EFFECT OF PEA APHID ON SEEDLINGS OF LUCERNE CULTIVARS IN NEW ZEALAND

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Summary

Pea aphid (*Acyrtosiphon pisum*) resistance of lucerne (*Medicago sativa*) cultivars was tested in a series of glasshouse trials. Of the cultivars currently grown in New Zealand 'Wairau' and 'Hunter River' were susceptible 'AS 13' only slightly tolerant, 'Saranac', 'Washoe' and 'Iroquois' moderately resistant and 'WL 311', 'WL 318' and 'Rere' resistant. These results are not completely in agreement with U.S.A. results and further work should be undertaken to establish whether New Zealand populations of pea aphid differ in virulence from U.S.A. populations.

INTRODUCTION

The pea aphid was first reported in New Zealand in 1977 and was quickly recognised as an important pest of lucerne throughout the country. Overseas data on resistance to pea aphids of a number of the cultivars now grown in New Zealand are available (Marble 1978) but information on the performance in New Zealand of these and other potentially useful cultivars was required.

MATERIALS AND METHODS

Lucerne seeds were germinated in petri dishes in an incubator for 24 hours and uniformly vigorous seedlings were placed in rows in wooden glasshouse flats filled with sterilised soil. There were 12 seedlings per entry and 12 entries per flat in a randomised block design with each flat a complete replicate. Pea aphids were reared on broad bean plants (*Vicia faba*) and collected and inoculated onto the lucerne seedlings at about 5 per seedling when the cotyledons were fully expanded. In experiment 1 plant heights were measured 12 days after inoculation and in all experiments survival was assessed when most of the plants in the susceptible lines were dead. There were 16 replicates in experiment 1 (i.e. about 200 plants per entry) and 8 replicates in experiments 2, 3, 4 and 5, (i.e. about 100 plants per entry). Survival percentages were analysed using the arcsine transformation, and those percentages presented are bias-adjusted back-transformed means.

RESULTS AND DISCUSSION

The results of experiment 1, in which the 12 cultivars represent a range of pea aphid resistance are given in Table 1. Table 2 comprises results for some cultivars being grown in New Zealand, extracted from experiments 2, 3, 4 and 5. In both tables, published results on resistance to pea aphid are included wherever available. Susceptible plants showed severe stunting (Table 1) with fewer leaves and very distorted leaflets. The

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Table 1. Mean % survival and plant height of lucerne cultivars following infestation with pea aphids.

Lucerne cultivar	Reported reaction to pea aphid (1)	Mean % survival after pea aphid infestation	Mean plant height of surviving plants 12 days after inoculation (mm)
WL 514	R	89.7 a	20.3 a
CUF101	R	88.4 a	17.7 ab
WL 318	HR	86.0 a	16.3 b
Rere	—	82.5 ab	15.2 b
Honeoye	—	74.7 bc	9.5 cde
Arc	R(2)	73.1 bcd	12.5 c
Saranac	—	72.3 bcd	9.6 cde
Washoe	R	64.6 cde	11.2 cd
Pioneer 581	T	62.1 de	10.8 cd
520	—	58.2 ef	9.1 de
Europe	—	46.9 f	6.8 ef
Wairau	—	23.2 g	5.7 f

(1) All reactions reported are from Marble (1978) unless otherwise stated.

HR = highly resistant, R = resistant, T = tolerant - = No published information.

(2) Reaction reported from Devine *et al* (1974).

susceptible seedlings produced leaves at a much slower rate than the resistant ones. For example, 12 days after inoculation the resistant CUF101 had more than 50% of plants with three or more trifoliate leaves while the susceptible Wairau had only 1% at the same growth stage. This is a quite different response to that reported by Wynn-Williams and Burnett (1977) and McSweeney and Dunbier (1978) with blue-green lucerne aphid (*A. kondoi*), (BGLA). They found that shoots were produced at about the same rate in susceptible as in resistant plants, but, in susceptible plants these shoots did not elongate.

Table 2. Mean % survival of some lucerne cultivars following pea aphid infestation.

Lucerne cultivar	Reported reaction to pea aphid (1)	Trial 2	Trial 3	Trial 4	Trial 5
PA 1	HR (2)	—	94.3 a	—	85.2 a
WL 311	HR	93.4 a	—	—	—
WL 318	HR	91.5 a	—	—	—
Rere	—	—	—	62.8 a	—
Washoe	R	—	79.1 b	43.4 a	—
Saranac	—	—	85.1 ab	48.2 a	—
Iroquois	—	—	—	44.2 a	—
AS 13	—	—	—	22.5 b	—
Wairau	—	36.6 b	32.7 c	—	11.4 b
Hunter River	—	—	—	—	9.5 b

(1) All reactions reported are from Marble (1978) unless otherwise stated.

(2) Reaction reported from Nielson, N. W. (Pers. comm.)

From Tables 1 and 2 several points emerge. Firstly, seedlings of Wairau and Hunter River, the traditional cultivars grown in New Zealand and Australia are extremely susceptible to the pea aphid. In every test

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where Hunter River or Wairau were included they were in the most susceptible group of cultivars. In contrast, the most resistant cultivars; CUF101, WL 311, WL 318 and WL 514 and the breeding line PA 1 have all been selected for resistance to pea aphids and are all regarded as being resistant or highly resistant (Marble 1978; M. W. Nielson pers comm) in the U.S.A. The New Zealand bred cultivar Rere, which was selected from Saranac and CUF101 for resistance to BGLA, also showed high resistance to pea aphid in these trials although it had not previously been tested for resistance to pea aphid. A range in level of pea aphid resistance was shown by other U.S.A. cultivars being grown in New Zealand. AS 13 was only slightly tolerant but Saranac and Iroquois were as resistant as Washoe. Of these, only Washoe was selected for resistance to pea aphid, but it is apparent that there is considerable resistance in other cultivars. Similar results are indicated by Arc, Honeoye and Pioneer 581 in experiment 1. Arc is considered resistant to pea aphid, Pioneer 581 tolerant and Honeoye was not specifically selected for resistance to pea aphid (Anon., Report Committee on Varietal Descriptions, Alfalfa Improvement Conference Report 1976). Honeoye had a significantly higher survival percentage than Pioneer 581, but did not survive significantly better than Arc.

There is evidence (Kilian and Nielson 1971) of virulence differences between populations of pea aphids from different areas within the U.S.A. These results suggest that New Zealand populations of pea aphids differ in virulence from U.S.A. populations. This is strengthened by results with Rere in the U.S.A. (M. W. Nielson, U.S.D.A., Tucson, Arizona, pers. comm.). In our trials Rere was not significantly different in survival from CUF101, but in Tucson Rere had only 36% survival compared with 71% for CUF101.

Further studies should be carried out to investigate these possible differences and to determine just what level of pea aphid resistance is required for satisfactory field performance in New Zealand.

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