SCOUTING FOR LEPIDOPTERAN PESTS IN COMMERCIAL CABBAGE FIELDS

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SUMMARY

A scouting method with an action threshold of 15% plants infested was evaluated from Oct 1990 to Nov 1991 in six commercial cabbage fields. Growers did not alter their normal management practices except to apply insecticides only upon our recommendations. This method successfully decreased the number of insecticide applications by 25% to 100%. In a cost-benefit analysis, saving a single insecticide application was equivalent to the cost of scouting for the duration of an entire crop.
Keywords: white butterfly, diamondback moth, aphids, Integrated Pest Management, economics.

INTRODUCTION

Vegetable brassica growers in the Pukekohe area grow cabbage year-round for the fresh-produce markets of Auckland. Normal grower practice is calendar applications of broad-spectrum insecticides to control lepidopteran and aphid pests. Increasing consumer concern over pesticide residues has encouraged growers to consider reducing the numbers of sprays, but growers generally do not have the specialised knowledge necessary for implementing complicated scouting and/or threshold techniques. Work by Beck (1991) and Wyman (1992) indicated that scouting using a "percent infested" threshold is feasible for grower-useable reduced spray programmes. The technique is simple and fast, an important consideration as Wearing (1988) and Theunissen (1988) showed that most Integrated Pest Management (IPM) programmes failed because they were too complex for users. In field station trials, Beck and Cameron (1990) and Beck (1991) found an action threshold of "15% infested plants" gave good harvests with fewer insecticide applications than fortnightly-treated plots. In this paper we discuss the implementation of this threshold in commercial cabbage fields.

METHODS

Six commercial cabbage fields were scouted in Pukekohe from October 1990 to November 1991. Each field was approximately 2 ha in size. In all fields, growers agreed to follow normal cultural and chemical practices with the sole exception of applying insecticide only when a recommendation was made. Lepidopteran infestation was determined on a "presence/absence" basis. A plant was scored as infested upon sighting of (1) any larval instars of diamondback moth (DBM) (*Plutella xylostella*) or (2) any large (third to fifth instar) white butterfly (WB) (*Pieris rapae*) or noctuid (*Helicoverpa armigera* or *Thysanoplusia orichalcea*) larvae or (3) any fresh feeding damage and/or frass. An action threshold of 15% infested was used for lepidopteran infestations. However, when infestations were 12-14%, a repeat sample was made 3 or 4 days later (Beck 1991). Although observations on aphid infestations were given to growers for all fields, recommendations for aphid control were made only in Fields 4-6 using a preliminary action threshold of 10% infested. An aphid infestation was determined on the presence/absence of a colony and did not discriminate between *Myzus persicae* or *Brevicoryne brassicae*.

Scouting was initiated 1 week after transplanting and continued until harvest. Each field was visually divided into four quadrants and 25 samples taken without bias from a transect in each quadrant. Samples consisted of whole plant examinations until the heading stage (defined as presence of a 10 cm head) after which samples included the head and four wrapper leaves. Samples were taken on a weekly or biweekly basis, dependant upon the infestation level determined.

Damage estimates were scored by a visual assessment prior to commercial harvest. A minimum of 250 cabbages were evaluated in Fields 1 - 3 by scoring damage to outer wrapper leaves, inner wrapper leaves, and head, as per the techniques of Beck and Cameron (1990). Fields 4 - 6 were assessed on a similar basis, using only inner wrapper leaves and head on a minimum of 100 cabbages per field. For all fields, these scores were used to determine the percentage of plants in each field which would be deemed "acceptable" to the fresh-produce market. For Fields 1 - 3, acceptable cabbages equated to a score of <6 and for Fields 4 - 6, this equated to a score <4.

RESULTS

Results of spray/no spray recommendations in commercial fields are shown in Table 1. A single application of methamidophos was applied to Field 1 on the fourth sample when lepidopteran populations exceeded 15%. Samples were taken for 10 weeks, at which time a pre-harvest damage assessment indicated that 95% of the cabbages in the field were rated acceptable.

TABLE 1: Number of insecticide applications recommended compared to normal grower applications and harvest quality for six commercial cabbage crops.

Field	Crop	Insecticide applications		Harvest
		Recommended	Normal	% acceptable heads
1	Oct - Dec	1	5	95
2	Feb - Apr	2(4)*	6	100
3	Apr - Jun	1	4	98
4	May - Aug	0	4	95
5	Jul - Nov	0	6	89
6	Sep - Nov	1	4	87

* Two sprays against lepidopteran infestations were recommended, but the grower actually applied four sprays.

Field 2 had low lepidopteran populations but high aphid populations. The grower applied chemicals four times, even though only two applications were recommended. The first recommended application, directed against DBM, consisted of methamidophos. The second recommended application, directed against WB, consisted of methamidophos and dimethoate. The latter chemical was applied to control aphids and was based on our observation of the presence of aphid colonies. This aphicide application and two later, additional applications, were made without our recommendation, but the grower stated that because of our recommendations he applied two fewer sprays for control of lepidopteran pests than normal. Pre-harvest damage assessment indicated no damage in the field (Table 1).

WB populations exceeded the action threshold on the first sample in Field 3 and an application of deltamethrin was made. WB oviposition continued for 1 week after insecticide application but no larval infestations resulted. Pre-harvest damage assessment indicated 98.5% of the cabbages were rated acceptable (Table 1).

Field 4 had low pest populations throughout the crop, no insecticide applications were made and 95% of the crop was rated acceptable. Infestations in Field 5 did not reach action thresholds and no insecticides were applied. Field 6 received a single application of dimethoate against a 10% infestation of aphids. Neither Field 5 nor 6 were harvested at peak quality; our pre-harvest damage assessment scores reflect decreased cabbage quality due to environmental effects, not insect infestation.

An average of 10 visits were required per field and each visit required an average of 30 minutes for one scout to determine the infestation level of the field.

DISCUSSION

This study indicates that there is considerable potential for decreased insecticide input into commercial cabbage plantings. Fewer insecticide applications did not result in a decrease of crop marketability for either summer or winter crops, and for all fields, the growers considered the crop yield and quality fully acceptable. Scouting for infestations ensured that applications were timed to coincide only with damaging pest populations so as to minimise insect damage. In many instances, use of scouting can result in increased harvest, due to more accurate timing of insecticide applications (Beck 1991). As this programme was initiated and designed for use by growers, the potential for decreased insecticide use may encourage them to learn and use the scouting methods.

The cost of scouting was minimal compared to overall crop costs. Total pesticide plus application cost for a cabbage crop is estimated at $499 per hectare (Annual Crop Gross Margin, MAF Pukekohe 1989). In a summer crop which receives an average of six insecticide applications (Beck 1991), each application will therefore cost the grower $83 for material, labour, and equipment depreciation. The total cost to the grower for scouting this same cabbage crop using existing employees would be $60 ($12 per hour x 10 visits x 0.5 hour per visit). Thus, a grower who saves a single insecticide application through the use of a scout has an immediate financial benefit of $23 per hectare. In this study, growers saved a mean of 3.6 insecticide applications with a potential saving of $83/ha.

In addition to the economic savings, reducing the number of insecticide applications using the scouting technique has other less tangible benefits. These include preserving the effectiveness of insecticides by deferring the development of resistance, decreased personal contamination of applicators, and reduced levels of insecticide residues in the product and the environment. The potential development of resistance in DBM is of particular concern as Bell and Fenemore (1990) reported low levels of resistance to three insecticide classes in populations of DBM at Pukekohe. Growers in this important vegetable growing area are aware of these results, and are also familiar with problems being faced by overseas brassica growers who can no longer control DBM with chemical insecticides (Ooi 1992). Accordingly, Pukekohe brassica growers are interested in learning techniques such as scouting.

Future research will include expanding this cabbage scouting technique to include threshold levels for control of ringspot, and further refinement of aphid thresholds. Theunissen (1989) used variable tolerance levels for *Brevicoryne brassicae* based on crop growth stage and Wyman (1992) used a similar technique for lepidopteran pests. Use of scouting in other vegetable crops such as cauliflower and broccoli to determine pest infestation levels also shows promise as Beck (1991) indicated that a similar decrease in insecticide application was feasible in these crops.

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