Dispersal of click-beetles in agricultural fields: a mark-recapture study

**Rod P. Blackshaw, Robert S. Vernon, Florent Thiebaud**

Abstract: Wireworms remain one of the more pernicious soil pests in field cropping systems. It is apparent that the adult stage – click beetles – are more widespread in agricultural landscapes than the wireworms. Dispersal of adults has become of interest as alternative approaches to insecticides are sought. In this paper we report part of a series of studies to determine what factors may affect click beetle dispersal across fields. Two experimental sites (wheat and fallow) were established with arrays of traps. Batches of marked male *Agriotes lineatus*, and male and female *A. obscurus* were released at the centre of each field. Traps were examined on the day of release and daily thereafter to recover marked beetles giving time periods of 1 to 561 hrs after release. Data for both sites and all release events were analysed as direction or distance travelled from the release point using univariate methods. Only 9.8% of the deviance in directional data could be accounted for, but 22.1% for distance travelled. Female *A. obscurus* travelled significantly less distance than did males but there was no difference between males of the two species. Greater distances were travelled in the wheat than fallow field and the date of release affected both distance and possibly travel direction.

Can we use cranefly counts to monitor larval numbers?

**Rod P. Blackshaw, Libby Gibson, Peter Andrew**

Abstract: For most non-insecticidal controls for *Tipula paludosa* larvae (leatherjackets) it is necessary to estimate the numbers present. Direct sampling of leatherjackets is resource demanding and reduction of effort is a precursor to widespread adoption of monitoring. We report a pilot study into the use of water trapping of adult craneflies to predict the size of leatherjacket populations. We conclude that there is potential, that female trap catches are a better predictor than male catches, and that there may be a spatial element to predictions.

IPM of aphids in vegetable field crops in Albania

**Ejup Çota**

Abstract: Different methods were used to control aphids on field tomato crops during 2007-2008. The trials consisted of monitoring the key pest aphid species using yellow sticky traps and evaluation of the effectiveness of the insecticides acetamiprid, thiamethoxam, and azadirachtin. Infestation levels on tomato foliage were also recorded. Regular monitoring showed that aphids were very active from March to July in the Mediterranean climate of the study area. The first peak in aphid numbers caught on yellow sticky traps was reached in the middle of April. After that, there were three more, smaller, peaks until the end of the season. Sampling tomato foliage showed that 2% of leaves were infested at the start of sampling but aphid numbers reached the economic threshold for treatment one week later. Two foliar applications of acetamiprid, applied two weeks apart, starting at the beginning of aphid colonization, provided better aphid control than thiamethoxam and azadirachtin.
Potential control of cabbage root fly (Delia radicum) with the predatory staphylinid beetle Atheta coriaria
Jude Bennison, Mike Lole, Tom Pope, Kerry Maulden, Heather Maher, Martyn Watling

Abstract: The predatory staphylinid beetle, Atheta coriaria, was investigated as a potential biological control agent for cabbage root fly (CRF) (Delia radicum). Initial predation bioassays confirmed that A. coriaria adults eat both CRF eggs and young larvae. Subsequent work demonstrated that it was possible to ‘seed’ plant-raising modules with A. coriaria in the propagation glasshouse. By adding an artificial food source (turkey-rearing crumbs) to the compost, A. coriaria was able to colonise and breed in modules during the propagation period. Modules prepared in this way were then used in a semi-field experiment to test whether the A. coriaria that had established in the modules could reduce the severity of CRF damage to cauliflower plants once planted out. CRF eggs were added to the soil around each plant over a 2-week period, to simulate second generation CRF egg laying. Significantly less CRF root damage was recorded in plants where beetles had been reared in modules during propagation compared with untreated control plants. Similarly, plants treated with high numbers of beetles after planting out had significantly less damage than control plants. The efficacy of A. coriaria used either to ‘seed’ modules during propagation or applied to plants after planting out was tested in the field in 2009. Results compared A. coriaria-treated plants with modules drenched with chlorpyrifos or spinosad and with untreated control plants. More untreated control plants died as a result of CRF feeding, and root weights of surviving plants were lower, compared with A. coriaria- or insecticide-treated plants. The number of plants dying as a result of CRF feeding, and root weights of surviving plants, were similar in both A. coriaria and insecticide treatments. However, root damage index assessments did not differ significantly between treated and untreated plants. Although further work is required, results so far indicate that A. coriaria, applied to modules during propagation or after planting out, has potential for cost-effective biological control of CRF.

Large scale demonstration of exclusion fences for management of cabbage root maggot Delia radicum: Opportunities for IPM?
Robert S. Vernon, Rod Blackshaw, Renee Prasad

Abstract: The distribution of cabbage root maggot (CRM), Delia radicum, adults, eggs and damage was studied in large-scale fenced and unfenced fields of rutabagas in Delta, British Columbia in 2009. In the field enclosed by a 1.3m high exclusion fence (2.7ha), numbers of CRM females that were able to enter the field were highest on yellow sticky traps situated 1m into the rutabagas, relative to numbers on traps 6, 13 and 28m into the field (respectively, 65.9, 72.7 and 93.2% fewer flies than at 1m). In the open field (3.2ha), CRM females entering the field were also highest on sticky traps situated 1m into the rutabagas relative to numbers on traps 6, 13 and 28m into the field (respectively, 19.7, 39.3 and 70% fewer flies than at 1m), but population decline with distance into the field was much more gradual than inside the fenced field. This trend was also observed with plants infested with CRM eggs, where counts dropped rapidly in the fenced field between 1.5m and >13m (92.5% drop), relative to a more gradual decline in the open field between 1m and 13, 43 and 61m (respectively, 56.9, 77.6 and 91.4% fewer plants with eggs). The proportion of rutabagas considered culls in the fenced field at 1, 6, 13 and >28m into the field were, respectively, 0.23, 0.23 0.01 and 0.03, whereas the proportion culls at 1, 13, 43 and >61m into the unfenced field were, respectively, 0.85, 0.45, 0.25 and 0.07 at harvest. These data showed that CRM females and associated egg deposition and damage to rutabagas in the fenced field were strongly aggregated at the outer perimeters of the planted field, with the majority of CRM activities being within 6 and 13 m of the fence. These trends were not observed in the unfenced field. The data suggest that exclusion fences could be used on large-scale plantings of brassica crops (>1ha) as a first line of defence against CRM attack, combined with various additional control methods to reduce CRM populations accumulating 1-13m inside the fence perimeter.
Pest management in vegetable production in “masseira” fields region
Ana Aguiar ........................................................................................................ 33-36
Abstract: In the northwest of Portugal, by the seaside, there is a system of modulating the land named “masseira”. In 1997 this area was classified as vulnerable. For decades, thousands of tones of vegetables have been produced here. But now farmers are concerned about the growing importance of some pests like white fly. Also a new pests as Epitrix similaris and Tuta absoluta have recently been spotted. Farmers undertake integrated pest management and follow good agricultural practices. Increasing problems with pests are warning signs that the production system must change. A new production system is needed and we think that to have a sustainable system, more land should be dedicated to vegetable production. It can be an opportunity for some of the area planted with corn and fodder crops for dairy cattle to change to vegetable production. The demand for vegetables will not decrease but the system of production has to change.

The arrival of Tuta absoluta in Portugal – Pest management on tomato production has to change
Ana Aguiar ........................................................................................................ 37-42
Abstract: The South America tomato moth Tuta absoluta (Polvony, 1994) (Lepidoptera: Gelechiidae) has been in Northern Portugal since September 2009. T. absoluta’s main host is tomato, Lycopersicum esculentum, and this pest attacks, feeds and develops on all plant parts above ground, including fruits. The damage occurs throughout the entire growing cycle of the tomato plant; the potential damage could lead up to 100% yield loss; the biological cycle is completed in 29–38 days, depending on environmental conditions. Different combinations of methods have been proposed to control this pest in Europe – this includes the release of mirids Macrolophus and Neisidiocoris, the release of Trichogramma achaeae and also spraying with Bacillus thuringiensis in addition to authorized insecticides.

Phenology and pest status change of Agrotis segetum related to climate change in Northwest Europe
Peter Esbjerg ........................................................................................................ 43-49
Abstract: Cutworm, the larva of the Turnip moth (Agrotis segetum Schiff.) is known as a strongly varying pest species in NW Europe. Monitoring by sex pheromone trapping is a vital part of pest management. In Denmark the number of localities involved has varied over the years but the monitoring methodology has been unchanged since 1981. Therefore it is possible to trace some phenological changes in response to the gradually warmer climate and suggest explanations to the apparent changes in its pest status over the last decade.
Due to the rising summer temperatures the median date of the trapping (flight) period is now approximately 8 days earlier than in the 1980s, and the previously negligible second generation of moths may be as large as the first generation. In Denmark and southern Sweden the earlier mean flight period in combination with a higher risk of dry periods in summer increases the risk of serious attacks of cutworms. However, the second moth generation is lost to the population in the following year. In addition climate change also involves an increased probability of extreme precipitation events. If several very rainy days coincide with the presence of the youngest cutworms, they will suffer high mortality. The end result of these contradictory possibilities is increased variation, geographically as well as between years, and hence a more difficult forecasting situation.

The spatial distribution of a root fly in a barrier protected crop
Rod P. Blackshaw, Robert S. Vernon, Renee Prasad ........................................... 51- 55
Abstract: We report initial findings of an investigation into the effectiveness of a fence barrier in reducing ingress of Delia radicum flies into a field of rutabaga, and subsequent patterns of oviposition and plant damage. We observed a 98% reduction in the number of flies caught on yellow sticky traps within the fenced crop compared with outside the fence. There was also a change in the sex ratios of catches with a reduction in the proportion of males recovered inside the field. Data analyses of trap counts within and outside the fenced area using GLM methods
showed that for both sets of data there were significant differences in catch between sampling dates, trap locations and also the two sides of the traps. Spatial patterns of trap catches showed that female *D. radicum* were largely restricted to areas adjacent to the fence. Similar patterns were discerned for oviposition and damage to plants.

**Current research on entomopathogenic nematodes in Slovenia with the aim of controlling the pest insects of outdoor vegetable crops**

Žiga Laznik, Matej Vidrih, Jaka Rupnik, Stanislav Trdan ................................. 57-61

**Abstract:** In Slovenia, we started our first studies on entomopathogenic nematodes (EPNs) in 2004. Because EPNs had exotic organism status until 2008, all studies undertaken before 2008 were limited to laboratory experiments. The aim of our investigations was to examine the control activity of different species of EPNs at different temperatures and different concentrations of suspension for species of vegetable pest insect (*Eurydema ventrale, Phyllotreta* spp.). Between 2006 and 2009 we were actively involved in studying EPNs presence and abundance in Slovenian soils and from a total of 520 analysed samples we confirmed EPNs in 24 samples. At present we have evidence of the presence of 5 species of EPNs; *Steinernema affin*e (Bovien), *S. feltiae* (Filipjev), *S. carpocapsae* (Weiser), *S. kraussei* (Steiner) and *Heterorhabditis bacteriophora* (Poinar). The list of indigenous species of organisms used for biological control at present includes the last four species of EPNs. For commercial purposes 7 products can now be used in Slovenia. Their active ingredients are EPNs, but none of them is registered at the moment for controlling pest insects on vegetables grown outdoors.

**Control of leatherjackets in laboratory and field experiments**

K. Van Rozen & A. Ester .................................................................................. 63-67

**Abstract:** Larvae of crane flies (*Tipula* spp.), commonly known as leatherjackets, are an important pest in agriculture and horticulture. Significant damage occurs mainly in crop rotations with grass or high maintenance turfs used in golf courses. Damage may occur in crops like sugar beet, winter cereals and red beet that are grown following pasture or a crop of grass for seed production. The two most important species in Western Europe are *Tipula paludosa* and *T. oleracea*. The larvae damage seedling roots, lower parts of the stem or the lowest leaves at night. During the day, the larvae are generally close to the plants just beneath the surface of the soil. Overall, leatherjackets prefer moist soil conditions and survival is favored by mild winters. Leatherjackets have been controlled previously with the insecticides parathion-methyl and fenitrothion as soil treatments. However, nowadays, no insecticides are allowed against leatherjackets in The Netherlands. In recent years experimental and field trials have been conducted to control leatherjackets in grass, preventing problems in the following year in several crops. Several insecticides, biologicals and nematodes were tested as autumn applications. Bifenthrin and *Bacillus thuringiensis* var. *israelensis* showed the same level of protection as the reference insecticide Parathion-methyl.

**Decision support for vegetable growers in the UK – the HDC Pest Bulletin**

Rosemary Collier ......................................................................................... 69-75

**Abstract:** For the last 6 years, UK vegetable growers have received information about vegetable pest activity through a web site funded by the Horticultural Development Company (the grower–funded organisation that funds horticultural research and development in the UK). The service is called the HDC Pest Bulletin and is hosted by the web site at Warwick HRI. The Pest Bulletin provides forecasts for several pests of vegetable crops, summaries of aphid captures by the network of suction traps run by the Rothamsted Insect Survey and other information on pest numbers and activity as it becomes available. It also provides a certain amount of ‘historical’ data – which can provide useful background information. The Pest Bulletin web pages received 31,000 ‘hits’ between 1 March and 31 October 2009. The peak month was June (nearly 4,800 hits) and the peak day was 24 April (263 hits). The four most popular pages were, in decreasing order of popularity: the HDC Pest Bulletin home page, *Psila rosae, Delia radicum* and *Agrotis segetum*.
The possibilities of protection of organic cabbage crops in Poland

Jolanta Kowalska ........................................................................................................ 77-83

Abstract: In Poland strict regulations are in force limiting the availability of plant protection products (PPPs) for organic farming. At present, only 28 PPPs are qualified for use in this system of agricultural production. Among them, only 16 products are registered to protect vegetables and/or horticultural crops. There is only 1 insecticide, 13 fungicides-bactericides and 2 plant products for the purpose of dressing seeds (not available for individual growers). There are only 4 products registered for cabbage crops and this is a main reason that in Poland the growing of organic cabbage is very difficult. Some research in Poland is directed towards seeking of new possibilities for plant protection. This study involved a review of all the permitted PPPs for organic vegetable crops in Poland. In the next part of paper the results of the insecticidal efficacy of spinosad (0.2 %), neem (0.5%), rape oil (0.1%) and garlic extract (2%) under field conditions are shown. Treatments were applied 2 times with spray intervals of 7 days. In this experiment the caterpillars of Pieris brassicae, P. rapae, Mamestra brassicae and colonies of the aphid Brevicoryne brassicae were observed. Pest presence and percentage defoliation due to feeding by insect pests were assessed. The degree of effectiveness of the treatments was related to changes in leaf consumption and yield. The efficacy of spinosad and neem treatments was the best, whereas two applications of rape oil or garlic extract were insufficient to protect of plants. Tests with microbial protection were involved also. A commercial product containing Trichoderma asperellum was used. Trichoderma treatments increased cabbage head weight and decreased symptoms of disease compared to untreated plants.

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