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Preface	i
List of participants	ii

Emerging pests in Brassicas in Flanders

K. Martens, D. Callens..... 1

Abstract: In cole crops, a remarkable change in pests has been noticed over the last decade. Pests which had hardly been found on Brassica crops before suddenly developed into a major pest problem. On the other hand, pests appearing to be a problem in one year disappeared as fast as they had appeared.

Diapause and post-diapause development in turnip root fly (*Delia floralis*) populations

T.J. Johansen.....3-8

Abstract: Studies have focused on the progress of diapause and post-diapause development in one early- and one late-emerging population of *D. floralis* at various temperatures. For the early emerging biotype, diapause progressed gradually at low temperatures and terminated in late spring. For the late emerging biotype also, diapause progressed gradually for a certain period, but did not end, no matter the duration of chilling. For both populations, diapause developed faster at a constant 18 °C compared to combinations with chilling periods, indicating that chilling was not a prerequisite for diapause development. For the late emerging population, results indicated a second phase of diapause development with a threshold temperature of about 7 °C. However, the rate of this second phase of development did not increase linearly with temperature but had an optimum at about 12 °C. Post-diapause development for both populations was similar and had a lower threshold of about 2 °C. Results explain how delayed emergence in some populations is regulated.

Host-plant finding by the cabbage root fly *Delia radicum* L.

D. Martins, R. Collier, S. Finch.....9-16

Abstract: The aim of this project was to determine how host-plant finding and oviposition by the cabbage root fly (*Delia radicum*) were affected when non-host plants, commonly called “companion plants”, were “grown” alongside *Brassica* (cauliflower) plants. The companion plants were made from both green and brown card, as artificial “companion” plants produce similar disruptive effects as living plants. Fewer eggs were laid on cauliflowers surrounded by green (48% reduction) and brown (32% reduction) companion plants than on cauliflowers surrounded by bare soil (control). Lowering the leaves of the companion plant from three-quarters to half the height of the cauliflower plant reduced the disruptive effect from 48% to 18%. The companion plants also disrupted fly activity under field-cage conditions. For maximum impact in disrupting oviposition by this fly, companion plants need to be green, be at least three-quarters as tall as the *Brassica* plants and be grown in the crop row so that their leaves are amongst those of the *Brassica* plants.

Sex pheromone traps for predicting wireworm populations: limitations to interpretation

R.P. Blackshaw, H. Hicks, R.S. Vernon.....17-21

Abstract. Sex pheromone traps have been developed to trap the adult males of the three main UK wireworm pest species. Recommendations have been issued for their use with an emphasis on monitoring populations in grass the year before potatoes are planted. There are three assumptions underlying this method; that annual wireworm cohorts are of equal size, that adult male distributions relate to larval distributions, and that activity/density relationships are similar for the three species. Data are presented to challenge each of these assumptions and it is concluded that current advisory recommendations lack scientific credibility.

Forecasting Western Corn Rootworm using GPS technology T. Németh, J. Takács, M. Nádasy	23-26
No abstract.	
Dead-end trap cropping D. George, R. Collier, G. Port	27-30
Abstract: <i>Plutella xylostella</i> (L.) (diamondback moth) caterpillars took longer to develop into adults on some potential trap crop plant species compared to others and to cauliflower, a standard main crop plant. Although the number of adults that developed was similar on all plants tested, those plants on which development times were delayed could possibly still act as 'dead-end' trap crops for this pest.	
Physical barriers for insect control in vegetables R.S. Vernon, D. Hunt, P. Pät, .M. Bomford	31-37
Abstract: A number of economic dipteran pests of vegetables, including the cabbage maggot fly, <i>Delia radicum</i> (L.); the onion maggot fly, <i>D. antiqua</i> (Meigen); the seed corn maggot, <i>D. platura</i> ; and the carrot rust fly, <i>Psila rosae</i> (F.), typically fly at low elevations in their crop habitats. From these observations, it was hypothesized that these low-flying pests could be prevented from entering their host crops by erecting screen fences around the field perimeters. In initial trials (1991-1995) which tested various physical properties of fences, exclusion fences 0.9 m in height with downward-sloping screen overhangs about 25 cm long prevented >80% of cabbage fly females from entering enclosed plantings of rutabaga, and associated maggot damage was also significantly reduced relative to unfenced controls. The length of the overhang was found to be quite important, with exclusion efficacy and damage control improving with increasing overhang length (0.0, 12.5, 25.0 and 50.0 cm overhangs were tested). Exclusion fences 1.2 m high with 25 cm long overhangs facing both inside and outside the fence were found to be effective at reducing the colonization of carrot plantings by the carrot rust fly. The number of second generation carrot rust fly adults emerging within enclosures and damage to carrots was considerably and significantly lower than in unfenced control plots. The same fences tested in a commercial onion field reduced the number of female onion flies entering the enclosures by >78%. A portable trench barrier composed of extruded PVC plastic has also been developed to intercept and kill Colorado potato beetles, <i>Leptinotarsa decemlineata</i> (Say) entering fields of potato or field tomato. The efficacy of these trenches was equal to insecticide sprays, with the number of beetles and amount of crop damage being significantly lower than in open untreated plots.	
Towards an IPM strategy for aphid control in brassica crops R. Collier, D. Chandler, G. Prince, A. Jukes, M. Elliott	39-48
Abstract: Aphids infesting the foliage of brassica crops are becoming increasingly difficult to control. The purpose of a 3-year project (2004-6) was to develop an IPM strategy for aphid control on both brassica and lettuce crops. This paper describes a laboratory experiment to measure the susceptibility of adults and nymphs of <i>Myzus persicae</i> and <i>Brevicoryne brassicae</i> to proprietary biopesticides based on insect pathogenic fungi and field experiments to devise insecticidal control strategies for the pest aphids of brassica crops that will minimise the development of insecticide resistance. In the laboratory experiment, BotaniGard (<i>Beauveria bassiana</i>) was the most virulent biopesticide examined. This product consistently resulted in fungal-induced mortality, regardless of aphid species. However, when applied at similar treatment intervals to insecticide spray treatments, it was not as effective in the field. The performance of all insecticide spray treatments varied between species and occasion. Where insecticides were applied to control either insecticide-resistant or insecticide-susceptible clones of <i>M. persicae</i> , as expected, pirimicarb (Aphox) was ineffective against aphids with the MACE resistance mechanism and pyrethroid insecticides were ineffective against aphids with kdr resistance. On occasions, aphid numbers were lower on insecticide-free control plots than on plots treated with insecticide. This was sometimes associated with relatively high numbers of aphids on plants that had been treated with pyrethroids, suggesting that natural enemies had been killed by the application of these broad-spectrum insecticides. Although application of a pyrethroid insecticide treatment is unlikely to be recommended for aphid	

control on lettuce or brassica crops, pyrethroids are applied to control caterpillars. This emphasises the importance of considering the entire pest complex when planning a control strategy; insecticides applied to control one pest may exacerbate problems with another.

Improving the targeting of thrips control measures

J. Burnstone, R. Collier.....49-56

Abstract: The onion thrips, *Thrips tabaci* (Thysanoptera, Thripidae) is a major pest of *Allium* crops in the UK and is the main arthropod pest of both leek and salad onion. Recent research has demonstrated increasing levels of pesticide resistance in UK populations. However, according to growers, control using chemical pesticides has always been poor. The problem lies with the cryptic nature of *T. tabaci* and the difficulty growers have in ensuring that control applications reach their intended target. A field experiment was done to test the hypothesis that ‘the intra-plant distribution of *T. tabaci* is affected by the natural cycle of environmental conditions throughout the day’, with the aim of identifying a predictable pattern of distribution which might help to target control measures.

The salad onion varieties White Lisbon [*A. cepa*] and Guardsman [*A. cepa*/ *A. fistulosum* cross] were direct-drilled into the field at Warwick HRI, Wellesbourne, Warwickshire, UK on five occasions between May and August 2006. The plots were situated close to a leek plot which had been maintained since 2005 and upon which a large population of thrips had overwintered. Sampling took place over a series of eight replicate days between 22 June and 17 October 2006. Samples were taken five times a day from the two varieties of salad onion. The first sample was taken at dawn and the last at dusk; the remaining three samples were spaced evenly throughout the day (dependent on the times of dawn and dusk) with a mid morning, early afternoon and late afternoon sample in each case. Sampling was destructive and the plants were separated into three sections: stem, basal half of leaves and apical half of leaves. The three sections were sealed in separate plastic bags and taken back to the laboratory for assessment. The numbers of live adult and larval *T. tabaci* on each section of each plant were recorded. The majority of adults were found on the basal section of the plant throughout the day. There were hardly any insects on the stem and this was the case across all time points. In the early and late afternoon, there was a clear and statistically significant change in distribution, with a much higher proportion of adults occupying the apical half of the leaves. In contrast, the vast majority of larvae occupied the basal half of the leaves and remained there throughout the day. Based on these data, recommendations could be made to growers to focus their spraying efforts in the early afternoon, and to target warmer days when *T. tabaci* is likely to be more active, in order to increase the efficacy of such control measures.

Thrips control on leek crops

R. Collier, M. Saynor57-62

Abstract: Onion thrips (*Thrips tabaci*) is the most important pest of leek grown in the UK. Thrips may also attack other *Allium* crops, particularly salad onion. Large populations of thrips can develop, causing blemishes to the leaves, which reduce quality and may make the crop unmarketable. In 2003, approximately 83% of the area of *Allium* crops treated with insecticides/nematicides in the UK was treated for thrips and the pyrethroid insecticide, deltamethrin, was the main insecticide used. However, there was some evidence that thrips cannot be controlled effectively with deltamethrin and indeed, insecticide resistance to pyrethroid insecticides in field populations of *T. tabaci* was confirmed in 2006. This paper describes experiments to determine the efficacy and persistence of novel insecticide treatments and evaluate the use of entomopathogenic nematodes as part of an integrated control programme. The aim of a replicated field trial at Warwick HRI, Wellesbourne in 2005, was to compare insecticide treatments applied to leek as seed treatments or foliar sprays. There were three seed treatments and six insecticides applied as foliar sprays. The tenth treatment was the insecticide-free control. The first spray treatments were applied on 14 July and three sprays were applied subsequently. The plots were assessed regularly for thrips damage. Thrips numbers were low during July and August and only started to increase considerably in September.

Tracer (spinosad) was the most effective spray treatment and Hallmark with Zeon Technology (lambda-cyhalothrin) was the least effective. Only one of the four other spray treatments appeared to provide thrips control. All three seed treatments (imidacloprid, two coded treatments) appeared to give a reasonable level of thrips control for several weeks after planting. In 2004, foliar sprays containing nematodes (*Steinernema feltiae*) were applied to small plots of leek at 100,000 nematodes per m². The nematodes survived in the pools of water at the base of each leaf and the stem. Assessments indicated that significant numbers of nematodes survived for up to five days and that they appeared to do so for longest in the absence of wetter (Silwet I-77). In 2005, nematodes were applied to leek in a plot trial in a commercial crop in the Thames Valley. None of the treatments reduced thrips numbers compared with the water-only control treatment.

Integrated Pest Management in vegetables grown for export in Zambia

S. Neave.....63-67

Abstract: Zambia's vegetable export industry is relatively small compared to other countries in the region. Only 12% of Zambia's agricultural activities is vegetable production with three commercial farms engaging in export to Europe and South Africa. The development of Integrated Pest Management on farms is driven by demands from the market through increasing consumer concerns and compulsory certification schemes. Zambia has a climate suitable for continuous cropping of baby vegetables as well as chillies and brassica crops. However, both climatic conditions and cropping practices lead to significant insect pest populations throughout the year, including species such as *Helicoverpa arimgera* and *Liriomyza spp.* Integrated Pest Management strategy development is centred around non-pesticide control options, such as mass trapping, hedges (beneficial organism habitats), harvesting of beneficial insects and the use of products such as oil, soap and plant extracts. For example, successful control of leafminer has been achieved through careful monitoring of adults leading to mass trapping followed by harvesting and releasing of beneficial insects from crop trash.

Testing novel insecticides in film coated cabbage seeds under controlled conditions

G. Siekmann, M. Hommes69-73

Abstract: A lack of available products for managing cabbage root fly (*Delia radicum*) in cole crops has stimulated ongoing efforts to find new insecticides, especially chemistries that can be delivered as seed treatments. Using film coated seeds offers a large number of advantages over drenching or spraying: a lower quantity of active ingredient, adequate coverage, safety for users, less weather dependency, labour and time saving for the farmer. The persistence of the insecticidal action of film coated seeds, however, remains limited and usually covers only young seedlings or transplants. The aim of this study was to compare the efficacy and insecticidal persistence of various neonicotinoids and other novel insecticides applied as seed coatings against cabbage root fly larvae. Seed treated cabbage plants (*Brassica oleracea* var. *capitata*) were raised in pots in a greenhouse and infested with 8 eggs of the cabbage root fly at either 6 weeks or 11 weeks after sowing. Approximately five weeks later the degree of root damage and number of fly pupae were recorded. The most successful treatments were "chlorpyrifos granular" as a standard treatment and seed coats with clothianidin + spinosad as well as thiamethoxam + abamectin. Degrees of efficacy against root damage ranged from 88 % to 99 % when infestation occurred 6 weeks after sowing. We observed a slight loss of efficacy when plants had been infested 11 weeks after sowing. Further tests under glasshouse conditions and in the field are required.

Control of the carrot fly *Psila rosae* F. in celery

K. van Rozen, A. Ester75-82

Abstract: The larva of the carrot fly *Psila rosae* F. is a well known pest insect in celery. Celery grown for tuber production may suffer cosmetic damage due to feeding and even plant loss through carrot fly damage to seedlings. National and international policy and regulation have reduced the availability of insecticides that can be used against this pest in celery. In 2006 and 2007 two field trials were conducted to search for alternative insecticides and methods of application. Different active ingredients provided reliable

control. Insecticide application methods such as tray treatment or application prior to transplanting showed promising results, with long term efficacy.

New approaches to integrated control of *Rhizoctonia solani* in carrot (*Daucus carota* L.)
F. Villeneuve, D. Breton, G. Maignien, E. Sclanich, J. Poissonnier.....83-92

Abstract: *Rhizoctonia solani* is a relatively new plant pathogen on carrot in southwestern France. This pathogen can cause various symptoms such as: damping off of seedlings, crown rot, constricted crowns and sunken, elliptically-shaped spots. At present there are no control techniques available for growers. The aim of this study is to determine the available options – both chemical and alternative techniques – for addressing problems related to *R. solani*. Our results have confirmed that there are differences in varietal susceptibility to *R. solani*. Some varieties show less susceptibility to tap root lesion symptoms in particular. Regarding the potential of antagonist microorganisms, the agents and strains tested did not provide a significant reduction in damage under the conditions of our experimental study. Our trials highlighted the efficacy of coating seeds to protect against seedling damping off and, to a lesser extent, against the other symptoms as well. Finally, regarding the possible use of azoxystrobin, we achieved good results with respect to seedling damping off and spot symptoms.

Natural resistance of cabbage against three insect pests

S. Trdan, N. Valič, I. Vovk, M. Martelanc, B. Simonovska, R. Vidrih, M. Vidrih, D. Žnidarčič93-106

Abstract: The paper presents the preliminary results of a study on the effect of 11 compounds found in cabbage leaves (epicuticular wax, α -amyirin, β -amyirin, lupeol, sucrose, glucose, fructose, vitamin C, palmitic acid, stearic acid, and arachidic acid) on the natural resistance of cabbage to onion thrips (*Thrips tabaci*), flea beetles (*Phyllotreta* spp.) and cabbage stink bugs (*Eurydema* spp.). Twenty cabbage genotypes were included in a field experiment and these were artificially grouped as follows: 9 early, 5 mid-early, 6 mid-late (based on the longevity of growing period), 3 red, 17 white (based on the colour), 14 hybrids and 6 non-hybrid varieties (based on their genetic origin). We showed statistically significant differences between cabbage genotypes in the feeding damage caused by all three pests, the net weight of the cabbage heads and the yield loss caused by onion thrips. Based on the results of one year's research we have shown that, for all of the groups of cabbage genotypes listed above, there was a clear negative relationship between damage by onion thrips, flea beetles and cabbage stink bugs and the epicuticular wax content. However, further work is required to establish the effect of the other compounds.

Phytotoxic effect of herbicides on green pea (*Pisum sativum* L.)

E. Nádasy, G. Wágner.....107-112

Abstract: The pea crop is especially sensitive to weed damage; so great attention should be paid to its cultivation. Effective weed control promotes continuous development and ripening of the pea crop and makes harvesting easier. We did a replicated field experiment in spring 2006, using 5 herbicides with different modes of action. We tested their effect on the growth of the vegetative parts of pea plants. Afalon Dispersion (linuron), Command 48 EC (clomazone), Pledge 50 WP (flumioxazin), Sencor 70 WG (metribuzin) were applied pre-emergence and Basagran (bentazon) post-emergence. To determine any phytotoxic effects of the herbicides, we collected samples on two different occasions and made a visual assessment. The first sample was taken at the 2-3 leaf stage, the second at flowering. Each of the samples contained 10 plants, collected at random from the plots. The length, fresh and dry weight of the shoots was determined. Afalon Dispersion (linuron) had the greatest effect on the growth of the pea plants, causing severe phytotoxic symptoms. The double doses of Pledge 50 WP and Command 48 EC also had damaging effects on the pea plants.