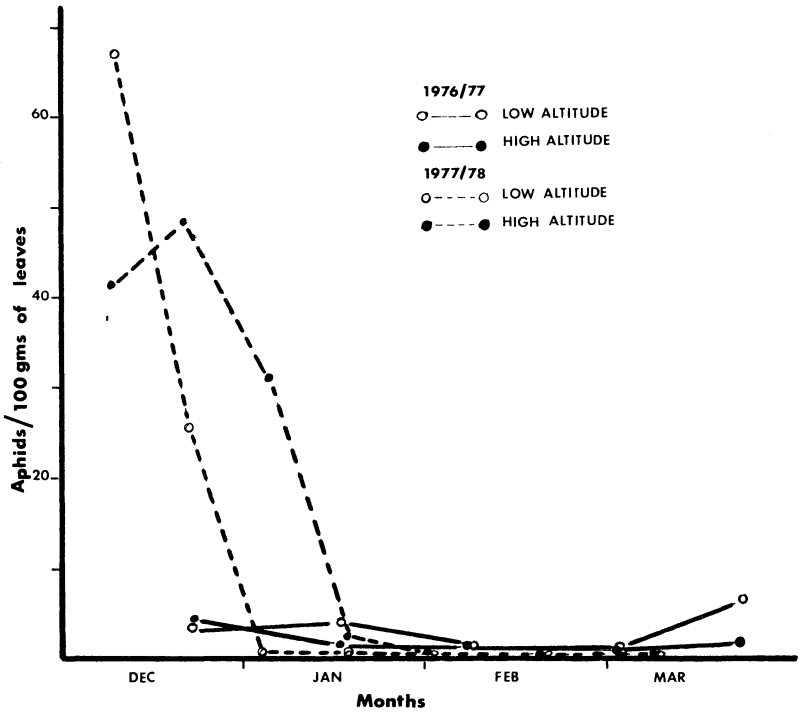
FIG. 3: Numbers of aphids sampled from untreated plots of potato trials.



and winter mortality is increased by frost and prolonged exposure to low temperature and high rainfall (Taylor 1977). Although lowland areas may favour winter survival of the aphids this will not prevent migration in large numbers to higher altitudes in spring since aphids assisted by prevailing winds are capable of flying long distances at air temperatures over 15°C (van Emden *et al* 1969). Timing and degree of infestation has been suggested to be correlated with distance from the overwintering site (Fisken 1959) and may be the reason for the later and more prolonged flights recorded in the Manawatu in the more inland and higher areas.

Once in the higher areas it is unlikely that temperature is a limiting factor for the green peach aphid which has a capacity to reproduce between temperatures of 2°C and 25°C, although the optimum lies close to the upper limit (Barlow 1962). The timing of infestation is important, however and it may be the lateness of infestation rather than the scarcity of aphid vectors which protects some crops from serious outbreaks of virus infection.

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