Project Title:	Vining peas: Monitoring and control of the pea midge (*Contarinia pisi*)
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PRACTICAL SECTION FOR GROWERS

Background

The pea midge (*Contarinia pisi*) is a localised and sporadic serious pest of peas in England, especially in Yorkshire, Lincolnshire and parts of East Anglia. It is also endemic in Northern Europe with particularly high infestations occurring in Northern France, Germany, Sweden and Eastern European countries.

Damage by the larvae, causes flower sterility and growth distortion of the growing points of peas, seriously reducing yield. Adult females enter the crop before flowering and lay eggs on the immature buds. Larvae enter the bud and feed at the base causing the flower to be infertile and develop a gouty appearance.

The midges sudden, local and sporadic attacks make control by insecticide sprays very difficult as sprays have to be applied as the females enter the crop before egg laying has commenced.

The timing of control measures is critical to achieve maximum effect. A monitoring system which detects the newly emerging midge adults in the previous years pea field will be an essential aid to predicting the timing and necessity of insecticide sprays.

The active components of the female sex pheromone have been identified and it is this project that evaluates synthetic versions of the pheromone, together with trapping methods in order to develop a monitoring system.

Summary of results

Lures containing synthetic forms of the single, double, triple, components of the female pea midge sex-attractant , and a racemic form of the three, were placed in Oecos delta traps in two fields known to contain overwintering populations of the pea midge (*Contarinia pisi*). Male midges were caught on the sticky inserts of all traps containing the triple component. Recordings of catches showed a peak time of emergence from both a low and a high population overwintering site. This forms the basis of a monitoring and prediction system for pea midge in vining peas in the UK.

Potential benefits

Pheromone traps specific to catching pea midge will enable fields to be assessed for the potential risk of infestation and to identify the time of peak emergence of the insect. This will provide information on the likely level of risk and give advanced warning of migration of midge from the overwintering site to the current season's vining pea crops.

Such a system will help to optimise insecticide application for effective control of the pest.

SCIENCE SECTION

Introduction

Work on the identification of the pea midge sex pheromone began in 1990 and was jointly funded by HDC, MAFF and PGRO. However, since 1996, the work has continued by PGRO and the Swedish Agricultural University. In 1998, the major active components were identified and synthesised and laboratory trials have shown them to be active in attracting male midge to lures in a wind tunnel.

Potential benefits to the Industry

The current method of control of pea midge is large scale prophylactic spraying of peas at the early bud stage in those areas where pea midge is known to be a pest. A monitoring system will identify the time of midge emergence from the previous years field and alert growers as to the risk of migration into the current seasons peas. This will reduce the use of prophylactic sprays and will enable optimum timing of application.

1. To evaluate pheromone dose rate and release rates.

2. To evaluate trap designs.

3. To optimise trap placement.

4. To develop a system of prediction of infestation based on trapping data.

5. Evaluation of spray timing in relation to trapping data.

Materials and methods

1. Identification of trapping sites

Four fields where peas were grown in 1998 and reported to have been attacked by pea midge, were sampled in the spring of 1999.

Soil samples were taken using a 15cm diameter core sampler to a depth of 8cm, at 10 randomly selected locations in various parts of the fields. Soil was wet sieved and midge cocoons extracted after floating the organic matter retained on the finest sieve, in a saturated solution of magnesium sulphate. Cocoons were counted and the two fields showing the highest and lowest population were chosen for the experiments. The site details are shown in table 1.

Table 1. Monitoring sites

Site 1: Low Hunsley Farm,
Walkington,
Yorkshire

Field name: Yard field
Previous crop: Waverex vining peas

Site 2: Hessleskew Farm,
Market Weighton,
Yorkshire

Field name: Arras Hill
Previous crop: Bikini vining peas

2. Field monitoring of pea midge

i. *Pheromone components*

The pea midge pheromone compounds 2 acetoxytridecane ,(2S,11S) diacetoxytridecane and (2S, 12S) diacetoxytridecane were used singly or in mixtures in the 1999 field trials. The synthesised compounds were prepared at the Swedish Agricultural University and were dosed on to dental cotton rolls (Celluron no 2) cut into thirds and placed within the body of an Oecos pea moth trap, with a sticky insert placed inside the base of the trap.
The lures and doses were as follows:

1. Blank (control)
2. Single component 2-acetoxytridecane (10µg)
3. Double component 2S,11S - diacetoxytridecane (10µg) and 2S, 12S diacetoxytridecane (10µg)
4. Three component (2 and 3)
5. Racemic version of the three components 2-acetoxytridecane (10µg) and 2, 11-diacetoxytridecane (40µg) and 2,-12- diacetoxytridecane (40µg)

ii. *Trapping*

Traps containing one of each lure were placed at 10m intervals along tramlines of each field, both of which were currently in winter wheat. The treatments were replicated five times in a Latin square design and the traps were placed on the soil within the wheat crop. The traps were examined twice weekly and the sticky inserts were replaced each time. The lures were replaced after the second visit.

The sticky inserts were returned to the PGRO laboratory and midge numbers recorded for each trap. The identity and sex of the midge were confirmed.

Trapping commenced on 11th June following soil samples made on 8th June when more than 25% of the cocoons were beginning to pupate at both the emergence sites. Recordings were made on 14th, 17th, 22nd and 26th June, by which time the midge numbers had fallen to a low level and it was assumed that the main emergence period had ended. The data were analysed by GENSTAT.

Results

Trapping

Midge were first caught in the traps between the 11th and 14th June. The highest numbers were recorded on 17th at both sites. Numbers declined at both sites by the 22nd June although at the Market Weighton site, numbers began to increase slightly by 25th June although all traps were removed from the sites after that time. The catches over the period are shown in table 2 and 3.

Table 2. Midge trap catches Walkington 1999

Lure: Midge per trap

	recording date: 14.6.99	17.6.99	22.6.99	25.6.99
Blank	0	0.8	1.0	0
Single	0	1.0	0.6	0.4
Double	1.2	5.0	1.4	5.4
Triple	22.4	35.4	19.4	6.2
Triple R	0.4	1.0	0.4	0
LSD @ P = 0.001	10.18(sig)	8.75(sig)	7.04(sig)	4.01(sig)
Coefficient of variation.%	158.1	75.5 1	115.2	124.5

Table 3. Midge trap catches Market Weighton 1999

Lure: Midge per trap

	recording date: 14.6.99	17.6.99	22.6.99	25.6.9
Blank	0.4	0.8	4.0	2.0
Single	0	1.0	3.6	2.2
Double	15.8	101.0	31.0	28.4
Triple	114.2	160.2	51.0	66.2
Triple R	0.6	0.4	1.4	0.6
LSD @ P = 0.001	72.0(sig)	91.0(sig)	27.5(sig)	32.0(sig)
Coefficient of variation %	205.0	128.9	112.5	120.2

All midges caught were male *Contarinia pisi.* An independent identification is being made.

Conclusions

The data showed highly significant differences between catches from the triple component compound compared with the single, double and racemic compound at the Walkington site. However, at the Market Weighton site, the catches form the triple component compounds were higher than the double component compounds although not statistically significantly different.

The trapping data clearly showed that at least one compound was highly effective in attracting male pea midge to Oecos delta traps. Midge were exclusively caught, with very few other insects present on the traps. A wet spell of weather, however, allowed some predation of midge caught on the sticky insert, by the grey slug (*Derocerus reticulatum*). Although this did not affect the count, as the remains of the midge were still discernible, (legs and wings). It is a factor which will need to be addressed in future field trials.

The most consistent results were achieved by the triple component compound at both sites. It is not known why the double component compound performed well at the Market Weighton site and there could be slight population differences of pea midge causing an alteration in response to the pheromone.

The trap catches reflected the high and low population overwintering sites of the pea midge, but emergence patterns were similar at both sites. The Oecos traps performed well and will be used for the rest of the project.