Pests in herbage seed production

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ABSTRACT. A number of insect pests affecting seed production of leguminous and graminaceous crops used for grazing or fodder conservation are described. Where known, the damage threshold levels and control measures are given.

Key words: Herbage seed production, pests, *Coleophorcl* spp., ***Acyrthosiphon kondoi, A. pisum, Hyperodes bonnriensis.***

INTRODUCTION

The value of meat, wool and dairy products to the economy of New Zealand is well recognized. The generation of these products through grazing animals is dependent upon an adequate supply of high-quality herbage from grasses and legumes. The seeds from which these various forms of herbage are grown are so far removed from the marketed end-products that their importance as the source of major agricultural production is rarely acknowledged. This may be one of the reasons why relatively little research has been carried out on many of the pests of herbage seed crops.

There can be considerable difficulty in distinguishing between and assessing the importance of the various pests. They frequently occur as a complex; a control measure used against one species may affect the whole complex, thus making it virtually impossible to determine which pest needs investigation.

It must also be accepted that climate, harvesting methods and management systems may, overall, have a greater influence on yields than many of the pests.

Apart, therefore, from the two main pests of white clover — the clover case-bearer moths and lucerne aphids, both of which have been found as virtually isolated and very destructive pests — the levels at which the numerous other pests of herbage seed crops will cause losses of economic importance are not known. They are, however, very well described by Pottinger (1973) .

CLOVER SEED CROPS

CLOVER CASE-BEARER MOTHS *(Coleophora* spp.)

These have received more attention than the other pests (e.g., Dumbleton, 1963; French, 1972), and although attempts have been made to control them by manipulating management systems, the only successful and economic method of control is well-timed insecticidal sprays.

Pest build-up and seed losses in second-year white clover seed crops tend to be higher than in the first year, but even in first-year crops the losses average 10 to 15%. Control measures are therefore almost certainly desirable even if, in'some years, levels of attack may be low. Red clover seed crops do not suffer severely from this pest owing to the different growing and harvesting season.

French (1970) describes how to assess the levels of clover case-bearer moths within white clover crops and the losses likely to be incurred with various levels of infestation. His method of assessment was by dragging a net for 20 paces through a white clover seed crop at intervals from early in December onward. At the current price of white clover seed, an average number of only 4 moths per sample will provide a level of damage (4%) which it is economic to control.

Because of the hazard to bees, only bromophos (0.5 kg/ha*), dichlorvos (0.12 kg/ha) and trichlorfon (1.0 kg/ha) are accepted for the control of clover case-bearer moths. The choice of chemicals, however, must now be related to the incidence of the more recently arrived luceme aphids, which can be very serious on clover seed crops.

*The rates quoted throughout are in terms of active ingredient.

LUCERNE APHIDS

Attacks on white clover seed crops by the blue-green aphid (*Acyrthosiphon kondoi* Shinji) were first noticed in 1976 (Trought, 1977). and small-scale trials at that time showed that losses of up to 20% could result from their attack. Since then the pea aphid (*A. pisum* (Harris)) has contributed toward the attack on white clover seed crops, although in 1977 the blue-green aphid was still the main pest. The losses assessed in 1976 were confirmed in the 1977 trials both on large (0.3 ha) sites which were header-harvested and on small hand-harvested plots (Table 1) . In both years clover case-bearer moth incidence was negligible.

TABLE I: WHITE CLOVER SEED YIELD (kg/ha) AFTEK BROMOPHOS TREATMENT AGAINST LUCERNE APHIDS ON TWO ADJACENT TRIALS, 1977

Treatment	*Mean Yield, Header-harvested*	*Mean Yield, Hand-harvested*
Bromophos 0.28 kg/ha	525 aA	**879** aA
Untreated	**424** bB	**710** bB

It is perhaps fortunate that the build-up of the aphids (Table 2) coincides with that of clover case-bearer moths and that one of the chemicals suitable for the moth is also satisfactory for aphid control.

From the trials it was determined that levels of aphids should not be permitted to rise above 4 per flowering head. Sampling is quite simple: pick two batches of 50 flowering heads at random through the crop. Each sample of 50 heads should then be dipped and agitated in a bowl of very hot water; the aphids float off and can be counted. It should be noted that low levels of aphid infestation may not be seen by examining heads in the held: if aphids can be observed it is probable that control measures are overdue.

TABLE 2: MEAN NUMBER OF LUCERNE APHIDS' PER FLOWERING HEAD OF WHITE CLOVER BEFORE AND AFTER INSECTICIDAL TREATMENT — 1977

	Aphids/Head (means of 100 heads/sample)						
Dates:	**1.12**	6.12†	**13.12**	**14.12**	**16.12**	**19.12**	**23.12**
	0.1	**4.5**	**22.4**	Trtd.	0.0	**0.3**	**0.6**
				Untrtd.	24.3	52.9	51.0

*Approximately 90% BGA. 10% pea aphid.
†Intended date of spraying (bad weather intervened).

Table 2 indicates that aphid numbers can build up very quickly. If sampling intervals are long or spraying is delayed, perhaps because of weather conditions, much damage is likely to occur. Infestations must therefore be very closely watched by sampling at 3 to 4 day intervals towards the end of November, and sprays applied immediately or infestation tends to build up,

Kromophos (0.28 kg/ha) and pirimicarb (0.15 kg/ha) are accepted for the control of aphids in clover seed crops. The rate of bromophos recommended for aphid control is, however, only about half that used for clover case-bearer moth control. In view of the value of the crop it is almost certainly advisable to apply the higher clover case-bearer moth rate to ensure both moth and aphid control. The alternative, pirimicarb, will give good control of the aphid, is also safe against bees and will not harm beneficial insects: it is, however, even at a higher rate, unlikely to give good control of the clover case-bearer moth.

Of special note in Table 1 is the difference in yield between the carefully hand-harvested plots and those harvested by header. It is probable that a loss of some 40% occurred owing to the method of cutting the crop: in this case a rotary hay mower windrowed the crop after chemical desiccation before being picked up by the header. Thus the method of harvesting may have a far greater influence on yield than pest damage, and every effort must be made to keep harvesting losses to a minimum.

RED CLOVER THRIPS (*Haplothrips niger* (Osborn))

This pest can be found in most clover seed crops but is particularly a pest of red clovers where it feeds within flowers on anthers and seed pods. The adult can bc recognized as a very small (2 mm) elongate, shiny black insect, and the larvae are bright red.

As many as 120 thrips per red clover seedhead have been recorded (Doull, 1949), and Yates (1952) describes the life cycle of this pest. She observed an apparent association between yield and pest incidence, but also commented that the presence of adequate numbers of pollinating bumblebees affected yield to a marked degree. Unfortunately, the levels of infestation at which economic damage occurs are not known; by inference from Yates' field observations, however, it seems that levels of 30 to 40 per head are harmful.

Since the larvae overwinter near the ground in hollow stalks it is probable that management systems in winter will alter the incidence in seed crops and may account for the apparent variability from site to site. Bromophos at 1.2 kg/ha effectively controls the pest in red clover seed crops. Treatment at early flowering, if thrips are present, is likely to provide protection and would be insurance against a range of other pests, including aphids and various sucking bugs. A later application may also be required if there are large invasions of the pest from sources outside the crop.

GENERAL

One of the most important aspects of pest control in clover seed crops, apart from yield, is quality — the appearance of the seed itself. Brightness and sheen may be lost due to thrips attack; or honeydew deposited by aphids in the field may cause dressing problems in stored white clover seed (P. T. P. Clifford, pers. comm.).

The value of a well-tended clover seed crop may be in excess of $400/ha, yet the cost of a grower-applied insecticide should not exceed $16/ha per hectare. The expenditure of 4% of the possible value of the crop is a small premium to pay to insure both yield and quality.

OTHER LEGUMINOUS HERBAGE SEED

Besides the. pests of clover seed crops already described there are a host of insects which feed on seedheads or seed in leguminous crops. Their numbers and types may vary from season to season and their importance as pests has not been studied in depth. Hard and fast recommendations for their control cannot therefore be made.

The seed chalcids, for instance, are tiny wasps, the larvae of which feed on the seeds of lucerne and red clover. Various caterpillars have been reported as seriously damaging lotus seed crops. Aphids such as those which attack white clover seed crops may also affect the growth of lucerne or lotus seed crops. All leguminous seed crops harbour a range of plant-sucking bugs such as the wheat bug (*Nysius huttoni* White).

Although generally present in low numbers, a set of favourable climatic and other conditions may arise which allows a minor pest suddenly to assume greater importance. Regular inspection and the judicious application of insecticides, if necessary. may prevent serious loss of crops.

It must be emphasized that leguminous seed crops, as opposed to grass seed crops, require insects for pollination. Haphazard, careless or ill-judged application of insecticides may therefore have serious detrimental effects: not only may vital beneficial pollinating insects be killed which will result in very poor seed set, but also the livelihoods of local apiarists are jeopardized.

GRASS SEED CROPS

ARGENTINE STEM WEEVIL (*Hyperodes bonariensis* Kurshel)

This is undoubtedly a major pest of some grasses and can affect not only the establishment and vigour of the crop in autumn but also, by attacking reproductive tillers in spring and summer, reduce seed yields.

Protection against damage to seedlings in late summer by the adults, and to subsequent autumn growth by larvae, can be provided by an application of phorate (1 kg/ha) with the seed at sowing (Trought, 1976) if the seed is sown before mid-February. Recent work by Goldson (1979) has shown that the cessation of egg-laying in early March is dependent upon photoperiod and therefore independent of climatic conditions. He was thus able to demonstrate that insecticide protection of a crop sown from mid-February is unnecessary. Early sowing, however, may result in greater vigour and winter yield in some ryegrass cultivars which would be an advantage.

Goldson (1979) has also defined when Argentine stem weevils first became competent to lay eggs in the spring. This information may improve the chances of success of insecticides such as chlorpyrifos (0.5 kg/ha) used against the adult in spring, which gave increased seed yields (Forgie, 1974), or increase the efficiency of insecticides such as oxamyl (1 kg/ha) (Welsh et ***al., 1974)*** against larvae. It is not yet possible to make exact recommendations for spring applications of insecticide since the effects of more accurate timing of applications have not been determined. Furthermore, the effects of recruitment due to flight into treated paddocks have yet to be assessed.

SOUTHERN ARMYWORM ***(Persecfania*** *aversa* (Walker)) and **COSMOPOLITAN** ARMYWORM ***(Leucania separata*** (Walker))

These, and other caterpillars, are regularly reported as damaging grass seed crops, particularly cocksfoot. Although they tend to hide under ground cover during the day, their presence can be detected by evidence of feeding on leaves and growing points. However the number required to constitute an economic problem is unknown, and no doubt varies seasonally. Since it is the overwintering population which causes the damage, control measures should be taken in early spring, and a number of chemicals including methomyl diazinon and fenitrothion can be recommended.

COCKSFOOT THRIP ***(Chirothrips*** *pallidicornis*)

This thrip is quoted (Doull, 1956) as doing considerable damage to seed crops, with a loss for instance of 47.8% seed in an unsprayed field near Lincoln. Little work has been done on this pest, but since egg-laying starts with flowering in mid-November a prophylactic spray with diazinon at flowering should give effective control.

COCKSFOOT STEM BORER ***(Glyphipteryx*** *achlyoessa* Meyrick)

This small moth, a little over 1 cm long and pale grey-brown in colour, is widespread, but the practice of stubble burning effectively controls the larvae and subsequent adult emergence in seed crops. No chemical control is recommended.

OTHER MINOR PESTS

Many insects may be present in grass seed crops, but it is probable that only very slight damage will normally result from their attack on seed or seedheads.

The larvae of the cocksfoot midge (*Stenodiplosis geniculati* var. ***dactylidis)*** , for instance, are small red-bodied maggots about the size of cocksfoot seed. Early-flowering cocksfoot appears to be more prone to attack than late. Another example of an occasional minor pest would be the wheat sheath miner ***(Cerodontha denticornis*** (Panzer)). Larvae of this pest feed on the leaf sheaths and occasionally on the stem of reproductive tillers, causing whiteheads or premature ripening of seed.

These and other insects rarely become important as pests; the recognition of them is desirable, however, since preventive control measures can be taken if necessary.

CONCLUSION

With the exception of clover case-bearer moths and lucerne aphids on clover seed crops and Argentine stem weevil in ryegrass crops, the insect pests causing yield reductions in herbage seed crops are generally of minor importance. Of greater overall importance are the agronomic, management and climatic factors which go toward producing a healthy crop; and the efficiency with which the seed is harvested

It may be presumed that lucerne aphids will be a pest of clover seed crops annually, but chemical control is relatively simple and effective. It is also probable that Argentine stem weevil will remain a threat to ryegrass seed crops, particularly short-rotation ryegrasses which are very susceptible. Recent studies on the biology of this pest may well lead to improved techniques for control based on forecasting the commencement and cessation of egg-laying.

The seasonal importance of most of the pests of herbage seed crops cannot yet be forecast. While it is known what levels of clover case-bearer moths and lucerne aphids are of

economic importance in clover seed crops, this information is not available for other pests.

The need to take control measures against all these other pests must depend not only upon an ability to recognize the pests, but also, for the time being, on a subjective view of their likely importance.

This is an unsatisfactory situation, but it must be emphasized. that the levels of- damage it would be economic to prevent would be much lower in high-value seed crops than in low-value crops. Thus insurance against damage by the application of wide spectrum insecticides at the first sign of insect attack will in many cases be advantageous, provided that bees are not at risk.

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