SESSION 6
POSTERS

Incidence and population dynamics of the black melon bug (*Coridius viduatus*) in the New Valley, Egypt

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INTRODUCTION

The black melon bug (BMB), *Coridus* (= *Aspongopus*) *viduatus* (Hemiptera, Heteroptera: Pentatomidae), has become a real menace for the cultivation of cucurbit crops in the New Valley, Egypt. Bohlen & Freidel (1979), Ahmed (1992) and Soliman (1998) found that, in the New Valley, the pest caused very serious yield losses if no chemical control was carried out. In Saudi Arabia, Walker & Pittway (1987) recorded that BMB causes major damage to melon crops. Ben-Yakir *et al.* (1996) observed that an infestation of 20 adults of BMB would kill one squirting cucumber plant within a week, with almost no recovery of lesser-infested plants. This indicated that besides initial feeding, salivary toxins of insects might also be involved. BMB is also known as a pest of melon in Namibia and is very common during the late autumn; traditionally, the bugs are controlled by picking them off by hand, which is effective but labour intensive (Anonymous, 1998). The present investigation was carried out to study some ecological aspects and some factors affecting the population of BMB on some cucurbit crops in the New Valley, Egypt.

MATERIALS AND METHODS

Field experiments were carried out during 2000 and 2001, to study the population dynamics of BMB. Sweet melon (*Cucumis melo* var. *aegyptiacus*) was planted on the recommended date (15 April) and conventional cultural practices were then followed; no chemical pesticides were applied during the study. Weekly counts of pests and natural enemies were taken at random, from the vegetative to ripening stages of the host plants, using simple square frames (50 × 50 cm) as sampling grids. On each occasion, all stages of the pest and associated natural enemies were counted directly on the plants in 8 sample grid squares.

The susceptibility of three cucurbit crops (watermelon, *Citrullus lantatus*; sweet melon, *C. melo* var. *aegyptiacus*; cantaloupe, *Cucumis melo* var. *cantaloupensis*), the effect of planting dates and three rates of fertilizer on infestation levels of the pest were also studied, using a split-split-plot design and three replicates (42 m^2 each). Sample size was as mentioned above.

The damage caused by the pest was also estimated in two sets of experiments of an equal size (90 plots each). In the first experiment, the plants were kept free from the pest, whereas in the second the plants were left open to natural pest infestation. At the end of the season, fruits from each plot were weighted separately and yield differences evaluated.

To estimate the rate of egg parasitism, egg masses of the pest were collected weekly from the cucurbit plants and placed separately in tubes (2 × 10 cm) and inspected daily to count the number of emerged parasitoids (EP) and the number of parasitizied eggs which failed to complete development (EFD). The percentage of parasitism was calculated as follows:

$$\text{parasitism (\%)} = (EP + EFD / \text{total number of eggs}) \times 100.$$

RESULTS AND CONCLUSIONS

The pest appeared on the sweet melon plants from the beginning of May onwards, and populations developed progressively up to the end of July, with two distinct peaks. Greatest numbers of the pest occurred during June, when the plants were in the fruit-set stage, which coincided with warm (23 to 44°C), dry (17 to 32% RH) weather. Sweet melon was the most susceptible cucurbit crop to BMB, harbouring the highest population density; cantaloupe was moderately susceptible and watermelon least susceptible. Lowest population densities of BMB were recorded on plants from early planting dates. Watermelon showed the least response to increased rates of fertilizer. To reduce the damage caused by BMB in the New Valley, Egypt, it is recommended to cultivate watermelon by planting early (April) and applying fertilizer at a rate of 50 kg N, 30 kg P_2O_5 and 25 kg K_2O per ha.

An average reduction in the cucurbit crop production due to BMB infestation in the New Valley reached about 53%.

An encyrtid (*Ooencyrtus* sp., Hymenoptera: Encyrtidae), as an egg parasitoid of BMB, was the most dominant natural enemy. Rates of parasitism were relatively low (0 to 20%) at the beginning of host colonization in May, but increased to a maximum level (98%) during July and August. Parasitism reached 84%, 77% and 30% during summer, autumn and spring, respectively. The ladybird *Coccinella septempunctata* (Coleoptera: Coccinellidae) was the most common predator, but was present in only small numbers.

REFERENCES

Ahmed S A (1992). *Studies on some pests infesting some vegetable crops.* M.Sc. Thesis, Faculty of Agriculture, Zagazig University, Egypt.

Anonymous (1998). *Information from the Entomology Center, Namibia, Natural Museum of Namibia.* www.natmus.cul.na/ento/pests/coridius/coridius.htm

Ben-Yakir D; Gral D; Chen M; Rosen D (1996). Potential of *Aspongopus viduatus* F. (Heteroptera: Pentatomidae) as a biological agent for squirting cucumber, *Ecballium elaterium* (L.) A. Rich (Cucurbitacae). *Biological control* 7, 48–52.

Bohlen E; Freidel J W (1979). Crash programme – Plant Protection – New Valley, Egypt. *German Agency for technical cooperation.* (*GTZ*), 56 pp.

Soliman M H A (1998). *Studies on certain pests infesting some cucurbitaceaous plants.* M.Sc. Thesis, Faculty of Agriculture, Zagazig University, Egypt.

Walker D H; Pittway A R (1987). *Insects of eastern Arabia.* Macmillan: London.

Presence of two quarantine broadleaf weeds in imported vegetable seed and grain samples

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INTRODUCTION

Bindweed (= field bindweed) (*Convolvulus arvensis*) (Convolvulaceae) and carelessweed (= redroot pigweed) (*Amaranthus retroflexus*) (Amaranthaceae) are broadleaf weeds of quarantine concern to Cuba (Official List of Quarantine 2004), and both are present in cultivations of economic importance at a world level. These weeds compete with crops, and also serve to spread various pests and diseases (Montemurro & Tei, 1998).

Bindweed is troublesome in temperate and Mediterranean environments, and is often found in tropical regions. Annual crops, such as cereals and grain legumes, appear particularly susceptible to yield loss following bindweed infestations, with reductions of 20–80% reported (Black *et al.*, 1994). Carelessweed is an aggressive and competitive weed of many crops, and has become naturalized throughout the temperate regions of both the northern and the southern hemispheres.

The presence of bindweed and carelessweed seeds in imported seeds and grain shipments is a problem directly related international trade. For this reason, exporter countries are required to ensure that their products arrive free of quarantined species, and also of other noxious species of economic importance. Nevertheless, in spite of these demands, these weeds continue to be detected in imports. The main objective of the present work is to assess the incidence of seeds of these two economically important weeds in imported seed and grain consignments.

MATERIALS AND METHODS

From 1999 to 2003 a total of 8,502 samples of imported seeds and grains were analyzed. All observations were made in the Weed Department of the Central Laboratory of Vegetable Quarantine, Plaza, Cuba.

The seed samples were placed in a white tray and were examined by eye or with the aid of a hand lens, depending upon the size of the seeds. Those unable to be identified in this way were subsequently examined under a stereoscopic microscope. Seed comparisons were used for diagnosis, together with reference to descriptions provided by Dobrojotov (1961) and Holm *et al.* (1977).

Percentages of bindweed and carelessweed seeds present were recorded according to the countries of origin and crops in the total number of samples analyzed during the study period, as well as their incidence in the total of samples examinedfrom the various exporting countries.

RESULTS

Bindweed and carelessweed were detected in 25 different crops (the former in 17 crops and the latter in 15 crops), coming from nine different countries: Canada, Israel, Italy, Japan, Mexico, the Netherlands, Spain and Turkey and the USA.

The highest incidence of bindweed was registered in radish seed samples from Spain (57.1%) and Italy (35%), wheat from the USA (25.6%), and parsley and spinach from Italy (14.3% and 12.5%, respectively). This weed is present in all of these countries (EPPO, 2003), and is considered a major weed of vegetables in Spain and of wheat in USA (Holm *et al*., 1977), where it is widespread (Black *et al*., 1994; EPPO, 2003). With regard to carelessweed, the highest incidences of contaminated seed samples were found in China aster (*Callistephus chinensis*) from the Netherlands (21.4%), and in celery and turnip from Italy (14.3% and 12.5%, respectively). Aellen & Akeroyd (1993) reported the presence of carelessweed in the Netherlands, and Holm *et al*. (1991) reported that the same weed was widely distributed in Italy and the USA. Most contaminated samples of crop seeds arrived from Italy.

Analyzing the samples for countries, the highest percentages of bindweed and carelessweed seeds were found in samples originating from the USA and Canada, respectively.

These results indicate the risk that exists for the introduction of these weeds into Cuba, which could result in considerable economic losses. Additional costs would be incurred by requiring qualified personnel for the establishment of quarantine measures and to implement an integrated programme for control and eradication of the weeds.

REFERENCES

Aellen P; Akeroyd J R eds (1993). *Amaranthus* L. In: *Psilotaceae to Platanaceae*. Flora Europea, Vol. 1. Cambridge University Press: Cambridge.

Black I D; Matic R; Dyson C B (1994). Competitive effects of field bindweed (*Convolvulus arvensis* L.) in wheat, barley and field peas. *Plant Protection Quarterly* **1,** 12-14.

Dobrojotov B H (1961). *Semillas de malas hierbas*. Moscú.

EPPO (2003). *PQR database (version 4.2)*. European and Mediterranean Plant Protection Organization: Paris.

Holm L G; Plucknett D L; Pancho J V; Herberger J P (1977). *The World's Worst Weeds. Distribution and Biology*. University Press of Hawaii: Honolulu.

Holm L G; Pancho J V; Herberger J P; Plucknett D L (1991). *A Geographic Atlas of World Weeds*. Krieger Publishing Company : Malabar.

Montemurro P; Tei F (1998). Weed Management in Vegetables. *Proceedings XIth Italian Weed Research Society S.I.R.F.I. Symposium "Weed Management in Vegetables", Bari, 12-13 November 1998*, pp. 1-61.

Invasive potential of the weed *Parthenium hysterophorus* – the role of allelopathy

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INTRODUCTION

Parthenium hysterophorus (hereafter *Parthenium*: family Asteraceae) is an invasive exotic weed from tropical America that has invaded the plains of India and is also spreading rapidly to hilly tracts in the north-western Himalayas. Upon invasion, it establishes quickly in the alien environment, thereby resulting in changes in the structure and dynamics of native ecosystems. Although the weed is found mostly in wastelands, it also grows well in cultivated fields, pastures and along roadsides. It forms pure stands at the expense of native vegetation, adversely affects the species diversity of the region, and also affects crop yield, animal husbandry and human health (Kohli & Rani, 1994; Evans, 1997). Such dominance may possibly be due to some chemical interference or allelopathy that gives it an additional advantage over native plants. This is further supported by a recently proposed hypothesis that highlights allelopathy as a novel strategy for the invasion of alien environments (Heirro & Callaway, 2003). In *Parthenium*, most allelopathic studies pertain to the adverse effect on crops (Evans, 1997), and no study is available regarding effects on native or naturalized non-invasive plant species. A study was conducted, therefore, to establish the allelopathic effect of *Parthenium* on two non-invasive naturalized species (*Bidens pilosa* and *Cassia occidentalis*) that seem to be adversely affected by its invasion.

MATERIALS AND METHODS

A *Parthenium*-infested (PI) or *Parthenium*-free (PF, control) area was selected and the number of species types and vegetal biomass was determined in both, using quadrats. Further, debris and soil (upper 3–5 cm profile) from PI or PF area were collected. Soils were brought into laboratory, air-dried and sieved (2 mm mesh); *Parthenium* debris was shade-dried and powdered. Soils and debris powder were then stored in polythene bags for further use. For the laboratory and growth bioassay, seeds of the non-invasive weeds *B. pilosa* and *C. occidentalis* were collected locally. Debris (4 g) was soaked in 100 ml of distilled water for 15 h at 24°C, followed by filtration through a double layer of muslin cloth and then Whatman no. 1 filter paper, to obtain full strength extracts (X) that were diluted to obtain half-strength extracts (X/2). The effect of the debris extracts (with distilled water as a control) was studied on early seedling growth (length and weight, after 1 week) of test plants in a laboratory bioassay in Petri dishes kept under controlled conditions in a growth chamber. For growth studies, PI and PF soil (250 g) was placed in 250-ml polystyrene cups (5 replicates), within which were sown 7 seeds each of *B. pilosa* and *C. occidentalis*. After 2 weeks, the length (from root tip to shoot tip) of 20 randomly selected seedlings from each treatment was measured; their biomass was also determined Total water-soluble phenolics in the debris extracts and infested soils were estimated by the method of Swain & Hillis (1959), using Folin-ciocalteu reagent. In each randomized experiment there were 5 replicates/ treatment; data were analyzed at $P < 0.01$.

RESULTS AND DISCUSSION

Compared with 39 plant types in the PF area, only 14 were present in the PI area, thereby indicating a sharp decline in vegetation diversity. Even vegetal biomass was drastically reduced in PI areas (401 g/m^2) compared with PF areas (998g/m^2), indicating that, upon invasion by *Parthenium*, diversity and biomass of the native species are drastically reduced. Allelopathy has recently been proposed as novel mechanism for the spread of invasive species in alien environments (Heirro & Callaway, 2003); therefore, it was explored as an invasive strategy against two non-invasive weeds. Early growth (seedling length and dry weight) of both *B. pilosa* and *C. occidentalis* was significantly reduced in PI soil compared with PF soils (Table 1). Growth reductions of test weeds in PI soils indicate the presence of phytotoxins, probably produced by *Parthenium*. Further, extracts prepared from debris also retarded growth of both weeds (Table 1). This indicated an influx of chemicals, from weed debris into the soil, that interfere with the growth of non-invasive naturalized plants.

Table 1. Effect of *Parthenium debris* extracts and infested soil on growth of test plants.

Treatment	*B. pilosa*		*C. occidentalis*	
	Seedling length (cm)	Dry weight (mg/plant)	Seedling length (cm)	Dry weight (mg/plant)
Parthenium free soil	6.37	3.35	11.61	26.20
Parthenium infested soil	4.12*	1.60*	7.75*	20.71*
Distilled water control	5.28	2.40	7.38	28.13
Debris extracts X	1.80*	1.70*	2.05*	21.26*
Debris extracts X/2	0.29*	0.66*	0	0

* Significantly different from respective control at $P < 0.01$.

The chemical analysis of infested soils and debris revealed the presence of water-soluble phenolics that play a significant role in allelopathy (Rice, 1984). The PI soil contained a significant amount of water-soluble phenolics (11.82 mg/kg) compared with PF soil (1.67 mg/kg). Even the debris was rich in phenolics (11.87 mg/g). In natural environments, these phenolics (upon release) interfere with the growth of natives that are not naturally adapted to tolerate chemical stress caused by allelochemicals. Presumably, allelopathic interference of *Parthenium* plays a major role in its successful colonization of alien environments, resulting in a decrease in vegetation density and biomass in infested areas.

REFERENCES

Heirro J L; Callaway R M (2003). Allelopathy and exotic plant invasion. *Plant and Soil* **256**, 29-39.

Evans H C (1997). *Parthenium hysterophorus*: a review of its weed status and the possibilities for biological control. *Biocontrol News & Information* **18,** 389-398.

Rice E L (1984). *Allelopathy*. Academic Press: Florida.

Kohli R K; Rani D (1994). *Parthenium hysterophorus* – a review. *Research Bulletin (Science), Panjab University* **44**, 105-149.

Swain T; Hillis W E (1959). The phenolic constituents of *Prunus domestica* I. The quantitative analysis of constituents. *Journal of Science of Food and Agriculture* **10**, 63-68.

Possible host plants for larvae of western corn rootworm (*Diabrotica virgifera virgifera*)

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INTRODUCTION

Since the late 1960s it is known that larvae of western corn rootworm (WCR) (*Diabrotica virgifera virgifera*) are not simply monophagous on maize; Branson & Ortman (1967, 1970) recorded nearly 20 possible monocotyledonous host plants for the larvae. This might not be important for the USA, where maize is usually grown in monocultures or in rotation with soybean which, in common with all dicotyledonous plants, is not a suitable host for the larvae of WCR. In most parts of Europe, however, a crop rotation with cereals and grassy fodder crops is common, which may result in an increase in the percentage of larvae of WCR that survive on such hosts. For eradication, which is the policy in the EU, rotation is an important means of controlling WCR. For this, and for integrated control in regions where WCR is already established, the availability of all suitable host plants needs to considered. We have, therefore, investigated the suitability of various cereals and monocotyledonous weeds as hosts for the larvae of WCR.

MATERIAL AND METHODS

All plants were grown in individual pots (18 × 18 cm), each filled with 3 kg of soil. One maize plant was grown per pot; a field-typical number of plants was used for the other test of species selected as possible alternative host plants. Cereals and typical grass weeds of agricultural fields in central Europe, which might be exposed to larvae of WCR, were selected as the alternative hosts. Five to ten neonate larvae (not older than 24 hrs) were placed into each pot. The eggs originated from Romania, and were supplied by S Toepfer (University Goedoelloe, Hungary). The plants were kept in a climatic chamber at 25°C, 65% RH and 16h : 8h light. After 3–4 weeks, when most larvae reached the third larval or the pupal stage, the trials were interrupted because of current quarantine regulations. The soil was searched by hand for live larvae or pupae, which were counted and weighed. The larvae or pupae were then isolated in glass tubes, and the number and sex of adult beetles that eventually emerged recorded. Each experiment consisted of five replicates of from one to three different plant species, with maize as the control (except in experiment 6).

RESULTS AND DISCUSSION

Besides cereals, four (out of eight) species of grasses tested in these experiments were suitable host plants for larvae of WCR reared under laboratory conditions (Table 1). Members of the genus *Setaria*, which is a common weed in many crops, were especially suitable. Also, cereals such as barley and wheat could be possible host plants, and should be tested more thoroughly. In most cases larvae that fed on grasses or cereals were lighter in weight than those fed on maize. Only the larvae that fed on *Setaria* were nearly the same weight as those fed on maize. Most adults that emerged were males, independent of the larval food plant. In future trials host plants at different phenological stages and other species of plants will be assessed. These laboratory result need to be confirmed by field trials, and the coincidence in the field of possible host plants and larvae of WCR need to be established. Preliminary field experiments done in Romania in 2004 indicated that *Setaria glauca* is also a suitable host plant for larvae of WCR in the field

Table 1. Larval development of WCR (% surviving larvae or pupae, 3–4 weeks after release of neonate larvae) on maize and several other possible host plants.

Tested plant species	No. of expt	No. of larvae inserted	No. larvae surviving	% surviving	% surviving compared with maize (= 100%)
Summer wheat	1	25	1	4	14.3
Summer wheat	3	25	0	0	0
Winter wheat	2	25	1	4	12.5
Summer barley	3	25	2	8	25
Triticale	3	25	0	0	0
Echinochloa crus-galli	5	30	0	0	0
Elytrigia repens	1	25	1	4	14.3
Elytrigia repens	6	45	9	20	–
Poa annua	5	30	0	0	0
Setaria glauca	4	25	5	20	50
Setaria verticillata	4	25	1	4	10
Setaria verticillata	5	30	0	0	0
Setaria viridris	4	25	5	20	50
Sorghum sudanense	6	45	0	0	–
Maize	1	25	7	28	100
Maize	2	25	8	32	100
Maize	3	25	8	32	100
Maize	4	25	10	40	100
Maize	5	30	10	33	100

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REFERENCES

Branson T F; Ortman E E (1967). Host range of larvae of the Western Corn Rootworm. *Journal of Economic Entomology* **60**, 201-203.

Branson T F; Ortman E E (1970). Host range of larvae of the Western Corn Rootworm: Further studies. *Journal of Economic Entomology* **60**, 800-803.

Preliminary observations on the biology and management of western corn rootworm (*Diabrotica virgifera virgifera*) in Italy

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INTRODUCTION

Western corn rootworm (WCR) (*Diabrotica virgifera virgifera*) (Coleoptera: Chrysomelidae) is one of the major pest of corn (*Zea mays*). This pest was introduced to Europe in 1992, in Serbia (Sivcev *et al.*, 1994), and then spread rapidly in many countries. In Italy, WCR was first recorded in Veneto, in 1998 (Furlan *et al.*, 1998), and it is now present in virtually all northern regions. The highest population density is in Lombardy, where crop damage has been observed since 2002 (Boriani *et al.*, 2002; Jucker, 2004).

Because of the great importance of corn for Lombard agriculture, a research project (funded by a grant from the Regione Lombardia) started in 2003–4, with the aim of extending the knowledge of WCR in our region.

Preliminary data (obtained in the first research year) on the biology of WCR, on the evaluation of different trapping system and on agronomic management measures are reported here.

MATERIALS AND METHODS

In 2004, observations on the pest were made in three different localities in Lombardy. Pre-imaginal stages were monitored by collecting soil samples, from June onwards, in order to obtain biology information. To monitor adults, six types of trap were compared, with three replicates: yellow sticky trap (Pherocon AM and Csalomon YST), PAL and PALs (Csalomon), Novapher Dvv-n and Dvv-l (produced by Novapher, Italy). Pheromone and kairomone baits were replaced every 5 weeks. Traps were set in June and examined weekly.

To determine the larval host-range of WCR, barley (*Hordeum vulgare*), rye (*Secale cereale*) and wheat (*Triticum aestivum*) were sown on 7 November 2003; also, alfalfa (*Medicago sativa*) and soybean (*Glycine max*) and were sown on 10 May 2004. Each plot had been cultivated with corn during the previous year. Three emergence cages (3 × 3 × 2 m) containing a yellow sticky trap were placed on each plot, and examined weekly from late June up to harvest. Further, summer corn was sown on 8 August 2004, and the presence of adults monitored by means of yellow sticky traps in emergence cages.

RESULTS AND DISCUSSION

Larvae were found from the end of June until the end of July. The first specimens collected were 2nd and 3rd instar larvae, suggesting that egg hatch had begun in at least the first half of June. Pupae were present from the end of June onwards. Adults first appeared at the end of June and continued to be found up to the beginning of October.

According to mean captures, flight curves for both pheromone- and kairomone-baited traps showed three distinct peaks: at the beginning of July, at the beginning and at the end of August. These fluctuations were probably due to structural problems. Novapher traps (experimental traps) showed a similar trend to PAL traps, with less-intense fluctuations. Further, the same trend was shown by Novapher Dvv-l traps that were baited with a long-lasting pheromone, set at the beginning of the season and never changed. Csalomon YST traps demonstrated the same trend as PAL and PALs traps. Pherocon AM traps caught up to 20 times more adults than the Csalomon YST traps, exceeding the damage threshold; Csalonom YST catches were always below threshold levels.

Crop rotation was confirmed as an efficient control practice for WCR, because no adults were caught on the traps in the emergence cages. Some adults were collected in the summer corn, which might indicate that a few eggs can hatch very late in the season; as a consequence, delayed sowing would not be effective in eradicating WCR. Moreover, because of the presence of fresh vegetation and silks, summer corn is very attractive to ovipositing females. For these reasons summer corn must be excluded from crop rotation options.

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REFERENCES

Boriani M; Bettoni D; Notarangelo N (2002). Primi danni da Diabrotica su mais in Italia. *Informatore agrario* **31**, 61.

Furlan L; Vettorazzo M; Ortez A; Frausin C (1998). *Diabrotica virgifera virgifera* è già arrivata in Italia. *Informatore fitopatologico* **12**, 43-44.

Jucker C (2004). Il punto sulla Diabrotica in Europa. *Informatore agrario* **6**, 136-142.

Sivcev I; Manojlovic Krnjajic S; Dimic N; Draganic M; Baca F; Kaitovic Z; Sekulic R; Keresi T (1994). Distribution and harmful effect of *Diabrotica virgifera virgifera* LeConte (Coleoptera, Chrysomelidae), a new maize pest in Yugoslavia. *Zastita bilija* **1**, 19-26.

Alternative methods for the protection of white horse chestnut trees against the leaf miner *Cameraria ohridella*

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INTRODUCTION

In Poland, the large-scale occurrence of horse chestnut leaf miner (*Cameraria ohridella*) on white horse chestnut (*Aesculus hippocastanum*) has been observed for several years. The pest is a cause of premature leaf-fall (Gilbert & Gregoire 2002), and the aim of the current research was to assess the effectiveness of different methods for protecting trees.

MATERIALS AND METHODS

The research was done from autumn 2003 to autumn 2004, in selected green areas of Szczecin (West Pomerania, Poland), where a high incidence of leaf miner damage (25–70%) had previously been observed. Four transects, each with a different control method, were employed as follows:

- Transect A (8 trees): leaf raking (= mechanical method);
- Transect B (10 trees): leaf raking + use of sticky bands on tree trunks;
- Transect C (42 trees): leaf raking + use of a bio-preparation (= biological method);
- Transect D (9 trees): leaf raking + spraying of tree crowns (= chemical method).

Transects A and B were located near transport routes with considerable traffic congestion, and C and D in the centre of green areas (and thereby isolated from the direct impact of traffic pollution). In all transects (in autumn 2003), all fallen leaves were raked off and sent for composting. In transect B (in March 2004), colourless sticky bands (1 m wide) were placed around tree trunks at a height of 1.5 m from the ground. In transect C (in April 2004), the effectiveness of the biological preparation "Larvanem" (see Copping, 2004) was tested against leaf miner pupae that remained after autumn leaf raking and had then overwintered near the soil surface (1,000 million juveniles of the entomopathogenic nematode *Heterorhabditis bacteriophora* being applied to a ground surface of 2,000 m^2, in order to limit the number of moths eventually emerging). In transect D, the tree crowns were sprayed with a preparation of diflubenzuron (as "Dimilin 25 WP"), at a rate of 0.9 kg/ha; the chemical was applied twice (on 10 May 2004 and on 24 July 2004), to coincide with the start of emergence of first- and second-generation moths respectively.

RESULTS AND DISCUSSION

The effectiveness of the tested control methods was assessed in the various transects on the basis of the degree of leaf damage caused, according to the scale adopted by Baranowski *et al.* (2002) (see Table 1). At the beginning of vegetative growth, during the leafless period, first-generation moths emerging from pupae became stuck in large numbers on the sticky bands (transect B), which could explain the differences in the degree of leaf damage caused by the pest larvae at the beginning of their development in comparison with transect A. The first signs of leaf mining were observed in June. Biological treatment against overwintered pupae in the early spring (transect C) effectively reduced feeding by first-generation larvae, which was of importance for host trees during the further period of their development. Least leaf damage was observed where chemical treatment was applied twice (transect D). Although the degree of leaf damage cause by the pest varied according to the type of control method used, the greatest amount of damage also occurred in the two transects (A and B) located near transport routes, which were a source of pollution, and this may have compounded differences between treatments. The condition of white horse chestnut trees may be affected by many biotic factors (e.g. pests and pathogenic fungi) and abiotic factors (e.g. low temperatures, water shortages, high soil salinity and pollution connected with road traffic) (Baranowski, 2002). Pollution, for example, may influence host tree condition and lessen their resistance to pest attack. Leaf raking alone appears insufficiently effective to reduce the population of horse chestnut leaf miner. Therefore, protection of host trees needs to be done comprehensively, and to include more effective methods: e.g. the use of bio-preparations with entomopathogenic nematodes against the first generation of the pest, followed by conventional chemical treatment against the second and third generations.

Table 1. The incidence of leaf damage, on white horse chestnut trees, caused by larvae of horse chestnut leaf miner: damage scale according to Baranowski *et al.* (2002).*

Week of observation**:	1–8	9–11	12–13	14	15–17	18–20	21	22	23–29	30–31
Transect A:	0	1	2	3	3	3	3	4	4	4
Transect B:	0	1	1	2	3	3	3	3	4	4
Transect C:	0	1	1	1	1	2	3	3	3	4
Transect D:	0	1	1	1	1	1	1	1	1	1

* 0 = undamaged; 1 = slight damage [up to 10% of leaf surface]; 2 = medium damage [10 to 25% of leaf surface]; 3 = heavy damage [25% to 70% of leaf surface]; 4 = very serious damage [> 70% of leaf surface].

** Week 1 = 30 April 2004; week 31 = 10 November 2004.

REFERENCES

Baranowski T (2002). W obronie szrotówka kasztanowcowiaczka.*Ochrona Roślin* **11-12,** 6.

Baranowski T; Parus A; Fajfer B (2002). Występowanie szrotówka kasztanowcowiaczka (*Cameraria ohridella* Deschka&Dimic) na kasztanowcach w Poznaniu w latach 2000-2001. *Progress in Plant Protection* **42**, 654-657.

Copping L G (ed.) (2004). *The Manual of Biocontrol Agents.* BCPC: Alton.

Gilbert M; Gregoire J C (2002). Visual, semi-quantitative assessments allow accurate estimates of leafminer population densities: an example comparing image processing and visual evaluation of damage by the horse chestnut leafminer *Cameraria ohridella* (Lep. Gracillariidae). *Journal of Applied Entomology* **127**, 354-359.

Distribution and spread of *Pepino mosaic virus* (PepMV) in tomatoes cultivated in a re-circulating hydroponic system

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INTRODUCTION

Pepino mosaic potexvirus (PepMV), whose host range is mainly limited to Solanaceae (Salomone & Roggero, 2002), was initially described in 1974 as causal agent of a viral disease of pepino (*Solanum muricatum*) in Peru. The virus was detected in tomato plants (*Lycopersicon esculentum*) in 1980 (Jones *et al.*, 1980), and in 1999 it was found in Europe infecting glasshouse tomatoes in the Netherlands (EPPO 2000; van der Vlught *et al.*, 2000). Since this first report in the European Community, PepMV was placed on the EPPO Alert List. The virus was monitored during subsequent years and found in several European tomato-growing regions (including Belgium, the Canary Islands, France, Germany and Spain), predominantly in indoor cultivated tomato plants, but then eradicated (Roggero *et al.*, 2001; EPPO, 2001). Because PepMV is easily transmitted by contact and propagation, and tomato is a major crop in Europe, putative ways of transmission of PepMV (as well as the susceptibility of tomato cultivars) have to be investigated in detail, to evaluate the pathogen as an invader and its potential to spread.

METHODS AND RESULTS

The susceptibility of several tomato cultivars to two different PepMV isolates (PepMV-Peru, DSMZ PV-0554 and PepMV-France, isolated from infected French tomato fruits) was tested in a glasshouse under different culture conditions. Two tomato plants of several different cultivars (e.g. Backmor, Counter F1, Hildares F1, T3, T7, T9, Rawan F1 and three local cultivars from Syria), were mechanically inoculated at the four-leaf stage. Plants were cultivated in standard soil and grown for 10 weeks in a glasshouse under natural light and a temperature regime of from 16 to 24°C. In parallel, four plants of seven different tomato cultivars (Balkonstar, Counter F1, Frühzauber, Gnom F1, Goldene Königin, Hildares F1 and Master F1) were planted in a re-circulating hydroponic system (nutrient solution after De Kreij *et al.*, 1997) and grown for 12 weeks under 15 h light/9 h dark cycle (RH 60% and temperature ranging from 18°C (night) to 20°C (day). After inoculation with either PepMV-Peru or PepMV-France, plants were tested by DAS-ELISA. After three weeks, all inoculated tomato cultivars were PepMV positive in DAS-ELISA, but (compared with healthy control plants) only tomatoes grown in soil exhibited visible symptoms such as reduced growth and distorted leaves with chlorotic lesions (typical for a PepMV infection in tomato).

To investigate PepMV distribution via nutrient solution and spread in tomato, plants were grown in a re-circulating hydroponic system in a glasshouse for 14 weeks. Seedlings (cv. Hildares) at the seven-leaf stage were planted in troughs with re-circulating nutrient solution (as described above). Plants were cultivated outside under global radiation of 32 $MJ/m^2/d$, 65 % RH, and mean daily temperatures of from 20 to 28°C. Seven non-inoculated test plants (separated from eight PepMV-infected tomato plants by 1 m spacing and an additional fleece), serving as inocula, were examined by DAS-ELISA for virus infection. Sampling for ELISA was carried out once a week, using roots and leaf sections as well as newly grown plant parts (such as inflorescences, fruits and leaves). During the experiment, no symptoms of PepMV infection were visible in tomato, although roots of test plants became infected two weeks after inoculation. Nine weeks after inoculation, PepMV was detectable in roots of all test plants, although the virus was not detectable in extracts of the nutrient solution, neither by DAS-ELISA nor by IC-RT-PCR. It was shown that PepMV was immediately transported within a newly infected plant to young leaves, inflorescences and developing fruits, whereas old leaves remained virus free. This demonstrates that long-distance transport of the virus inside an infected tomato plant is directed mainly to sink tissue. Furthermore, PepMV was shown to cause yield loss about 17% in infected plants after 11 weeks of plant cultivation.

The risk of PepMV transmission in glasshouse tomatoes grown in a re-circulating hydroponic system is quite high, because infected plants often display no significant symptoms (especially if grown under optimal conditions), so the pathogen can be easily spread unnoticed. Furthermore, many tomato cultivars are susceptible to PepMV, and infection by this virus can reduce yield significantly, particularly in PepMV-susceptible cultivars.

REFERENCES

De Kreij C; Voogt W; van den Bos A L; Baas R (1997). Voedingsoplossingen voor de teelt van tomaat in gesloten teeltsystemen. *Proefstation voor Bloemisterij en Glasgroente, Naaldwijk, Niederlande* **1** *(Auflage 22).*

EPPO (2000). *EPPO Alert List-Viruses. Pepino mosaic potexvirus – a new virus of tomato introduced into Europe.*

www.EPPO.ORG/QUARANTINE/Alert_List/viruses/pzmxxx.htm

EPPO (2001). *EU survey on Pepino mosaic potexvirus.* www.maff.gov.uk/planth/pestnote/pepino.htm

Jones R A C; Koenig R; Lesemann D E (1980). Pepino mosaic virus, a new potexvirus from pepino (*Solanum muricatum*) *Annals of Applied Biology* **94**, 61-68.

Roggero P; Masenga V; Lenzi R; Coghe F; Ena S; Winter S (2001). First report of *Pepino mosaic virus* in tomato in Italy. *Plant Pathology* **50**, 798.

Salomone A; Roggero P (2002). Host range, seed transmission and detection by ELISA and lateral flow of an Italian isolate of *Pepino mosaic virus*. *Journal of Plant Pathology* **84**, 65-68.

van der Vlught R A A; Stijer C C M M; Verhoeven J T H J (2000). First report of pepino mosaic virus on tomato. *Plant Disease* **84**, 103.

Demography of an allergenic European invasive plant: *Ambrosia artemisiifolia*

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INTRODUCTION

Common ragweed (*Ambrosia artemisiifolia*) (Asteraceae) is an annual plant, introduced from North America to Europe over 100 years ago, and is now widespread in numerous countries (Dechamp & Meon, 2002). Problems with this invader are varied. It is considered a weed of spring crops such as sunflower, but also invades a wide range of non-crop areas, such as open disturbed (ruderal) habitats or river banks (Basset & Crompton, 1975). Moreover, this plant causes problems for human health, as it produces an abundance of allergenic pollen (Laaidi *et al.*, 2003). In North America, common ragweed is the first cause of hay fever (Basset & Crompton, 1975).

Whereas many studies focusing on human health were carried out on common ragweed, comparatively few new data have been published on its biology and ecology within in its introduced range. To our knowledge, only one demographic study in field crops in Canada have been published (Deen & Swanton, 2001). The demographic processes governing the colonization and the maintenance of invasive species are considered a key parameter of biological invasion. In France, in 2004, a 3-year study was initiated on the demography of different common ragweed populations established in various environmental situations (namely: field crops, but also ruderal and naturally invaded habitats). Data from these studies may eventually help towards understanding the adaptive strategies of this invasive plant; factors that control populations in relation to management perspectives will also be studied.

MATERIALS AND METHODS

Ten populations of common ragweed were studied in 2004. Populations were chosen according to their French geographic distribution (from the centre to the periphery of colonization) and also to the types of invaded habitats. There were two northern populations in old and recent gravel pits, six central populations on embankments and in fallows and spring crops (one faba [= field] bean, one maize and two sunflower), and two southern populations in fallow and river. For each site, and during the weed's lifecycle, plant density was recorded using 10 plots (each of 1 m^2) and demographic parameters (i.e. plant height, width, shoot dry biomass, shoot number, pollen and seed production) measured for a 100 individuals. Mean plant density was compared throughout the lifecycle, and the demographic parameters were analyzed with ANOVA and linear regression analysis, using Statistica 5.5 software.

RESULTS AND CONCLUSIONS

Initial common ragweed population densities ranged from 0.3 to 630 plant/m^2, with the lowest ones observed in field crops (0.3 to 18 plant/m^2); densities in ruderal/natural sites ranged from 10 to 630 plant/m². This distribution pattern in field crops can be easily explain by the annual soil perturbation, that scatters and hides seeds compared with other soil-stable populations. This mode of disturbance can also explain the spatial pattern of seedling distribution observed: from random (in field crops) to clumped (in old fallows).

Plant density also fluctuated over time, according to their habitat. Populations in field crops did not show any density variation after initial germination, whereas there was a density-dependent mortality (self-thinning) in others. Differences were also observed for demographic parameters. Height of plants from field crops populations increased, and then slowed down to their maximum one month before other populations. In contrast, ruderal/natural populations showed a continuous increase in plants height until the end of the vegetative growth phase (beginning of fructification). Final heights were significantly different between populations ($P < 0.001$), except for two populations in sunflower and faba bean crops ($P = 0.061$). Plant height (but also life-history traits such as plant volume, dried weight and shoot number) was greater for populations in field crops than for those in ruderal/natural sites. In field crops, there was a positive correlation ($R^2 = 0.84$) between the heights of common ragweed plants and the related crop, that can be directly explained by light competition. In ruderal/natural sites, the same general pattern related to plant competition for volume and dried weight can be observed, but not for the other life-history traits (owing to additional constraints).

A comparative study of these life history traits can help to detect phenotypic plasticity and local adaptation. These two components may explain the ability of common ragweed to colonize new areas. For example, linear regression of plant volume and weight showed different slopes according to the populations, suggesting phenotypic plasticity. In addition, there was a positive correlation between shoot dry biomass of plants and pollen production ($R^2 = 0.72$), and between biomass and seed production ($R^2 = 0.86$). Seed production gives an estimate of the degree of lifetime reproductive success (fitness), and its correlation with trait values suggests that directional phenotypic selection may act in populations.

Preliminary results suggest a high variability of life-history traits between populations, associated with differences in fitness. Two different demographic patterns take place in field crop and ruderal/natural populations. The observed high degree of phenotypic plasticity could help to explain the plant's capacity to colonize and become self-maintaining on disturbed areas.

REFERENCES

Basset I J; Crompton C W (1975). The biology of Canadian weeds. 11. *Ambrosia artemisiifolia* L. and *A. psilostachya* DC. *Canadian Journal of Plant Science* **55**, 463-476.

Déchamp C; Méon H (eds) (2002). *Ambroisies, polluants biologiques*. Arppam: Lyon.

Deen W; Swanton C J (2001). A mechanistic growth and development model of common ragweed. *Weed Science* **49**, 723-731.

Laaidi M; Laaidi K; Besancenot J-P; Thibaudon M (2003). Ragweed in France: an invasive plant and its allergenic pollen. *Annals of Allergy, Asthma and Immunology* **91**, 195-201.

Biological and molecular characteristics of cherry leaf roll virus (CLRV) isolates from different host plants

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INTRODUCTION

Cherry leaf roll nepovirus (CLRV) is a widespread pathogen of woody plants in Germany and throughout the European Community (Bandte & Büttner, 2001). It is also spread in several herbaceous plants, such as rhubarb (*Rheum rhabarbarum*), but the origin of this virus is unclear (Jones, 1985). CLRV often induces symptoms in, for example, ash, birch, cherry, elderberry and walnut, including delayed leaf development, chlorotic leaf streaks or spots as well as dieback of branches or whole trees (Hamacher & Giersiepen, 1989; Hamacher & Quadt, 1991; Rebenstorf & Obermeier, 2003). In nature, CLRV is mainly transmitted through seed or pollen, leading to viral spread within one plant species; mechanical transmission, including grafting procedures, is also possible (Cooper *et al.*, 1984; Massalski & Cooper, 1984; Mircetich *el al.*, 1980). Genomic organisation of CLRV is still unknown, but morphology and particle composition is typical for nepoviruses, which are classified within the family of Comoviridae (Jones, 1985). Supporting the observation that CLRV isolates, obtained from identical host species, are serologically related, a phylogenetic analysis of a 280 bp (base pair) fragment of the 3′ non-coding region of viral RNA demonstrated that CLRV isolates were also clustered on a genomic level that accorded with the original host plant.

METHODS AND RESULTS

One-year-old seedlings of nine different plant species were mechanically inoculated and cultured in the field (Berlin, Germany), to evaluate the role of transmission via wounding as a source of horizontal virus spread between different plant species under natural environmental conditions. Ten selected CLRV isolates, originating from different host plants, were used for inoculation. Six months after inoculation no characteristic symptoms of CLRV infection were observed. However, buds from inoculated trees were sampled and analysed for CLRV infection by a sensitive IC-RT-PCR assay with specific primers, according to Werner *et al.* (1997). In none of the samples could an infection be confirmed. Furthermore, virus particles were purified after their propagation on the herbaceous host plant *Chenopodium quinoa*, in order to compare viral components (structure-proteins and nucleic acids) of CLRV isolates included in the field experiment. On *C. quinoa* all ten CLRV isolates induced chlorotic spots on inoculated leaves 3–5 days after inoculation. A systemic infection, exhibiting leaf distortion and necrosis of expanding leaves, was established 9 days after inoculation in all cases, with the exception of CLRV-walnut strain from Hungary; this particular isolate induced necrotic local lesions on inoculated *C. quinoa* leaves without systemic symptoms. Electron microscopic control of purified virus preparations revealed isometric virus particles (28 nm in diameter) typical for nepoviruses in all investigated isolates. Protein analysis of purified viruses by SDS-PAGE displayed, from eight CLRV isolates, a structure-protein of expected size (MW is approximately 53 kDa). In two isolate purifications different proteins of significantly smaller size were present, suggesting an infection with another virus. In RNA-gels, seven virus isolates showed typical RNA patterns, with a larger genomic RNA1 (molecular weight around 8,2 kb) and a slightly shorter RNA2 (c. 6.9–7.3 kb). While the virus isolate from rhubarb (Germany) exhibited a 53 kDa coat protein typical for CLRV, only one RNA was detectable in RNA gels under native conditions. The CLRV isolate derived from European ash (Germany) as well as the CLRV-walnut strain from Hungary, which were different in protein analysis, also exhibited atypical RNA patterns. Correspondingly CLRV detection by RT-PCR, using particle purifications of these two isolates as templates, also failed.

To date, it remains unclear whether or not, in certain woody host plants, CLRV isolates appear as mixed infections with other viruses of similar morphology.

Further investigations are necessary to identify the viruses responsible for unusual RNA and protein patterns. Additionally, detection of CLRV in the initiated field experiments has to be continued to clarify the potential of different virus isolates to infect various woody host plants through wounds and the relevance of CLRV distribution between species by other factors than through seed or pollen.

REFERENCES

Bandte M; Büttner C (2001). Occurrence, transmission and diagnosis of cherry reafroll nepovirus – a literature review. *Pflanzenschutzberichte* **59**, 1-19.

Cooper J I; Massalski P R; Edwards M L (1984). Cherry leaf roll virus in the female gametophyte and seed of birch and its relevance to vertical transmission. *Annals of Applied Biology* **105**, 55-64.

Hamacher J; Giersiepen R (1989). Histologisch-cytologische Veränderungen in Kirschenblattrollvirus-infizierten und durch Luftschadstoffe gestreßten *Betula*-Arten. *Nachrichtenblatt des Deutschen Pflanzenschutzdienstes* **41**, 124-130.

Hamacher J; Quadt A (1991). Light- and Electron Microscopic Studies of Cherry Leaf Roll Virus (CLRV) on European Ash (*Fraxinus excelsior* L.). *Journal of. Phytopathology* **131**, 215-226.

Jones A T (1985). *Cherry leaf roll virus.* CM/AAB Description of plant viruses, No. 306.

Massalski P R; Cooper J I (1984). The location of virus-like particles in the male gametophyte of birch, walnut, cherry naturally infected with CLRV and its relevance to vertical transmission of the virus. *Plant Pathology* **33**, 255-262.

Mircetich S M; Sanborn; R R, Ramos, D E (1980). Natural spread, graft-transmission, and possible ethiology of walnut blackline disease. *Phytopathology* **72**, 988.

Rebenstorf K; Obermeier C (2003). Gefahr für Gehölze: Das Kirschenblattrollvirus. *Deutsche Baumschule* **7**, 54-55.

Werner R; Mühlbach H P; Büttner C (1997). Detection of cherry leaf roll nepovirus (CLRV) in birch, beech and petunia by immunocapture RT-PCR using a conserved primerpair. *European Journal for Pathology* **27**, 309-318.

Introduction and spread of invasive mites and insects in Serbia and Montenegro

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INTRODUCTION

Legislative and regulatory measures concerning plant protection in Serbia have been established since 1898. According to the Law of plant protection (1998) and related legislation, they include eradication, containment campaigns, surveys, risk assessments, and scientific investigations on the life history and behaviour of harmful organisms. Invasive and alien mites and insects, some of which are of economic importance in agronomy, horticulture and forestry (Milošević, 1980), have been studied in the former Yugoslavia, and in Serbia and Montenegro, for more than 70 years.

MATERIAL AND METHODS

The investigation of invasive and alien mites and insects was based mainly on pests of agriculture, forestry and ornamental plants. In order to obtain correct diagnoses, standard acarological and entomological methods were applied. Scientific names of mites follow the Petanović (2004), and scientific names of insects follow Jacobs & Renner (1988), Alford (1991) and Petrović-Obradović (1992).

RESULTS AND DISCUSSION

The following 17 alien species of mite were found in Serbia or the former Yugoslavia during the period 1979–2004: Eriophyidae – *Aceria byersi*, *A. caliberberis*, *A. ligustri*, *Aculops gleditsiae*, *Antocoptes transitionalis*, *Cecidophyopsis hendersoni*, *Coptophylla lamimani*, *Cosetacus camelliae*, *Epitrimerus cupressi*, *Eriophyes emarginatae*, *Paraphytoptus chrysanthemi* and *Vasates quadripedes*; Phytoptidae – *Phytoptus hedericola*; Tetranychidae – *Eotetranychus weldoni*; Tenuipalpidae – *Brevipalpus obovatus* and *Tenuipalpus pacificus*; Tarsonemidae – *Polyphagotarsonemus latus*.

More than 60% of the alien mite species were recorded for the first time during the last 15 years. Fourteen species were associated with ornamental plants, two species were found on vegetables and one species on fruit. Six species could become of great importance in glasshouses; e.g. *Brevipalpus obovatus* and *Polyphagotarsonemus latus* could be harmful to protected ornamentals. Five species could become of great importance in green urban areas; *Aceria ligustri* could cause severe damage and dieback on privet (*Ligustrum*) hedges.

Most of alien and invasive mites originated from Central and North America.

The following 53 invasive and alien insect pests were found in Serbia and Montenegro, most from 1950 onwards: Hemiptera (Heteroptera) – *Corythucha ciliata*, *Metcalfa pruinosa* and *Stictocephala bisonia*; Hemiptera (Homoptera) – *Adelges laricis*, *Aphis forbesii*, *Chaetosiphon fragaefolii*, *Cinara cedri*, *C. curvipes*, *Myzus varians*, *Diuraphis noxia*, *Dreyfusia nordmannianae*, *Eriosoma lanigerum*, *Gilletteella cooleyi*, *Icerya purchasii*, *Pineus strobi*, *Pseudaulacaspis pentagona*, *Quadraspidiotus perniciosus*, *Scaphoideus titanus*, *Trialeurodes vaporariorum* and *Viteus vitifolii*; Thysanoptera – *Frankliniella occidentalis*; Coleoptera – *Acanthoscelides obtectus*, *Diabrotica virgifera virgifera* *Glischrochilus quadrisignatus*, *Lasioderma serricorne*, *Latheticus oryzae*, *Leptinotarsa decimlineata*, *Lyctus brunneus*, *Neoclytus acuminatus*, *Oryzaephilus surinamensis* and *Tenebrioides mauritanicus*; Lepidoptera – *Antherea yamamai*, *Anagasta kuehniella*, *Cacoecimorpha pronubana*, *Cameraria ohridella*, *Coleophora laricella*, *Cydia molesta*, *Epichoristodes acerbella*, *Hyphantria cunea*, *Parectopa robiniella*, *Phyllocnistis citrella*, *Phyllonorycter robiniella*, *P. leucographella* and *Sitotroga cerealella*; Diptera – *Aedes albopictus*, *Ceratitis capitata*, *Chymomyza amoena*, *Dasyneura gleditchiae*, *Liriomyza trifolii* and *L. huidobrensis*; Hymenoptera – *Bruchophagus sophorae*, *Megastigmus spermotrophus* and *Monomorium faraonis*.

The majority of alien insect species were pests of ornamentals (34%), fruit (25%) and stored products (13%). The rest were associated with grapevine (4%), cereals (6%), vegetables (6%), forestry (6%), wood (4%) and human health (4%). First records for more than one third of the important species occurred during the past 16 years. The most important pests were: the lachnid *C. curvipes*, the thrips *F. occidentalis*, the planthopper *M. pruinosa*, the leaf beetle *D. virgifera virgifera* and the leaf miner *L. huidobrensis* (all important plant pests), plus the leafhopper *S. titanus* and the mosquito *A. albopictus* (potential vectors of plant and human pathogens, respectively).

Of the alien insect pests, about one third were of American origin; one fifth originated from China, Korea, Japan and from elsewhere in South East Asia.

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REFERENCES

Alford D V (1991). *A Colour Atlas of Pests of Ornamental Trees, Shrubs & Flowers.* Wolfe: London.

Jacobs W; Renner M (1988). *Biologie und Oekologie der Insekten.* Gustav Fischer: Stuttgart.

Milošević B (1980). *Quarantine pests and diseases in SFR Yugoslavia* [in Croatian]. Zagreb.

Petanović R (2004). *Atlas of Mite Pests on Ornamentals* [in Serbian]. Beografik: Belgrade.

Petrović-Obradović O (1992). *Aphids (Homoptera: Aphididae) in Serbia* [in Serbian]. Belgrade.

Possibilities to control the horse chestnut leaf miner (*Cameraria ohridella*) in Berlin

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INTRODUCTION

The horse chestnut leaf miner (*Cameraria ohridella*) infests almost exclusively the leaves of the common horse chestnut (*Aesculus hippocastanum*). The soft wood of horse chestnuts is useless as commercial timber and, consequently, unimportant for the woodworking industries. However, horse chestnut trees are of considerable economic importance for European cities. Their aesthetic beauty is highly valued, especially in urban environments, where this tree species plays a dominant role along avenues, in parks and in gardens. The continuous epidemic infestation of horse chestnut trees by the pest is, therefore, a serious problem for towns with renowned tourist centres or large recreational areas, as well as for private citizens (such as owners of beer gardens).

The aims of the presented project BerlinCam (funded by the European Communion as part of the EFRE programme and by the Senate Department of Urban Development by means of the 'Umweltentlastungsprogramm') are to develop control measures which meet the special needs of urban plant protection, i.e. they must not pose any potential threat to human health, and they should be practicable for adoption in crowded places or along streets with heavy traffic, as well as in private gardens. Finally, they should be environmentally safe and economically justifiable.

MATERIALS AND METHODS

The project takes an interdisciplinary approach, and employs various methods to cover all aspects of modern plant protection. The programme is divided into six work packages: (1) monitoring of the population dynamics of the pest, using pheromone traps, and visual estimation of infestation levels; assessing the abundance of native parasitoids, by dissection of leaf mines; (2) assessing the impact of the pest on the vitality of the trees, by measuring shoot lengths and photographic documentation of damaged twigs; (3) evaluating mechanical control methods, including experiments with small compost heaps to optimise the disposal of infested leaves; (4) assessing the fecundity, sex ratio, and host preference of several parasitoid species under laboratory conditions, and developing methods for mass rearing of such parasitoids; (5) testing of new insecticides, including bioagents, and various application techniques for their efficiency against the leaf miner, and assessing their practicability for use on young and old horse chestnut trees; (6) dissemination of the results, including publication of the results in scientific journals, informing the public via the internet and posters, and developing a pest management concept for local authorities.

RESULTS AND DISCUSSION

Population dynamics – As in many other European regions, the horse chestnut leaf miner is trivoltine in Berlin. Compared with 2003, swarming of the overwintered adults occurred considerably later in 2004, and pheromone trap catches were almost 50% lower (average number of moths caught at the peak of the first flying period: 1,400 and 730 individuals/trap in 2003 and 2004, respectively). As a consequence, infestations remained at a low level during the summer 2004, by which time in 2003 trees had already begun to shed their leaves. One of the main reasons for these differences may have been unfavorable weather conditions for the pest in the spring and early summer of 2004.

Vitality of horse chestnut trees – A second flush of leaves, and even a second flowering of heavily infested trees was observed in autumn 2002. Frost at the end of October was lethal to flowers and green terminal buds, allowing easy infection of the twigs by secondary pathogens. Although in the following spring, lateral buds took over the role of the dead terminal buds, the resulting twigs were weaker and leaves were smaller and often deformed. So far, it is not clear whether these anomalies affect tree growth and vitality in the longer term.

Biotechnical measures – Hackling leaves with a shredder before composting significantly increases the mortality of the overwintering pupae (the number of emerging moths was reduced to only 6% of the total number emerging from the control). Weekly measurements revealed that small composters, containing < 1 cu m of leaf litter (as used in private gardens), never reached temperatures lethal for diapausing pupae. Several other methods, such as the use of entomopathogenic nematodes or fungi need to be studied in more details in the future.

Biological control – Continuous rearing of leaf miners on horse chestnut seedlings is possible in the laboratory (16 hr light: 8 hr dark, @ 22°C and 70% RH); also, diapause of pupae overwintering in dry leaves (as well as dormancy of horse chestnut buds) can be broken with exposure to high temperatures (25–28°C) for several days. The chalcidoid wasp *Pnigalio agraules* successfully laid diploid eggs (resulting in female offspring) under the same laboratory conditions. Some basic parameters of this parasitoid (such as fecundity and host preferences) are currently being assessed, in order to evaluate its potential as a mass-release biocontrol agent. Other native chalcidoid wasps will undergo the same experimental procedure. Two 'attract and kill' methods are useful to minimize infestation levels in the first half of the season, provided that fallen leaves are removed efficiently at the treated locations. However, treatments are costly and labour intensive, and their economical feasibility is still unclear.

Chemical control – Several new insecticides proved to be suitable for controlling horse chestnut leaf miner. However, effective spraying of mainly old and large trees in urban environments is nearly impossible. Alternative application techniques (such as the injection of systemic insecticides or the use of 'banks' of continuously emitting insecticide which can be absorbed through the bark of the tree) may be practicable solutions to overcome this problem, at least in younger trees. In addition to examining the effect of treatments on the pest, the potential risks for tree health (e.g. physical changes of the bark under 'banks' or excoriation after stem injection) are also being assessed.

Competence in science information – a guide to invasive species on the internet

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INTRODUCTION AND BACKGROUND

By accessing the gateway portal 'Plant Protection Invasive Species', provided by the Information Centre for Phytomedicine and Library (IZ) on behalf of the Federal Biological Research Centre for Agriculture and Forestry (BBA), one can learn about the impacts of invasive species on the environment and the economy, and find links to agencies and organizations dealing with such issues.

A rapid and comprehensive supply of information on the latest international research results is essential for any scientific work to be effective. At BBA (centred in Berlin and Braunschweig), this task is performed by its IZ. From searching both subscribed and freely available databases, through the acquisition of relevant literature (in electronic or printed form), IZ aims to provide data relevant to BBA's research focus in as timely and reliable a manner as possible. The results are then presented (mainly online) in the BBA intranet or on the internet website, but also distributed in print or via electronic mail. Such services are performed mainly on behalf of BBA scientists, but are intended also to provide a sound information base for both the scientific community and the general public.

THE PORTAL AND ADITIONAL SERVICES

With regard to invasive species, both datasets in applied science databases and websites containing information on the subject were thoroughly searched on the internet, and appraised for their relevance and importance. This was done by BBA-IZ scientists specializing in the field of phytomedicine/phytopathology, and competent in documentation and information services. The most promising search strategies were then compiled and sorted into linked lists, for presentation on web pages, to enable interested parties (less versed in such matters) to obtain quickly the results they were looking for. Considering the main target audiences, the search terms as shown on these pages are in German as well as in English, the *lingua franca* of science. To any or all literature citations that are found this way, IZ staff are then able to supply the customer with the corresponding document. This can be in electronic form (as full text in PDF format from online sources or via document scanning), or as a photocopy printout (from the extensive holdings of our unique specialist library of phytomedical literature, open to the interested scientists or students for further research).

Search examples are given in Figures 1 & 2.

PHYTOMED

Search by keywords:

Invasiv*	start-search
alien*	start-search
Invasiv*&Pflanzenschutz	start-search
alien*&Pflanzenschutz	start-search
Invasiv*&plant protection	start-search
alien*&plant*	start-search
Invasiv*&plant health	start-search
Invasiv*&Pflanzengesundheit	start-search
alien*&Pflanzengesundheit	start-search
Invasiv*&Quarantäne	start-search
alien*&Quarantäne	start-search
Invasiv*&quarantine	start-search
alien*&quarantine	start-search

Figure 1. Search templates for databases (here: BBA PhytoMed)

GOOGLE.DE

Search terms:

Invasive Arten BBA	start search or start search
Invasive Arten/Pflanzenschutz	start search
Invasive Arten/Quarantänebestimmungen	start search
Invasive Arten/Pflanzengesundheit	start search
Invasive species/plant health	start search
Invasive species/plant protection	start search

Figure 2. Search aid for a search engine (Google).

ACKNOWLEDGEMENTS

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Towards biotechnical pest management of the western corn rootworm (*Diabrotica virgifera virgifera*)

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INTRODUCTION AND RATIONALE

The western corn rootworm (WCR) (*Diabrotica virgifera virgifera*) (Coleoptera: Chrysomelidae) is one of the 10 most damaging insect pests in worldwide grain production. Damage and control costs of WCR in maize (*Zea mays*) in the USA, for example, reach 1 billion US$ annually. Following its introduction to Europe (prior to 1992), WRC populations are steadily increasing, and the pest is also greatly extending its geographical range. Ultimately, European damage levels may reach and match those in the USA. WCR is a notoriously difficult insect to control and manage, as the history of maize cultivation over the past 50 years amply demonstrates. The genetic base of WCR is very broad, and allows numerous unexpected adaptations, including 'crop rotation resistant' WCR populations. Exclusive control by pesticides is highly problematic, because of the rapid selection of resistant strains. Therefore, environmentally compatible and sustainable plant protection require novel approaches to WCR management, including biotechnical strategies with the preferential use of natural or nature-related signal compounds.

We here introduce a promising management strategy, based on the biotechnical manipulation of adults by the plant kairomone MCA (4-methoxy-cinnamaldehyde), a compound first discovered by R L Metcalf 20 years ago.

PRINCIPLE OF THE NEW STRATEGY

A novel 'MSD' or 'diversion' technique, which consists of **m**ass trapping, combined with **s**hielding and **d**eflecting of the adult beetles is now proposed. Release stations were established around the perimeter of a field at a distance of 10–20 m from one another, to create a kairomonal barrier zone (or 'curtain'),with an MCA odor plume extending from ground level to a height of c. 3 m, within which 95% of the mobile adult beetles flew. Such odor barriers can significantly reduce the flux of beetles moving in and out of a 'shielded' field section. High-capacity traps can remove the majority of beetles at a trapping spot, while the remaining beetles are deflected and are, thus, unable to orient themselves towards finding mates, traps and oviposition sites. During August and early September, in both 2003 and 2004, shielded and untreated (control) field sections were compared, at Urbana and Champaign, Illinois, USA.

MATERIALS AND METHODS

Treatments consisted of release stations of the kairomonal attractant MCA. Its release points simultaneously served as mass trapping stations, since the high-capacity traps used (see below) can perform both functions within one and the same unit. The release rate of the volatile MCA was c. 1 g/day for a field of 0.3 ha. Sensitive monitoring traps of the sticky cone-cup ('Metcalf') type, high-capacity Shaw/Hummel ('IRC') traps, and those of the 'UNI-trap' design, were baited with 0.1 mg of sex pheromone or with 10 mg of the specific kairomonal WCR attractants reviewed by Metcalf (1994), and exposed at from 1.0 to 1.2 m above ground level within fields of maize (ranging from 0.15 to 0.3 ha). Sampling for WCR consisted of: (a) visual counts of adults on maize plants, sampled along the centre line within the fields, (b) counts of beetles attracted to specific attractant traps placed along the centre line of the fields, and (c) egg counts, obtained by taking (at random) 20 soil samples, each of 1 kg, and then washing the soil away through a fine-meshed flotation machine.

RESULTS, DISCUSSION AND CONCLUSIONS

Adults were less numerous on maize plants within the treated MSD field from 19 August to 4 September 2003, compared with untreated control sections (both located at the Urbana field site) ($P < 0.05$ to $P < 0.01$); similarly, for the MCA-treated 'Champaign' field section in 2004, adult numbers from 2 to 28 August were always smaller than in the untreated control. The number of adults attracted to kairomone-baited centre traps (located inside and outside the MSD field section) differed by an average factor of 3 for the period 6–11 September 2003, with beetle counts in the 'control' field section always being greater. At the 'Champaign' field site, for all days from 6 August to 1 September 2004, fewer adults were attracted to sex-pheromone-baited Uni-traps (located at the central line of the MSD plot) than to those in the untreated control. The most decisive proof of population and oviposition reduction came from 20 randomly taken soil samples, 10 each from treated and control sections, from maize fields after harvest. Thus, in 2003, the MSD-treated field (vs. control) showed a ratio of 17 : 93 WCR eggs; the 2004 ratio of 2 : 60 was even more striking, and of greatest statistical significance ($P < 0.001$).

The novel MSD technique provides a promising biotechnical approach for the management of WCR in maize under treatment with MCA kairomone. Results obtained at two different field sites at Urbana and Champaign, Illinois (situated 6.5 km apart from each other), were mutually supportive and consistent for two consecutive years. Mass trapping can yield close to 10,000 beetles/trap/month. However, this alone cannot fully explain the effects observed, since it accounted for only 15–20% of the beetles actually present in the maize field. There must be an equally (or more) important sensory component, whose exact mechanism and nature still needs further investigation. In effect, however, the MSD approach (with a suitable barrier zone of traps spaced at a sufficient density) holds considerable promise, and should be more fully explored in the near future.

REFERENCES

Metcalf, R L (1994). Chemical Ecology of Diabroticites. In: *Novel Aspects of the Biology of Chrysomelidae*, eds P H Jolivet, M L Cox, E Petitpierre, pp. 153-169. Kluwer: Amsterdam.

Spectrum of hymenopterous parasitoids on urban stands of horse chestnut trees

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INTRODUCTION

The spectrum of beneficial organisms which attack the horse chestnut leaf miner (*Cameraria ohridella*) in the city of Berlin (most of which are hymenopterous parasitoids) is currently being studied within the project BerlinCam (funded by the European Commission as part of the EFRE programme and by the Senate Department of Urban Development by means of the 'Umweltentlastungsprogramm'). The project involved intensive field and laboratory studies, spanning three vegetative periods, and are being done to understand the influence of abiotic and environmental factors on such organisms.

MATERIAL AND METHODS

Seven stands of horse chestnut trees in Berlin were selected, each within different types of habitat (including streets, parks and places in the city centre, as well as a landscaped park and a forest outside the city). The parasitoid complex of the pest was determined three times a year. In total, 250 host larvae were dissected in the laboratory to assess the rates of parasitism. In addition, infested (mined) leaves were put into photoeclectors and all adult parasitoids that emerged from the mines were isolated and identified. Temperatures and relative humidity at the field sites were measured during the entire season, and environmental factors (e.g. the surrounding vegetation at the various field locations), were estimated visually.

RESULTS AND DISCUSSION

The rates of parasitism of larvae were, on average, lower in 2004 than in 2003 (Table 1). In addition, four times as many parasitoids were recorded in 2003 than in 2004; numbers of parasitoid species were also different between years (13 species in 2003; 9 in 2004). The parasitism rate of larvae seems to depend on the weather conditions and the kind of location. Highest rates of parasitism were measured along streets in both years, but the reason for this surprising result is still unclear; temperatures, which are higher at inner-city stands, may play an important role (Figure 1).

Fourteen parasitoid species were reared from *Cameraria* in the city of Berlin. These were: *Itoplectus alternans* and *Scambus annulatus* (Ichneumonidae); *Pteromalus semotus* (Pteromalidae); *Chrysocharis nephereus*, *Closteroceus trifasciatus*, *Neochrysocharis chlorogaster* and *Pediobius saulius* (Eulophidae – Entedoninae); *Cirrospilus elegantissimus*, *C. pictus*, *C. viticola*, *Elachertus inunctus*, *Pnigalio agraules* and *Sympiesis sericeicornis*

(Eulophidae – Eulophinae); *Minotetrastichus frontalis* (Eulophidae – Tetrastichinae). *P. saulius* (which is a parasitoid of pupae) was found for the first time in 2003; this parasitoid dominates the *Cameraria* parasitoid complex in south-eastern Europe, but is normally absent in samples from northern and western Europe.

Table 1. Rates of parasitism (%) of *Cameraria ohridella* larvae in relation to habitat type and the time of collection in Berlin (2003 and 2004)

	2003		2004		
	August	September	July	September	October
Place A in city	6,8	13.6	0	6.3	0.8
Place B in city	3.6	13.6	-	10.4	3.1
Street A in city	3.8	12.4	4.5	19.7	3.7
Street B in city	12.0	49.6	8.2	18.6	8.3
Park in city	5.0	12.0	1.3	2.0	0.4
Landscaped park outside city	8.4	13.2	1.0	3.2	1.9
Forest outside city	5.6	18.0	0.6	2.9	3.7
Mean	6.5	18.9	2.6	8.8	3.1

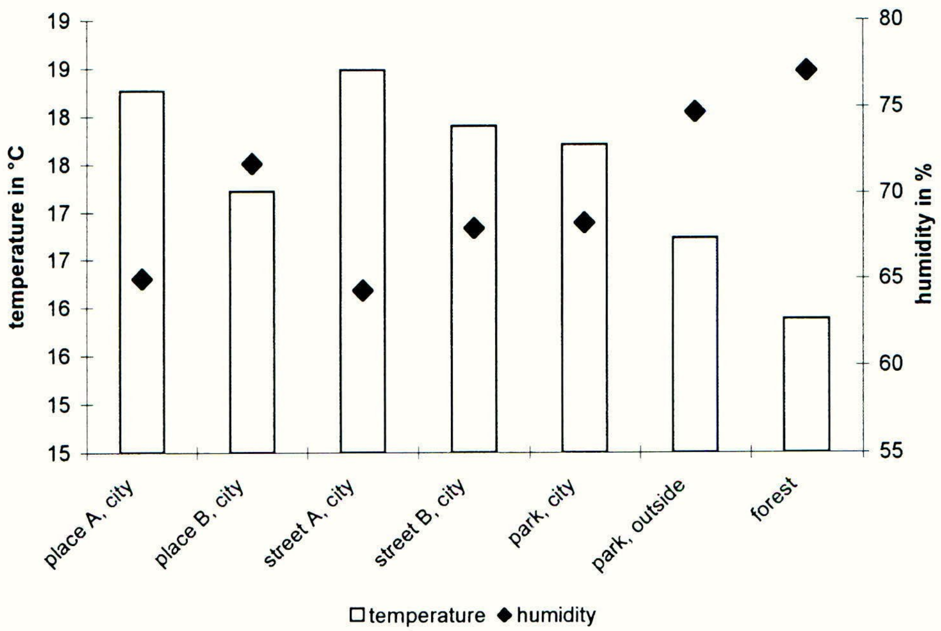

Figure 1. Mean temperature and relative humidity at the investigated locations in Berlin (August, 2004)

The pathogen *Phytophthora ramorum* in Germany

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INTRODUCTION

Phytophthora ramorum has been present in Europe since 1993, where it was first detected on *Rhododendron* and *Viburnum* nursery plants in Germany and the Netherlands (Werres *et al.*, 2001). The infected *Rhododendron* showed dieback of twigs and the *Viburnum* plants died completely. Since 1995, in the USA, a disease of native coastal oaks has been observed in California and parts of Oregon, which is also caused by *P. ramorum* (Rizzo *et al.*, 2002); in the USA the disease is known as 'sudden oak death' (SOD), as it leads to extensive mortality of oak trees. On the basis of such severe damage, and the increasing host range in Europe and America (which currently includes trees, shrubs, woody ornamentals and herbaceous plants), fears of catastrophic consequences for Europe have been voiced, resulting in the adoption of emergency measures by the European Commission (EC). Since the first detection of *P. ramorum*, the number of European countries where the pathogen has been found (mainly in nurseries) has greatly increased, and currently includes Belgium, Denmark, France, Germany, Ireland, Italy, the Netherlands, Norway, Poland, Slovenia, Spain, Switzerland, Sweden and the UK. Since 2003, in North America (in addition to California and Oregan), *P. ramorum* has been detected in the federal state Washington and in a nursery in British Columbia (Canada).

REGULATIONS

To prevent the introduction of *Phytophthora ramorum* into, and the spread within, the Community, the EC set up emergency phytosanitary measures in 2002, with decision 2002/757/EC (subsequently amended in 2004 by decision 2004/426/EC). These emergency measures, include regulations governing the import of susceptible plants and wood from the USA, and for their movement within the Community. Under these regulations, *Camellia*, *Rhododendron* and *Viburnum* plants originating in the Community must be accompanied by a plant passport when traded. Specific requirements have been set down, for implementation in the case of an occurrence of *P. ramorum* in nurseries. These include the destruction of all susceptible plants within a radius of 2 m around the infected plant. Further, all susceptible plants within a radius of 10 m (as well as all plants belonging to the same batch) must be quarantined for three months, during the season of active growth, and the plants inspected at least twice during this period by staff from Plant Protection Services.

SURVEYS and HOST RANGE IN GERMANY

According to the above-cited EC decision, surveys were done in 2002, 2003 and 2004 by the Plant Protection Services of the 16 German federal 'regions' (Bundesländer). The surveys include inspections of nurseries and garden centres, as well as inspections of public green sites, private gardens and forestry areas. The German Plant Protection Services take samples from symptomatic plants, and are responsible for diagnosis which (at present) is done mainly by direct isolation and identification on a morphological basis. For positive confirmation of this pathogen, however, laboratory-based diagnosis is essential.

In 2004, members of the German Plant Protection Services carried out 2,258 visual inspections (1,560 in nurseries and garden centres; 561 in public green areas and private gardens; and 107 in forests); 251 'suspect' samples were taken to the laboratory for further investigation, and eight cases of *P. ramorum* were subsequently confirmed.

Inspections in nurseries and garden centres involved various well-known host plants, including *Camellia* (and hybrids), *Fagus sylvatica*, *Pieris*, *Quercus*, *Rhododendron* (and hybrids), *Taxus* and *Viburnum*. From 56 samples taken to the laboratory, six proved positive for *P. ramorum* (all either *Rhododendron* or *Viburnum* plants). No cases of the pathogen were found in samples from public green areas or from private gardens. However, two cases were confirmed in forest samples (one on a 50-year-old *Rhododendron* plant and one on *Pieris japonica*). The sites of these 'outbreaks' were located closely together, and belonged to two c. 120-year-old mixed forest stands consisting of trees such as *Fagus sylvatica*, *Pinus sylvestris* and *Quercus robur*, with an understory of *Leucothoe*, *Pieris*, *Rhododendron* etc. The trees at these locations still looked healthy, and were not infected by *P. ramorum*.

Up to 2004, *P. ramorum* had been detected in Germany only on *Rhododendron* (excluding *R. simsii*) and *Viburnum*. In 2004, however, the organism was isolated for the first time on *Pieris japonica*. To date, *P. ramorum* has not been found on trees in Germany.

FUTURE PROSPECTS

The reason for the comparatively few findings of *P. ramorum* in 2004, in Germany and other European countries, is not yet clear. It may be the result of current eradication measures and control mechanisms, or related to the limited ecological conditions for the pathogen in most parts of Europe. At present, knowledge on *P. ramorum* is inadequate; further, a risk analysis is currently incomplete and some statements concerning the pathogen are still provisional. Although research has progressed substantially, many questions on biology and epidemiology of *P. ramorum* (such as survival and the potential for spread under natural conditions in Europe) remain to be answered, and further research is necessary. Effective control mechanisms also still need to be developed.

REFERENCES

Rizzo D M; Garbelotto M; Davidson J M; Slaughter G W; Koike S T (2002). *Phytophthora ramorum* as the cause of extensive mortality of *Quercus* spp. and *Lithocarpus densiflora* in California. *Plant Disease* **86**, 205-214.

Werres S; Marwitz R; Man in't Veld W A; De Cock A W A M; Bonants P J M; De Weerdt M; Themann K; Ilieva E; Baayen R P (2001). *Phytophthora ramorum* sp. nov., a new pathogen on Rhododendron and Viburnum. *Mycological Research* **105**, 1155-1165.