Recueil Bionovation

Édition 2008

Un inventaire des innovations
et de la recherche internationales
dans des secteurs ciblés de la production
végétale biologique

VOLET RAVAGEURS

Un document complet comprenant tous les volets
existe sur le site Agriculture biologique d'Agri-Réseau,
sous la rubrique **Recherche et innovation**

CRAAQ

Centre de référence en agriculture
et agroalimentaire du Québec

Ce recueil s'adresse aux conseillers et aux chercheurs œuvrant dans le secteur de la production végétale biologique. Il permet, entre autres, d'effectuer un survol rapide de la recherche et de l'innovation récemment effectuées en production végétale biologique située hors Québec.

Cet outil se présente sous forme de fiches-référence complètes, lesquelles sont classées par ordre alphabétique d'auteur. Il contient en outre des tableaux récapitulatifs qui facilitent la consultation. En un coup d'œil, il est possible de sélectionner les éléments d'intérêt et d'accéder à la fiche-référence en naviguant avec la main active tout en utilisant les hyperliens. Chaque fiche présente un résumé de l'information disponible et des références bibliographiques. Elle indique aussi la disponibilité et le coût d'accès à l'information intégrale, s'il y a lieu. De plus, un lien vers la source Internet permet l'accès en un simple clic.

L'information traitée s'articule autour des priorités suivantes :

- Les ravageurs spécifiques dans les petits fruits et les légumes de champ (altises, anthonome du fraisier, cécidomyie du chou-fleur, chrysomèle rayée du concombre, mouche du chou et de la carotte, pucerons dans la laitue, punaise terne dans la fraise).

Des liens Internet utiles et des références sont présentés en annexe. Ceux-ci permettent d'accéder à de l'information complémentaire et de découvrir d'autres sources de renseignements. Bien que ce projet s'intéresse spécifiquement à la recherche et à l'innovation en production végétale biologique située hors Québec, nous avons cru bon d'y ajouter quelques liens québécois qui nous apparaissent incontournables.

En terminant, l'information a été recueillie au cours d'une veille technologique effectuée en début d'année 2008. Le comité consultatif, formé d'intervenants du milieu, a émis les recommandations de priorités pour cette veille et a orienté, en plusieurs étapes, le développement du projet. Les priorités identifiées, sans représenter les seuls besoins pour les différents secteurs de production, constituent certaines des problématiques majeures reconnues par le milieu et maintes fois soulignées[1].

[1] Voir le document « Priorités de recherche, d'adaptation et de transfert technologique en agriculture biologique », CRAAQ et intervenants du milieu, 2006.

Avertissements

Les recherches scientifiques répertoriées dans ce recueil ont été compilées à partir de la littérature disponible et des sites Internet des organismes concernés. Le classement proposé a pour but de faciliter la consultation.

L'information et les coordonnées des organismes se veulent les plus exactes possible, mais sont publiées sous réserve de modifications qui auraient pu survenir depuis la rédaction de ce document. Leur utilisation demeure sous l'entière responsabilité du lecteur.

Ce document a été réalisé dans le cadre du programme *Initiative d'appui aux conseillers agricoles*, selon les termes de l'entente Canada-Québec sur le Renouveau du Cadre stratégique agricole.

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Agroécologie, aménagement du paysage	Général	Général	Bianchi et *al*., 2006
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1- ÉCOLOGIE DU PAYSAGE ET PRATIQUES CULTURALES			
Approche	**Culture**	**Ravageurs**	**Auteurs**
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Champignon entomopathogène - Essais sur une sélection de souches (*Lecanicillium lecanii*, *Paecilomyces farinosus*, *Beauveria bassiana*…)	Général	Pucerons	Vu et *al.*, 2007
Explorations de stratégies de gestion des arthropodes	Général	Général	Zehnder et *al.*, 2007
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3- PIÈGES, ACTIVATION DES DÉFENSES ET PHYTOPROTECTION			
Approche	**Culture**	**Ravageurs**	**Auteurs**
Filet (clôture)	Carotte, crucifères	Cécidomyie du chou-fleur (*Contarinia nasturtii*) Mouche du chou (*Delia radicum*) Mouche de la carotte (*Psila rosae*)	Andermatt BIOCONTROL AG
Filet (clôture)	Carotte, crucifères	Mouche du chou (*Delia radicum*) Mouche de la carotte (*Psila rosae*)	Siekmann et *al.*, 2005
Filet (clôture), effet sur la dispersion des insectes	Crucifères	Pucerons (*Myzus persicae*)	Bomford et *al.*, 2000
Filet (clôture)	Crucifères	Cécidomyie du chou-fleur (*Contarinia nasturtii*)	Wyss et *al.*, 2004
Bactéries de la rhizosphère favorisant la croissance et diminuant la curcubitacéine, Roténone, Pyrèthre, Sabadilla	Curcubitacées	Chrysomèle rayée du concombre (*Acalymma vittatum*)	Bellows et Diver, 2002 (ATTRA)
Inducteur de résistance par promoteur de croissance rhizobactérien (PGPR)	Curcubitacées	Chrysomèle rayée du concombre (*Acalymma vittatum*) Flétrissement bactérien (*Erwinia tracheiphila*)	Zehnder et *al.*, 2001
Filet (toile) et pyrèthre Acariens prédateurs	Fraise	Anthonome (*Anthonomus rubi*) Tarsonème (*Phytonemus pallidus*)	Berglund et *al.*, 2007
Piège (surveillance et contrôle)	Général	Punaise terne (*Lygus lineolaris*)	Blackmer et *al.*, 2008
Nicotine (oléate de nicotine, stabilisé avec caséinate de sodium)	Général	Général	Casanova et *al.*, 2002
Une revue des biopesticides, de leur mode d'action et de leur efficacité	Général	Général	Copping et Duke, 2007
Une revue des biopesticides, de leur mode d'action et de leur efficacité	Général	Général	Copping et Menn, 2000
Huile essentielle de lavande	Général	Pucerons (*Myzus persicae*)	González-Coloma et *al.*, 2006

3- PIÈGES, ACTIVATION DES DÉFENSES ET PHYTOPROTECTION			
Approche	**Culture**	**Ravageurs**	**Auteurs**
Une revue des huiles essentielles avec un effet insecticide	Général	Pucerons (*Myzus persicae*) utilisés comme insectes témoins	Isman, 2000
Une revue des insecticides « naturels »	Général	Général	Isman, 2006
Ail, Roténone, savon, pyrèthre	Général	Altises	Kuepper, 2003 (ATTRA)
Piperaceae (poivrier long)	Général	Pucerons (*Myzus persicae*)	Park et *al.*, 2002
Une revue des biopesticides, de leur mode d'action et de leur efficacité.	Général	Général	Rai, Mahendra et Carpinella M.C. (éditeurs), 2006
Les pesticides « naturels » - un point de vue de l'Industrie	Général	Général	Rice, 1998
Piperaceae (poivrier)	Général	Général	Scott et *al.*, 2008
Phéromones	Général	Général	Shani, 2000
Cultures pièges (trap cropping)	Général	Général	Shelton et Badenes - Perez, 2005
Une revue des biopesticides, de leur mode d'action et de leur efficacité	Général	Général	Singh, 2005
Neem/Margousier (Azadiractine)	Laitue	Pucerons (*Nasonovia ribisnigri*)	Palumbo et *al.*, 2001
Neem/Margousier Gliciridia (*Gliricidia sepium*)	Maïs	Général	Montes-Molina et *al.*, 2008
Spinosad	Pomme	Anthonome (*Anthonomus pomorum*)	Daniel et *al.*, 2005

FICHES RÉFÉRENCES

Altieri M.A., 1999. The ecological role of biodiversity in agroecosystems. *Agriculture, Ecosystems and Environment*, Vol. 74 (1): pp. 19-31. [contact: agroeco3@nature.berkeley.edu]

Increasingly research suggests that the level of internal regulation of function in agroecosystems is largely dependent on the level of plant and animal biodiversity present. In agroecosystems, biodiversity performs a variety of ecological services beyond the production of food, including recycling of nutrients, regulation of microclimate and local hydrological processes, suppression of undesirable organisms and detoxification of noxious chemicals. In this paper the role of biodiversity in securing crop protection and soil fertility is explored in detail. It is argued that because biodiversity mediated renewal processes and ecological services are largely biological, their persistence depends upon the maintenance of biological integrity and diversity in agroecosystems. Various options of agroecosystem management and design that enhance functional biodiversity in crop fields are described.

{Recherche appliquée}

Accès au document : limité avec inscription, via le site Science Direct (document pdf)
Coût : 30,00 $

Voir aussi : Agroecology in action.
Site Internet offrant une réflexion et de nombreux documents
sur le sujet.http://www.agroeco.org

Andermatt BIOCONTROL AG (entreprise suisse). Filet vertical pour le contrôle des ravageurs dans les cultures maraîchères, tels que cécidomyies du chou (*Contarinia nasturtii*), mouches du chou (*Delia radicum*) ou mouches de la carotte (*Psila rosae*).

Le FiBL-Insectstop est un filet vertical qui fait l'effet d'une clôture et qui empêche les insectes de migrer dans les cultures maraîchères. Le haut du filet FiBL-Insectstop est replié vers l'extérieur empêchant les insectes de passer par dessus pour atteindre la culture.

Le FiBL-Insectstop doit être installé tout de suite après le semis/plantation ou avant le début du vol des ravageurs. En principe, il faudrait entourer complètement la parcelle à protéger. Il est également envisageable de protéger uniquement le côté de la parcelle avec le même précédent cultural, mais il faut encore déterminer si cette protection est suffisante.

Les résultats des essais conduits de 2002 à 2004 par l'institut de recherche de l'agriculture biologique (FiBL) ont démontré que la migration des cécidomyies du chou-fleur, des mouches du chou et de la carotte a été empêchée par le FiBL-Insectstop. Les migrations des auxiliaires n'ont par contre été que faiblement restreintes. Dans ces essais, on pouvait réduire les dégâts de 60 à 80 %.

{Transfert technologique}

Accès au document : via le site de l'entreprise (document pdf)
http://www.biocontrol.ch/export/index.php?fibl-insectstop

Anon., 2002. Desk study to apply knowledge developed for conventional horticulture to the control of pests in organic vegetables (OF0179). Report, Wellesbourne, Horticulture Research International. [contact: Arable@defra.gsi.gov.uk]

This is the final report for Defra project OF0179.

The demand for organic vegetable and salad crops is likely to increase as a result of the projected requirements of the multiple retailers. The threat of yield and quality reductions due to pest damage is a major constraint to increasing the organic vegetable crop area. The aim of this project is to demonstrate how methods of pest control developed for conventional vegetable production can be adapted for use by organic growers. The project concentrates on the pest insects that cause damage to umbelliferous and cruciferous vegetable crops. Umbelliferous crops are attacked by one major pest insect, the carrot fly (*Psila rosae*), and two minor pests, whereas cruciferous crops are attacked by about eight major, and over 40 less important pests.

A strategy for reducing carrot fly damage in organically grown umbelliferous crops was produced. The strategy is based on the existing carrot fly forecast, on published data and on information collected previously at HRI. This includes the contribution that can be made by partial host plant resistance. Commercial breeding lines of carrots now have levels of partial resistance up to 75% and, if used in combination with late sowing, could reduce infestations by more than 90% when compared with a susceptible variety sown early.

The carrot fly forecast was adapted to predict 1) the proportion of the first generation of flies that will lay eggs on crops sown on different dates and 2) the timing of emergence of the subsequent (second) fly generation within the crop. Field experiments confirmed that late sowing is an effective method of reducing carrot fly damage. The model was modified to identify the times at which crops should be covered to reduce damage by carrot fly larvae. Previous experiments have shown that to avoid damage by carrot fly larvae, crop covers should be applied to susceptible crops before the start of fly emergence. Although third generation carrot flies may be active after the end of September, their progeny do not damage overwintering crops, so late control is unnecessary.

{Recherche appliquée}

Accès au document : via le site orgprints.org (document pdf)

Arancon, N.Q., Edwards, C.A., Yardim, E.N., Oliver, T.J., Byrne, R.J., Keeney, G., 2007. Suppression of two-spotted spider mite (Tetranychus urticae), mealy bug (Pseudococcus sp) and aphid (Myzus persicae) populations and damage by vermicomposts. *Crop Protection*, Vol. 26 (1): pp. 29-39. [contact: arancon.1@osu.edu]

A vermicompost, produced commercially from food wastes, was tested for its capacity to suppress populations and damage to plants, by two-spotted spider mites (*Tetranychus urticae*), mealy bugs (*Pseudococcus* sp.) and aphids (*Myzus persicae*), in the greenhouse. A range of mixtures of food waste vermicompost and a soil-less bedding plant growth medium Metro-Mix 360 (MM360) was tested in cages (40 cm × 40 cm × 40 cm) (0.2 mm mesh aperture) into which known numbers of greenhouse-bred pests were released. The crops tested were cucumbers and tomatoes for mealy bugs, bush beans and eggplants for spider mites, and cabbages for aphids. In all experiments, four 10 cm diameter pots, each containing one seedling, grown in the same MM360/vermicompost mixture were exposed to either 50 mealy bugs, 100 spider mites, or 100 aphids in cages, with each cage treatment replicated 4 times per treatment. The five growth mixtures tested were: (i) 100% MM360; (ii) 90% MM360 with 10% vermicompost; (iii) 80% MM360 with 20% vermicompost; (iv) 60% MM360 with 40% vermicompost; and (v) 20% MM360 with 80% vermicompost. Almost all of the mixtures containing vermicomposts suppressed the arthropod pest populations, and decreased pest damage significantly, compared with the MM360 controls. Not only did the vermicomposts make the plants less attractive to the pests, but they also had considerable effects on pest reproduction over time. The effects of the vermicompost substitutions tended to be least on spider mites, intermediate on mealy bugs, and greatest on aphids; however this may relate to the motility of the pests, as well as to the suppression potential of vermicomposts. Possible mechanisms for the suppression discussed include: the form of nitrogen available in the leaf tissues, the effects of vermicomposts on micronutrient availability, and the possible production of phenols, by the plants after applications of vermicomposts, making the tissues unpalatable.

{Recherche appliquée}

Accès au document : via le site Science Direct (document pdf ou html)
Coût : 30,00 $ US

Bellows, B., Diver, S., 2002. Cucumber Beetles: Organic and Biorational IPM. NCAT/ATTRA Pest Management Series. ATTRA Publication #IP212. National Center for Appropriate Technology, Fayetteville, Arkansas. 16 p.

Cucumber beetles are present throughout the U.S. and are one of the most serious pests on cucurbits in many areas. The overwintering adult insect causes feeding damage on young, emerging plants; larvae maturing in the soil feed on plant roots; and the adults that arise from these larvae feed on plant leaves, blossoms, and fruit. Besides damaging plants by feeding on roots, stems, leaves, and fruits, these insects also transmit bacterial wilt and squash mosaic virus This publication will focus on organic and biorational control methods that fit into an IPM (integrated pest management) approach. Organic control measures include delayed planting and use of trap crops, parasitic organisms, and botanical pesticides. Includes lists of further resources, websites, and suppliers of crop protection materials.

{Transfert technologique}

Accès au document : via le site de l’ATTRA (document html en ligne, ou document pdf)

Berglund, R., Svensson, B., Nilsson C., 2007. Evaluation of methods to control *Phytonemus pallidus* and *Anthonomus rubi* in organic strawberry production *Journal of Applied Entomology*, Vol. 131 (8): pp. 573-578. [contact: Rakel.Berglund@ltj.slu.se]

Use of the predatory mite *Neoseiulus cucumeris* (Oudemans) (Acari, Phytoseiidae) and a fleece cover in combination with pyrethrum application showed potential for control of two important pests in organic production of strawberry (*Fragaria* × *ananassa* Duch.), although there were some unexpected interactions between pyrethrum and the release of *N. cucumeris* that need to be investigated further. Two cultivars, Honeoye and Cavendish, were treated with pyrethrum with or without fleece to control strawberry blossom weevils [*Anthonomus rubi* Herbst. (Col., Curculionidae)] and *N. cucumeris* was released to control strawberry mites [*Phytonemus pallidus* (Banks) (Acari, Tarsonemidae)]. Number of strawberry mites, number of flower buds damaged by the weevil, incidence of grey mould and powdery mildew, and fruit yield were measured in two consecutive fruiting seasons. In Honeoye, the fleece in combination with pyrethrum decreased the proportion of damaged buds by 11–23% and increased yield by 49–91 g per plant. When pyrethrum was used alone it did not influence the number of damaged buds or yield. This indicates that the combined treatment was more effective because of the fleece. In Cavendish, the fleece and pyrethrum treatments were not found to be effective. Almost no *P. pallidus* was found in Honeoye and the results were not analysable. In plots with Cavendish where *N. cucumeris* had been released, there were approximately 50% fewer *P. pallidus* from the end of August onwards in 2003. However, this response did not significantly influence the succeeding year's yield. The number of fruits infected with fungi was very low and no effects were observed for any of the treatments.

{Recherche appliquée}

Accès au document : limité avec inscription, via Wiley Inter Science (document html ou pdf)

Coût : 39,00 $ US pour un accès de 30 jours à l'article

Bianchi, F.J.J.A., Booij, C.J.H., Tscharntke, T., 2006. Sustainable pest regulation in agricultural landscapes: a review on landscape composition, biodiversity and natural pest control. *Proceedings of the Royal Society B. Biological Sciences*, Vol. 273 (1595): pp. 1715-1727

Agricultural intensification has resulted in a simplification of agricultural landscapes by the expansion of agricultural land, enlargement of field size and removal of non-crop habitat. These changes are considered to be an important cause of the rapid decline in farmland biodiversity, with the remaining biodiversity concentrated in field edges and non-crop habitats. The simplification of landscape composition and the decline of biodiversity may affect the functioning of natural pest control because non-crop habitats provide requisites for a broad spectrum of natural enemies, and the exchange of natural enemies between crop and non-crop habitats is likely to be diminished in landscapes dominated by arable cropland. In this review, we test the hypothesis that natural pest control is enhanced in complex patchy landscapes with a high proportion of non-crop habitats as compared to simple large-scale landscapes with little associated non-crop habitat. In 74% and 45% of the studies reviewed, respectively, natural enemy populations were higher and pest pressure lower in complex landscapes versus simple landscapes. Landscape-driven pest suppression may result in lower crop injury, although this has rarely been documented. Enhanced natural enemy activity was associated with herbaceous habitats in 80% of the cases (e.g. fallows, field margins), and somewhat less often with wooded habitats (71%) and landscape patchiness (70%). The similar contributions of these landscape factors suggest that all are equally important in enhancing natural enemy populations. We conclude that diversified landscapes hold most potential for the conservation of biodiversity and sustaining the pest control function.

{Recherche appliquée}

Accès au document : via le site Royal Society Publishing (document pdf ou html)

Bjorkman, M., Hamback, P.A., Ramert, B., 2007. Neighbouring monocultures enhance the effect of intercropping on the turnip root fly (Delia floralis). *Entomologia Experimentalis et Applicata, Blackwell Publishing*, Vol. 124 (3): pp. 319-326.

Knowledge of insect behaviour is essential for accurately interpreting studies of diversification and to develop diversified agroecosystems that have a reliable pest-suppressive effect. In this study, we investigated the egg-laying behaviour of the turnip root fly, *Delia floralis* (Fall.) (Diptera: Anthomyiidae), in an intercrop-monoculture system. We examined both the main effect of intercropping and the effect on oviposition in the border zone between a cabbage monoculture [*Brassica oleracea* L. var. *capitata* (Brassicaceae)] and a cabbage-red clover intercropping system [*Trifolium pratense* L. (Fabaceae)]. To investigate the border-effect, oviposition was measured along a transect from the border between the treatments to the centre of experimental plots. Intercropping reduced the total egg-laying of *D. floralis* with 42% in 2003 and 55% in 2004. In 2004, it was also found that the spatial distribution of eggs within the experimental plots was affected by distance from the adjoining treatment. The difference in egg-laying between monoculture and intercropping was most pronounced close to the border, where egg-laying was 68% lower on intercropped plants. This difference in egg numbers decreased gradually up to a distance of 3.5 m from the border, where intercropped plants had 43% fewer eggs than the corresponding monocultured plants. The reason behind this oviposition pattern is most likely that flies in intercropped plots have a higher probability of entering the monoculture if they are close to the border than if they are in the centre of a plot. When entering the monoculture, flies can pursue their egg-laying behaviour without being disrupted by the clover. As the final decision to land is visually stimulated, flies could also be attracted to fly from the intercropped plots into the monoculture, where host plants are more visually apparent. Visual cues could also hinder flies in a monoculture from entering an intercropped plot. Other possible patterns of insect attack due to differences in insect behaviour are discussed, as well as the practical application of the results of this study.

{Recherche appliquée}

Accès au document : via le site Ingenta Connect (document pdf ou html)
Coût de l'article : 55,09 $ US

Blackmer, J.L., Byers, J.A., Saona C.R., 2008. Evaluation of color traps for monitoring Lygus spp.: Design, placement, height, time of day, and non-target effects. *Crop Protection*, Vol. 27: pp. 171-181. [contact: jblackmer@wcrl.ars.usda.gov]

Lygus hesperus and *Lygus lineolaris* are two of the most economically important plant bugs in North America. Here we present results from field trials that evaluated effective trap characteristics for maximizing *Lygus* spp. and other herbivorous insect capture, while minimizing beneficial insect capture. The response of *Lygus* bugs, several other key herbivore species and predators to hue (white, clear, black, yellow, orange, blue, purple, green and red) and value (black, white and two neutral grays) was examined in alfalfa over three seasons using traps coated with Pestick adhesive. *Lygus* spp. exhibited a broad response to trap hue, but showed no response to trap value. Additionally, we showed that time of day, trap height and trap placement influenced the number of *Lygus* spp. captured. More *Lygus* spp. were trapped from late afternoon to dusk compared to all other times of the day, and more males than females were captured on sticky traps even though the sexes were at parity in field sweep net samples. In the alfalfa setting, male *Lygus* were more likely to be captured on traps placed 20 cm above the ground; traps placed 50 and 100 cm above the ground caught similar numbers of males and females. The highest number of plant bugs was captured when traps were placed in a cleared area between two alfalfa fields; lower numbers were captured on traps at the edge and in the center of the field. All other herbivores exhibited distinct preferences to trap hue and, in some cases, trap value. Predators were rarely trapped, but did exhibit preferences to trap color (i.e., hue and value) characteristics. The potential of using sticky traps with specific hue and value characteristics to monitor *Lygus* spp. effectively is discussed.

{Recherche appliquée}

Accès au document : via le site Science Direct (document pdf ou html)
Coût : 30,00 $ US

Bomford, M.K.; Vernon, R.S., Pats, P., 2000. Aphid (Homoptera: *Aphididae*) accumulation and distribution near fences designed for cabbage fly (Diptera: *Anthomyiidae*) exclusion. *Journal of the Entomological Society of British Columbia*, Vol. 97: pp. 79-87.
[contact: michael.bomford@kysu.edu]

Aphids accumulate near exclusion fences designed to intercept *Delia radicum* (L.) movement into fields. Aphid accumulations increase with fence height, but are not affected by fence overhang length. Overall aphid levels are higher in small (4.3 x 4.3 m) enclosed plots than in unenclosed plots. Enclosing large (38 x 38 m) plots does not alter overall aphid catches, but does alter aphid distribution within enclosures. In large enclosures aphid accumulations are higher at enclosure perimeters than interiors, with the highest accumulations near enclosure corners. This concentric distribution is not observed in unfenced areas, and is not altered by the addition of a trap crop inside an enclosure.

{Recherche appliquée}

Accès au document : via le site orgprints.org (document pdf)

Caldwell, J.S., Clarke, P., 1998. Aluminum-coated plastic for repulsion of cucumber beetles. *Commercial Horticulture Newsletter*, January–February 1998. Virginina Cooperative Extension, Virginia Tech.

Striped, *Acalymma vittata* (Fabricius), and spotted, *Diabrotica undecimpunctata howardi* Barber, cucumber beetles (Coleoptera: Chrysomelidae) are major pests of cucurbits in Virginia, especially for biological farmers who do not use insecticides (Caldwell et al., 1995). Feeding damage on young cucurbit seedlings can be serious in May and June. Bacterial wilt is transmitted by these beetles and can cause serious problems when insecticides are not used. Incidence of virus in squash is especially high in August in Virginia. In the Northern Neck of Virginia, average losses due to viruses were 70-80% of marketable yield of sample farms in 1997, and up to 100% in the worst case (Sam Johnson, Extension Agent, personal communication, 1998). Virus diseases on cucurbits include Cucumber mosaic virus (CMV), Squash mosaic virus (SqMV), Zucchini yellow mosaic virus (ZYMV), and Watermelon mosaic virus 2 (WMV2). CMV, WMV2, and ZYMV are transmitted by aphids, but SqMV is transmitted by cucumber beetles (Matthews, 1991).

Aluminum-coated plastic has been known for many years to repel aphids, reduce and delay the incidence of aphid-transmitted virus diseases, and increase total and marketable yield (Brown et al., 1993; Brown et al., 1996; Chalfant et al., 1977; Conway et al., 1989; Lancaster et al., 1987). It has also been shown in one study to reduce the incidence of striped and spotted cucumber beetles (Schalk et al., 1979), but it has not been widely been used for cucumber beetle control. In 1996, there appeared to be few cucumber beetles in an observational plot of squash planted into aluminum-coated plastic (P. Clarke, personal observation). In 1997, we therefore established an experiment to determine the extent to which aluminum-coated plastic repelled cucumber beetles.

{Recherche appliquée}

Accès au document : via le site de Virginia Tech (document html)

Campbell R., 2005. Pneumatic Insect Control for Organic Production. Organic Agriculture Centre of Canada. {En ligne}

Pneumatic equipment uses moving airstreams to dislodge insects from crop plants and then collects them from the dislodging airstream. The dislodging airstream may be either negative pressure (vacuum) or positive pressure (blowing). Dislodged insects are either collected in the vacuum stream and destroyed in turbines, or blown onto a collection device opposite the airstream. The two most common applications of this technology have been the control of the Colorado potato beetle (CPB) in potato fields and of the tarnished plant bug (TPB) in strawberry crops.

{Transfert technologique}

Accès au document : via le site du Centre d'agriculture biologique du Canada

Casanova H, Ortiz C, Peláez C, Vallejo A, Moreno ME, Acevedo M., 2002. Insecticide Formulations Based on Nicotine Oleate Stabilized by Sodium Caseinate. *J. Agric. Food Chem.*, Vol. 50 (22): pp. 6389-6394. [contact: casanova@matematicas.udea.edu.co]

Organic farming and new trends toward the use of safer insecticides for crop protection have created new opportunities for botanical insecticides in the pesticide market. In this study, the botanical insecticide nicotine was formulated as a dispersion (20 vol %) stabilized by sodium caseinate, with nicotine oleate solutions used as the dispersed phase. The formulation showed a phase transition on increasing the nicotine oleate concentration, being an emulsion at 7.5-8.2 wt %, a suspo-emulsion at 8.2-9.7 wt %, and a suspension at 9.7-10.8 wt %. Biological activity, apparent viscosity, dispersion time, and protein surface coverage were dependent on nicotine oleate concentration. The emulsion with 8.2 wt % nicotine oleate and the suspo-emulsion with 8.7 wt % nicotine oleate were found to be the most appropriate formulations for insecticide purposes due to their high bioactivity, low viscosity, and low dispersion time. Nicotine oleate formulations showed good creaming and microbiological stability for at least 4 months without losing their biological activity.

{Recherche appliquée}

Accès au document : via le site ACS Publications (document pdf ou html)
Coût de l'article : 25,00 $ US pour un accès de 48 h.

Cook, S.M., Khan, Z.R., Pickett, J.A., 2007. The Use of Push-Pull Strategies in Integrated Pest Management. *Annual Review of Entomology*, Vol. 52: pp. 375-400.
[contact: sam.cook@bbsrc.ac.uk]

Push-pull strategies involve the behavioral manipulation of insect pests and their natural enemies via the integration of stimuli that act to make the protected resource unattractive or unsuitable to the pests (push) while luring them toward an attractive source (pull) from where the pests are subsequently removed. The push and pull components are generally nontoxic. Therefore, the strategies are usually integrated with methods for population reduction, preferably biological control. Push-pull strategies maximize efficacy of behavior-manipulating stimuli through the additive and synergistic effects of integrating their use. By orchestrating a predictable distribution of pests, efficiency of population-reducing components can also be increased. The strategy is a useful tool for integrated pest management programs reducing pesticide input. We describe the principles of the strategy, list the potential components, and present case studies reviewing work on the development and use of push-pull strategies in each of the major areas of pest control.

{Recherche appliquée}

Accès au document : via le site Annual Review (document pdf ou html)
Coût de l'article : 20,00 $ US

Copping, L.G., Duke, S.O., 2007. Natural products that have been used commercially as crop protection agents. *Pest Management Science*, Vol. 63 (6): pp. 524-554.
[contact : lcopping@globainet.co.uk]

Many compounds derived from living organisms have found a use in crop protection. These compounds have formed the basis of chemical synthesis programmes to derive new chemical products; they have been used to identify new biochemical modes of action that can be exploited by industry-led discovery programmes; some have been used as starting materials for semi-synthetic derivatives; and many have been used or continue to be used directly as crop protection agents. This review examines only those compounds derived from living organisms that are currently used as pesticides. Plant growth regulators and semiochemicals have been excluded from the review, as have living organisms that exert their effects by the production of biologically active secondary metabolites.

{Recherche appliquée}

Accès au document : via le site Wiley InterScience (document pdf ou html)
Coût de l'article : 29,95 $ US

Voir aussi : Copping, L.G., 2004.The Manual of biocontrol agents, (3rd Ed. of Biopesticide manual). British Crop Protection Council; 760 p. (environ 275,00 $ can).

Copping, L.G., Menn, J.J., 2000. Biopesticides: a review of their action, applications and efficacy, *Pest Management Science*, Vol. 56 (8): pp. 651-676. [contact : lcopping@globainet.co.uk

A survey is given of the wide range of different materials and organisms that can be classified as biopesticides. Details are given of those currently of commercial importance, and future developments in this area are discussed. It is considered that, while in the immediate future biopesticides may continue to be limited mainly to niche and speciality markets, there is great potential for long-term development and growth, both in their own right and in providing leads in other areas of pest management science.

Biopesticides is a term that encompasses many aspects of pest control such as:

- Microbial (viral, bacterial and fungal) organisms
- Entomophagous nematodes
- Plant-derived pesticides (botanicals)
- Secondary metabolites from micro-organisms (antibiotics)
- Insect pheromones applied for mating disruption, monitoring or lure-and-kill strategies
- Genes used to transform crops to express resistance to insect, fungal and viral attacks or to render them tolerant of herbicide application.

Indeed, some might suggest the inclusion of insect predators and parasites, although these are not covered in this review.

{Recherche appliquée}

Accès : limité avec inscription, via Wiley Inter Science (document html ou pdf)
Coût : 29,95 $ pour un accès de 24 h à la base données du site Internet.

Voir aussi : Copping, L.G., 2004.The Manual of biocontrol agents, (3rd Ed. of Biopesticide manual). British Crop Protection Council; 760 p. (environ 275,00 $ can).

Corlay, F., Boivin G., Bélair G., 2007. Efficiency of natural enemies against the swede midge Contarinia nasturtii (Diptera: Cecidomyiidae), a new invasive species in North America. *Biological Control,* Vol. 43 (2): pp. 195-201. [contact: boiving@agr.gc.ca]

The swede midge, *Contarinia nasturtii* Kieffer (Diptera: Cecidomyiidae), a widespread pest of cruciferous crops in Europe, has been recently found in Canada. A 2-year survey in Quebec yielded no specialized natural enemies. Two polyphagous coccinellid predators (*Harmonia axyridis* (Pallas) and *Coccinella septempunctata* L) were field collected for further evaluation. In laboratory experiments, these two coccinellid species fed on swede midge larvae, and *H. axyridis* showed a higher voracity than *C. septempunctata*. Late larvae and adults of *H. axyridis* were shown to consume more swede midge larvae than young larvae, while the adults of *H. axyridis* showed no preference between swede midge larvae and the green peach aphid *Myzus persicae*. However, *H. axyridis* adults were not able to prey on swede midge larvae on potted infested broccoli plants. The susceptibility of swede midge larvae to three species of entomopathogenic nematodes (*Steinernema feltiae*, *Steinernema carpocapsae*, and *Heterorhabditis bacteriophora*) was also evaluated. *H. bacteriophora* was the only species that caused significant mortality to swede midge larvae. At a concentration of 1000 IJs/larva, *H. bacteriophora* caused 90-100% mortality to swede midge larvae in loam, sandy loam, clay and muck soils.

{Recherche appliquée}

Accès au document : via le site Science Direct (document pdf ou html)
Coût : 30,00 $ US

Daniel, C.; Tschabol, J.-L., Wyss, E. 2005. Bekämpfung des Apfelblütenstechers mit Spinosad im biologischen Anbau [Lutte contre l'anthonome du pommier dans la culture biologique au moyen de Spinosad]. *Schweizerische Zeitschrift für Obst- und Weinbau,* 141 (4/05): pp. 9-12. (allemand)

Daniel, C.; Wyss, E., Tschabold, J.-L. 2005. Anthonome du pommier: On a enfin trouvé une solution. *Bio actualités,* 1/105: pp. 8-9. (français) [contact: info.suisse@fibl.org]

L'anthonome du pommier est un ravageur très répandu en Europe. Dans la culture biologique, aucun produit de lutte contre l'anthonome du pommier n'était admis à ce jour. Spinosad « Audienz » est désormais autorisé dans la nouvelle liste des produits auxiliaires publiée par l'IRAB pour 2005, pour l'application préflorale contre l'anthonome du pommier.

Lors de traitements effectués en 2003, les applications avec un turbo-diffuseur dans de grandes parcelles étaient nettement plus efficaces que les traitements effectués avec un pulvérisateur dorsal dans des parcelles plus petites; 2 applications ont eu plus d'impact qu'une seule. Les concentrations suggérées vont de 0,02 % à 0,04 % (1 500 litres de bouillis à l'hectare), 1 à 2 applications (en préfloraison) par saison.

{Transfert technologique}

Accès au document : via le site orgprints.org (document pdf)

Dufour, Rex. 2000. Farmscaping to Enhance Biological Control. NCAT/ATTRA Pest Management Series. ATTRA Publication #CT065. National Center for Appropriate Technology, Fayetteville, Arkansas. 40 p. [contact: rexd@ncat.org]

"Farmscaping" is a whole-farm, ecological approach to pest management. It can be defined as the use of hedgerows, insectary plants, cover crops, and water reservoirs to attract and support populations of beneficial organisms such as insects, bats, and birds of prey.

This publication contains information about increasing and managing biodiversity on a farm to favor beneficial organisms, with emphasis on beneficial insects. The types of information farmscapers need to consider is outlined and emphasized. Appendices have information about various types and examples of successful "farmscaping" (manipulations of the agricultural ecosystem), plants that attract beneficials, pests and their predators, seed blends to attract beneficial insects, examples of farmscaping, hedgerow establishment and maintenance budgets, and a sample flowering period table.

{Transfert technologique}

Accès au document : via le site de l'ATTRA (document html en ligne, ou document pdf)

Finch, S., Billiald, H., Collier, R.H., 2003. Companion planting do aromatic plants disrupt host-plant finding by the cabbage root fly and the onion fly more effectively than non-aromatic plants? *Entomologia Experimentalis et Applicata, Blackwell Publishing,* Vol. 109 (3): pp. 183-195.

Brassica and *Allium* host-plants were each surrounded by four non-host plants to determine how background plants affected host-plant finding by the cabbage root fly (*Delia radicum* L.) and the onion fly [*Delia antiqua* (Meig.)] (Diptera: Anthomyiidae), respectively. The 24 non-host plants tested in field-cage experiments included garden \`bedding' plants, weeds, aromatic plants, companion plants, and one vegetable plant. Of the 20 non-host plants that disrupted host-plant finding by the cabbage root fly, fewest eggs (18% of check total) were laid on host plants surrounded by the weed *Chenopodium album* L., and most (64% of check total) on those surrounded by the weed *Fumaria officinalis* L. Of the 15 plants that disrupted host-plant finding in the preliminary tests involving the onion fly, the most disruptive (8% of check total) was a green-leaved variant of the bedding plant *Pelargonium × hortorum* L.H. Bail and the least disruptive (57% of check total) was the aromatic plant *Mentha piperita × citrata* (Ehrh.) Briq. Plant cultivars of *Dahlia variabilis* (Willd.) Desf. and *Pelargonium × hortorum*, selected for their reddish foliage, were less disruptive than comparable cultivars with green foliage. The only surrounding plants that did not disrupt oviposition by the cabbage root fly were the low-growing scrambling plant *Sallopia convolvulus* L., the grey-foliage plant *Cineraria maritima* L., and two plants, *Lobularia maritima* (L.) Desv. and *Lobelia erinus* L. which, from their profuse covering of small flowers, appeared to be white and blue, respectively. The leaf on which the fly landed had a considerable effect on subsequent behaviour. Flies that landed on a host plant searched the leaf surface in an excited manner, whereas those that landed on a non-host plant remained more or less motionless. Before taking off again, the flies stayed 2-5 times as long on the leaf of a non-host plant as on the leaf of a host plant. Host-plant finding was affected by the size (weight, leaf area, height) of the surrounding non-host plants. \`Companion plants' and aromatic plants were no more disruptive to either species of fly than the other plants tested. Disruption by all plants resulted from their green leaves, and not from their odours and/or tastes.

{Recherche appliquée}

Accès au document : via le site Ingenta Connect (document pdf ou html)
Coût de l'article : 55,09 $ US

González-Coloma, A., Martín-Benito, D., Mohamed, N., García-Vallejo, M.C., Soria, A.C., 2006. Antifeedant effects and chemical composition of essential oils from different populations of Lavandula luisieri L. *Biochemical Systematics and Ecology*, Vol. 34 (8): pp. 609-616.
[contact: azu@ccma.csic.es]

Forty-seven individual *Lavandula luisieri* (Rozeira) Riv.-Mart. plants were grouped into six categories according to their volatile composition using Principal Component Analysis. The essential oils from flowers and leaves from these six groups were analyzed by GC–MS and their antifeedant effects tested against the insect species *Spodoptera littoralis*, *Leptinotarsa decemlineata* and *Myzus persicae*; *L. decemlineata* and *M. persicae* being the most sensitive species. The antifeedant effects of these oils could not be justified by the activity of their major components considered individually thus pointing to synergistic effects among the oil components as suggested by a stepwise linear regression of compound concentrations on antifeedant effects for these groups.

{Recherche appliquée}

Accès au document : via le site Science Direct (document pdf ou html)
Coût : 30,00 $ US

Grundy, A. 2006. Using weeds to reduce pest insect numbers in organic vegetable crops - a desk study (OF0329). Report, Warwick HRI. [contact: Arable@defra.gsi.gov.uk]

Vegetable brassicas were chosen as the experimental crop, because their pest and weed models have been well validated, and because Brassica crops account for approximately 20% of the total organic vegetables grown in the UK. However, the research also demonstrates how the system could be adapted for other crop/pest combinations.

Three non-host weed plants were used in the study; *Chenopodium album* (fat hen), *Stellaria media* (common chickweed) and *Tripleurospermum inodorum* (scentless mayweed). These species were selected because they are common weeds in field vegetable crops, reduce colonisation by the cabbage root fly (*Delia radicum*) and have contrasting architecture (spread and height). The treatments combined weed species, planting times, plant sizes and plant densities to examine the impact on pest colonisation of cabbage.

To combine weed and pest insect models to quantify the interactions between crop growth, weed growth and pest insect numbers, further statistical analyses were done to consider relationships between the numbers of pests per plant and various crop and weed parameters.

The strategies were timed to coincide with periods of either low or high pest incidence in the field, predicted using the *D. radicum* forecast, and the weeds were removed 4 weeks after transplanting, when the cabbage plants should have been sufficiently well established to withstand a certain amount of root damage. Although the weeds were removed after the first 4 weeks of cabbage growth, the high density of weeds required over this period caused a significant reduction in crop yield.

Practical conclusions

1. The trade-off between crop yield and pest control is clearly illustrated by the study. Yield loss (up to 30%) due to competition may be tolerable as an alternative to severe pest damage, in situations where infestation levels are high.
2. The strategy of allowing weed presence for a limited period whilst maintaining a «weed: crop» ratio above a threshold can provide some protection against pest damage.
3. Planting into a background of natural flora is probably the most practical way of achieving this protection. However, the weeds would need to be well established before the cabbage was transplanted to achieve the required weed: crop ratio.
4. Weeds in close proximity to the crop do reduce pest colonisation, as seen in other studies. Hence a lower total number of weeds could potentially achieve the same protective effect, providing they are close to the crop plant.
   Further information is needed on the spatial characteristics of plant competition to enable more realistic and practical strategies to be evaluated.

{Recherche appliquée}

Accès au document : via le site orgprints.org (document pdf)

Holopainen, J.K. 2005. Improvement of biological control by volatile plant compounds. *Forskningsnytt om økologisk landbruk i Norden*, (1): pp. 18-19 [contact: riitta.koistinen@mtt.fi]

Compared to conventional farming the pest management strategies in organic farming is based on better plant resistance and sustainable cultivation technique that does not destroy the natural enemies of pest insects. Methods that reduce feeding efforts of pests and maintain strong population of predators and parasitoid on crop plant, are the way forward for sustainable plant protection strategies. Volatile compounds extracted from plants and sprayed on crop plants are one of the key factors for the development of these techniques.

{Transfert technologique}

Accès au document : via le site orgprints.org (document pdf)

Isman M.B., 2006. Botanical Insecticides, deterrents, and repellents in modern agriculture and an increasingly regulated world. *Annual Review of Entomology*, Vol. 51: pp. 45-66.
[contact: murray.isman@ubc.ca]

Botanical insecticides have long been touted as attractive alternatives to synthetic chemical insecticides for pest management because botanicals reputedly pose little threat to the environment or to human health. The body of scientific literature documenting bioactivity of plant derivatives to arthropod pests continues to expand, yet only a handful of botanicals are currently used in agriculture in the industrialized world, and there are few prospects for commercial development of new botanical products. Pyrethrum and neem are well established commercially, pesticides based on plant essential oils have recently entered the marketplace, and the use of rotenone appears to be waning. A number of plant substances have been considered for use as insect antifeedants or repellents, but apart from some natural mosquito repellents, little commercial success has ensued for plant substances that modify arthropod behavior. Several factors appear to limit the success of botanicals, most notably regulatory barriers and the availability of competing products (newer synthetics, fermentation products, microbials) that are cost-effective and relatively safe compared with their predecessors. In the context of agricultural pest management, botanical insecticides are best suited for use in organic food production in industrialized countries but can play a much greater role in the production and postharvest protection of food in developing countries.

{Recherche appliquée}

Accès au document : via le site Annual Review (document pdf ou html)
Coût de l'article : 20,00 $ US

Isman, M.B., 2000. Plant essential oils for pest and disease management. *Crop Protection*, Vol. 19 (8-10): pp. 603-608. [contact: murray.isman@ubc.ca]

Certain essential plant oils, widely used as fragrances and flavors in the perfume and food industries, have long been reputed to repel insects. Recent investigations in several countries confirm that some plant essential oils not only repel insects, but have contact and fumigant insecticidal actions against specific pests, and fungicidal actions against some important plant pathogens. As part of an effort aimed at the development of reduced-risk pesticides based on plant essential oils, toxic and sublethal effects of some essential oil terpenes and phenols have been investigated using the tobacco cutworm (*Spodoptera litura*) and the green peach aphid (*Myzus persicae*) as model pest species. In this paper I review (i) the range of biological activities of essential oils and their constituents; (ii) their toxicity and proposed mode-of-action in insects; (iii) their potential health and environmental impacts as crop protectants; and (iv) commercialization of pesticides based on plant essential oils.

{Recherche appliquée}

Accès au document : via le site Science Direct (document pdf ou html)
Coût : 30,00 $ US

Kuepper, G. 2003. Flea Beetle: Organic Control Options. NCAT/ATTRA Pest Management Series. ATTRA Publication #CT114. National Center for Appropriate Technology, Fayetteville, Arkansas. 6 p. [contact: georgek@ncat.org]

This publication focuses on organic control of flea beetles, one of the more serious vegetable crop pests. Cultural and biological options are discussed along with alternative pesticidal materials.

In organic systems, the preferred approaches to pest management are those that enhance the diversity of the farm system, such as cover cropping, rotation, and interplanting; those that use special knowledge of pest biology, such as delayed planting; and those that take advantage of existing on-farm resources. These approaches are typified by cultural and biological controls, which will be discussed first. Alternative pesticides, while frequently necessary for some crop pests and conditions, can be treated as "rescue chemistry"—to be used when and if other strategies fall short.

{Transfert technologique}

Accès au document : via le site de l'ATTRA (document html en ligne, ou document pdf)

Landis, D.A., Wratten, S.D., Gurr G.M., 2000. Habitat management to conserve natural enemies of arthropod pests in agriculture. *Annual Review of Entomology*, Vol. 45: pp. 175-201.
[contact: landisd@pilot.msu.edu]

Many agroecosystems are unfavorable environments for natural enemies due to high levels of disturbance. Habitat management, a form of conservation biological control, is an ecologically based approach aimed at favoring natural enemies and enhancing biological control in agricultural systems. The goal of habitat management is to create a suitable ecological infrastructure within the agricultural landscape to provide resources such as food for adult natural enemies, alternative prey or hosts, and shelter from adverse conditions. These resources must be integrated into the landscape in a way that is spatially and temporally favorable to natural enemies and practical for producers to implement. The rapidly expanding literature on habitat management is reviewed with attention to practices for favoring predators and parasitoids, implementation of habitat management, and the contributions of modeling and ecological theory to this developing area of conservation biological control. The potential to integrate the goals of habitat management for natural enemies and nature conservation is discussed.

{Recherche appliquée}

Accès au document : via le site Annual Review (document pdf ou html)
Coût de l'article : 20,00 $ US

Leland, J.E., McGuire, M.R., 2006. Effects of different Beauveria bassiana isolates on field populations of Lygus lineolaris in pigweed (Amaranthus spp) *Biological Control*, Vol. (3): pp. 272-281. [contact: jleland@ars.usda.gov]

The tarnished plant bug, *Lygus lineolaris* (Palisot de Beauvois), is a pest of various fruit, vegetable, fiber, and seed crops; including cotton. *Lygus* spp. populations often build on alternate host plants before moving to cotton, and in the midsouthern U.S. wild host plants, such as pigweed (*Amaranthus* spp.), play a major role in *L. lineolaris* population development. Three isolates of the entomopathogenic fungus *Beauveria bassiana* (Balsamo) were evaluated for *L. lineolaris* control in redroot pigweed (*Amaranthus retroflexus* L.): one from *L. lineolaris* in Mississippi (TPB3); one from *Lygus hesperus* (Knight) in California (WTPB2); and one commercial isolate from Mycotrol® (GHA). Fungal applications resulted in moderate to high mycosis in adults (33 to 80%) and moderate mycosis in nymphs (36 to 53%) that were collected from field plots at 2 days post-treatment and incubated under laboratory conditions. Although TPB3 was previously found to be more pathogenic in laboratory bioassays, there was not a consistent separation of this isolate from the other two isolates in field trials. Where differences in adult mycosis or mortality were observed, TPB3 was the most pathogenic. However, in one field trial 7 day mortality for nymphs treated with GHA was higher than those treated with TPB3 or WTPB2. Infection rates at 2, 7, and 14 days post-treatment from caged and non-caged adults suggested that movement of adults among plots occurred, which could have masked some treatment effects. Fungal treatments did not significantly reduce populations relative to controls. This may have been caused by delayed mortality rates under field conditions and/or difficulties with estimating population change under field conditions characteristic of wild host plant populations (e.g., heterogeneous populations, adult movement, and small plot size). Further work evaluating time–dose–mortality over dynamic temperatures, spring and fall field trials on this and other wild hosts, and improved methods for estimating populations on wild hosts are needed.

{Recherche appliquée}

Accès au document : via le site Science Direct (document pdf ou html)
Coût : 30,00 $ US

Letourneau, D., Bruggen, A. van, 2006. Crop protection in organic agriculture. In :. Kristiansen, P., Taji, A., Reganold, J., Eds. 2006. Organic agriculture: a global perspective. CSIRO Publishing, Collingwood / CABI, Wallingford / Cornell University Press, Ithaca / Manaaki Whenua Press, Lincoln. pp. 93-121. [contact: dletour@ucsc.edu]

This subject is reviewed under the following headings: pests and diseases in organic versus conventional agriculture; pest and disease management in organic versus conventional agriculture, including prevention of colonization or establishment of pests and pathogens in organic agriculture, regulation of established pests and pathogens in organic agriculture, host plant resistance, community resistance - vegetation, community resistance - pathogens and herbivores, community resistance - biological control, curative control; and pest and disease management case studies in organic versus conventional agriculture. Future research directions are also discussed.

{Recueil}

Accès au document : via le site orgprints.org (document pdf)

Montes-Molina, J..A., Luna-Guido, M.L., Espinoza-Paz, N., Govaerts, B., Gutierrez-Miceli, F.A., Dendooven, L., 2008. Are extracts of neem (Azadirachta indica A. Juss. (L.)) and Gliricidia sepium (Jacquin) an alternative to control pests on maize (Zea mays L.). *Crop Protection*, Vol. 27 (3-5): pp. 763-774. [contact: dendoove@cinvestav.mx]

Extracts of plants have been used to control pests, but little information exists about how effective they are to limit crop damage, or how they affect plant growth, crop yield and insects. Extracts from Azadirachta indica A. Juss. (L.) leaves (NEEM treatment), a plant originating from India known for its bio-insecticide characteristics, and Gliricidia sepium (Jacquin kunth ex Walp.) (GLIRICIDIA treatment), a plant originating from Mexico and Central America known to repel insects, were compared to a standard insecticide, lambda-cyalothrin or Karate® (CHEMICAL treatment) for insect pest efficacy in cultivated maize in Chiapas, Mexico. Untreated maize plants served as control (CONTROL treatment). Plant damage, crop growth, yield and fauna were monitored during four growing seasons from 2003 to 2006. Mean maize yield was significantly higher in the NEEM and CHEMICAL treatments, i.e. 9784 and 9916 kg ha^{-1}, respectively, compared to the CONTROL treatment (7206 kg ha^{-1}). The GLIRICIDIA treatment yielded 8747 kg ha^{-1}. Of the 26 insect species found during the growing season, only the number of Spodoptera frugiperda (Lepidoptera: Noctuidae), Macrodactylus spp. (Coleoptera: Melolonthidae) and Frankliniella spp. (Thysanoptera: Thripidae) was significantly different between the treatments, with the lowest values found in the chemical treated plots. The amount of beneficial insects was not affected by treatment, while the amount of insects that cause damage was significantly lower (ca. 2-fold) in the CHEMICAL treatment than in the other treatments. Mean damage to the newly formed leaves was 18% in the NEEM treatment and 23% in the GLIRICIDIA treatment and significantly lower than that of the CONTROL treatment (37%), but significantly higher than that of the CHEMICAL treatment (11%). It was found that leaf extracts of G. sepium and A. indica reduced damage to the newly formed leaves and increased yields compared to untreated maize plants, with neem being more effective. However, neem was not as effective as chemical control with lambda-cyalothrin, for overall maize protection.

{Recherche appliquée}

Accès au document : via le site Science Direct (document pdf ou html)
Coût : 30,00 $ US

Palumbo, J.C., Reyes, F.J., Mullis Jr., C.H., Amaya, A., Ledesma, L., Carey, L., 2001. Neonicotinoids and Azadirachtin in Lettuce: Comparison of Application Methods for Control of Lettuce Aphids. In D. N. Byrne and Baciewicz, Patti [ed.], Vegetable Report Series P-127. Publ. No. AZ1252. University of Arizona, College of Agriculture and Life Sciences, Cooperative Extension, Tucson, Arizona. pp. 35-42.

Several small-plot field studies were conducted at the University of Arizona, Yuma Agricultural Center in the spring 2001 growing season to evaluate various neonicotinoids and azadirachtin products against lettuce aphid, *Nasonovia ribisnigri*, in lettuce. Further, these products were compared as soil-applied treatments, foliar sprays and application through sub-surface irrigation.

The results of these trials provide useful information for understanding how to effectively use the new chemistries available for aphid management in lettuce. First, Platinum performed best as a post-planting application through a side-dress application or through the drip. The foliar neonicotinoids, Assail and Actara were active against lettuce aphids, but were most effective when populations densities were lower. Comparatively, the conventional chemistries (MSR, Orthene/Provado, Provado/Endosulfan) provided consistent control when used aggressively. The azadirachtin products were significantly less effective against LA in head lettuce due largely to their inability to contact the insects, but on formulation (AzaDirect) showed better efficacy when applied through drip irrigation or sprayed repeatedly in romaine lettuce.

{Recherche appliquée}

Accès au document : via le site de l’Université d’Arizona (document pdf)

Park, B.-S., Lee, S.-E., Choi, W.-S., Jeong, C.-Y., Song C., Cho, K.-Y., 2002. Insecticidal and acaricidal activity of pipernonaline and piperoctadecalidine derived from dried fruits of Piper longum L. *Crop Protection*, Vol. 21 (3): pp. 249-251. [contact: sel@pw.usda.gov]

Toxicities of two piperidine alkaloids, pipernonaline and piperoctadecalidine, isolated from *Piper longum* L. were determined against five species of arthropod pests. The most potent insecticidal activities of both alkaloids, pipernonaline (LD_{50}=125 mg/l) and piperoctadecalidine (LD_{50}=95.5 mg/l), were against *Spodoptera litura* F. (Lepidoptera: Noctuidae). Both alkaloids also showed insecticidal activities towards *Myzus persicae* Sulzer (Hemiptera: Sternorrhynche: Aphididae). Piperoctadecalidine (LD_{50}=246 mg/l) but not pipernonaline showed acaricidal activity against *Tetranychus urticae* Koch (Acari: Tetranychidae). Neither compound showed insecticidal effects on *Nilaparvata lugens* Stål (Hemiptera: Fulgoromorpha: Delphacidae) or *Plutella xylostella* L. (Lepidopetera: Yponomeutoidae).

{Recherche appliquée}

Accès au document : via le site Science Direct (document pdf ou html)
Coût : 30,00 $ US

Parker, W.E., Collier, R.H., Ellis, P.R., Mead, A., Chandler, D., Blood Smyth, J.A., Tatchell, G.M., 2002. Matching control options to a pest complex: the integrated pest management of aphids in sequentially-planted crops of outdoor lettuce. *Crop Protection*, Vol. 21 (3): pp. 235-248.
[contact: bill.parker@adas.co.uk]

Sequentially planted short-season vegetable crops grown in temperate climates offer the opportunity to use known variations in pest phenology through the season to develop a strategic way of matching control options on different plantings to predicted levels of pest risk. To test this approach in the UK, five field experiments were done over two years to test integrated pest management (IPM) programmes for four aphid pest species (*Nasonovia ribisnigri, Macrosiphum euphorbiae, Pemphigus bursarius* and *Myzus persicae*) on outdoor lettuce crops. Crops were planted to coincide with different periods of forecast aphid risk. The results suggested that acceptable levels of aphid control could be achieved, provided a full range of treatment options (resistant cultivars, selective insecticides, biocontrol agents and validated pest forecasts) could be utilised. Commercial and technical constraints to the commercial adoption of this approach are discussed.

{Recherche appliquée}

Accès au document : via le site Science Direct (document pdf ou html)
Coût : 30,00 $ US

Pascual-Villalobos, M.J., Lacasa, A., González, A., Varó, P., García, M.J., 2006. Effect of flowering plant strips on aphid and syrphid populations in lettuce. *European Journal of Agronomy,* Vol. 24 (2): pp. 182-185. [contact: MJesus.Pascual@carm.es]

A two-year field experiment was carried out in Southeast Spain to study the effect of planting strips of *Coriandrum sativum* L. or *Chrysanthemum coronarium* L. with spring Iceberg lettuce on aphid and syrphid predator populations. Without chemical treatments, infestations by *Nasonovia ribisnigri* Mosley spread over the field in March and April. In 2001, the severity of infestations was greater (statistically significant) in lettuces from the plot with coriander margins in comparison with the monoculture. In 2002, predatory syrphid larvae were more abundant (tendency not statistically significant) on lettuces from the plot with flowering plant strips (1.9 larvae/head) than on lettuce monocultures (1.3 larvae/head). Adult syrphids were foraging on flowering strips from early winter to spring. Species identified being: *Episyrphus balteatus* De Geer, *Eupeodes corollae* Fabricius, *Sphaerophoria rueppellii* Wiedemann and *Sphaerophoria scripta* Linnaeus.

{Recherche appliquée}

Accès au document : via le site Science Direct (document pdf ou html)
Coût : 30,00 $ US

Rai, Mahendra et María Cecilia Carpinella (éditeurs), 2006. *Naturally Occurring Bioactive Compounds. Advances in Phytomedicine*, Vol. 3: pp. 1-502. ISBN: 9780444522412
http://www.sciencedirect.com/science/bookseries/1572557X

Chapitres :

1- Natural compounds as antioxidant and molting inhibitors can play a role as a model for search of new botanical pesticides.
2- Pesticides based on plant essential oils: from traditional practice to commercialization.
3- Natural substrates and inhibitors of multidrug resistant pumps (MDRs) redefine the plant antimicrobials.
4- New concept to search for alternate insect control agents from plants.
5- Role of Melia azedarach L. (Meliaceae) for the control of insects and acari: present status and future prospects.
6- Bioactivity of fabaceous plants against food-borne and plant pathogens: potentials and limitations.
7- Screening of plants against fungi affecting crops and stored foods.
8- Opportunities and potentials of botanical extracts and products for management of insect pests in cruciferous vegetables.
9- The potential for using neem (Azadirachta indica A. Juss) extracts for pine weevil management in temperate forestry.
10- Plant allelochemicals in thrips control strategies.
11- Importance of plant secondary metabolites for protection against insects and microbial infections.
12- Naturally occurring house dust mites control agents: development and commercialization.
13- The search for plant-derived compounds with antifeedant activity.
14- An overview of the antimicrobial properties of Mexican medicinal plants.
15- Promissory botanical repellents/deterrents for managing two key tropical insect pests, the whitefly Bemisia tabaci and the mahogany shootborer Hypsipyla grandella.
16- Naturally occurring anti-insect proteins: current status and future aspects.
17- Antifungal natural products: assays and applications.

{Recherche appliquée}

Accès au document : chaque chapitre est disponible via le site Science Direct
(document pdf ou html)
Coût : 30,00 $ US par chapitre

Rice, M.J., Legg, M., Powell, K.A., 1998. Natural products in agriculture - a view from the industry. *Pesticide Science*, Vol. 52 (2): pp. 184-188.

The paper discusses the use of natural products and biological control agents in crop protection from an industrial viewpoint. The criteria which must be satisfied are noted. Examples are given from the genetic engineering of baculoviruses and proteins. The final section considers the utility of natural products as a source of leads for conventional agrochemicals, and the screens needed.

{Recherche appliquée}

Accès au document : via le site Wiley InterScience (document pdf ou html)
Coût de l'article : 29,95 $ US

Rosenfeld, A., Collier, R., Jayasinghe, C. 2006 Evaluation of module-sown companion plants as a method of controlling cabbage root fly. Paper presented at Joint Organic Congress, Odense, Denmark, May 30-31, 2006. [contact: arosenfeld@hdra.org.uk]

A novel technique for controlling cabbage root fly was tested. Companion plants of either birdsfoot trefoil (*Lotus corniculatus*), red clover (*Trifolium pratense*) or yellow trefoil (*Medicago lupulina)* were sown into modules together with calabrese (*Brassica oleracea* var Italica). The presence of companion plants subsequently reduced cabbage root fly egg-laying by up to 48% and reduced root damage considerably. Companion plant species did not affect egg-laying in this trial. Although, financially, this technique compares very favourably with an alternative strategy of applying fleece, further refinement is needed to improve the survival of companion plants on a commercial field scale as they were particularly vulnerable to damage by steerage hoes, which are used commonly in organic systems.

{Recherche appliquée}

Accès au document : via le site orgprints.org (document pdf)

Scott, I.M., Jensen, H.R., Philogène, B.J.R., Arnason, J.T., 2008. A review of *Piper* spp. (Piperaceae) phytochemistry, insecticidal activity and mode of action. *Phytochemistry Reviews*, Springer Netherlands, Vol. 7-1: pp.65-75. [contact: ims32@cornell.edu]

The tropical plant family Piperaceae has provided many past and present civilizations with a source of diverse medicines and food grade spice. The secondary plant compounds that produce these desired qualities function also as chemical defenses for many species in the genus *Piper*. The compounds with the greatest insecticidal activity are the piperamides. Many studies have shown the effectiveness of *Piper* spp. extracts for the control of stored products pests and recently studies from our laboratory group have tested the extracts of *Piper. nigrum*, *P. guineense* and *P. tuberculatum* against insect pests of the home and garden. These results and those from investigations that examined the biochemical and molecular modes of action of the piperamides singly or in combination will be the focus of this review. The conclusions of our current work with Piperaceae are that *Piper* extracts offer a unique and useful source of biopesticide material for controlling small-scale insect out-breaks and reducing the likelihood of resistance development when applied as a synergist with other botanical insecticides such as pyrethrum.

{Recherche appliquée}

Accès au document : via le site Springer Link (document pdf ou html)
Coût de l'article : 32,00 $ US

Shani, A., 2000. Chemical communication agents (pheromones) in integrated pest management. *Drug Dev. Res*., Vol. 50 (3-4): pp. 400-405. [contact : ashani@bgumail.bgu.ac.il]

The increasing resistance of pests to pesticides and microbes to drugs constitutes one of the major problems facing farmers and physicians, respectively. In the agricultural arena, there is a steady shift away from mere pesticide application to a more diversified approach and especially to integrated pest management (IPM). The latter strategy focuses, among others, on chemical communication among the species that cause most damage to crops - insect pests - and on disease transfer agents. Pheromones are the principal agent of chemical communication exploited in pest control. The major features of these natural nontoxic chemicals and their modes of application, current as well as potential, are described.

{Recherche appliquée}

Accès au document : via le site Wiley InterScience (document pdf ou html)
Coût de l'article : 29,95 $ US

Shelton, A.M., Badenes-Perez, F.R., 2005. Concepts and applications of trap cropping in pest management. *Annual Review of Entomology*, Vol. 51: pp. 285-308. [contact: ams5@cornell.edu]

Interest in trap cropping, a traditional tool of pest management, has increased considerably in recent years. In this review we propose a broader definition of trap cropping that encompasses the inherent characteristics of the trap crop plants themselves as well as the strategies associated with their deployment. Inherent characteristics of a trap crop may include not only natural differential attractiveness for oviposition and feeding, but also other attributes that enable the trap crop plants to serve as a sink for insects or the pathogens they vector. Successful deployment of trap crops within a landscape depends on the inherent characteristics of the trap crop and the higher value crop, the spatial and temporal characteristics of each, the behavior and movement patterns of insect pests, and the agronomic and economic requirements of the production system. Thus, trap cropping is more knowledge-intensive than many other forms of pest management. We review recent references on trap cropping, classify them according to their modalities and level of implementation, and provide a synthesis of the factors that influence the success of trap cropping. Last, we provide a list of recommendations and guidelines that should prove helpful in moving trap cropping forward to its full potential.

{Recherche appliquée}

Accès au document : via le site Annual Review (document pdf ou html)
Coût de l'article : 20,00 $ US

Siekmann, G., Hommes, M., 2005. Controlling root flies with exclusion fences?. Report, Institut für Pflanzenschutz im Gartenbau, Biologische Bundesanstalt für Land- und Forstwirtschaft. [contact: g.siekmann@bba.de]

Protecting crops with insect fences is currently being considered as an alternative to row cover netting and synthetic insecticides. Previous studies reported efficacies of such fences with 50-90% reduction in crop damage by root flies. We conducted trials with a 1.70 m fence over two years to monitor carrot rust fly (*Psila rosae*) in carrots and cabbage root fly (*Delia radicum*) in radish. There was a significant reduction in cabbage root fly damage in fenced plots whereas no such effect could be found with carrot rust fly. The structure of the overhang at the top of the fence and the mobility of this particular species may be important elements to consider in fence design. The length of the overhang also seemed to be important for cabbage root fly (*Delia radicum*) control, as a statistically significant treatment effect was observed only when the overhang was 35 cm long. Using radish as a test crop, the fences reduced damage by 55% in the second year of the trial. The population size of overwintering cabbage root flies was also an important factor, as the number of flies in the year that the fence was effective was lower than in the previous year.

{Recherche appliquée}

Accès au document : via le site orgprints.org (document pdf)

Singh, A., 2005. Pests in Organic Systems and Promising Solutions. Organic Agriculture Centre of Canada. {En ligne}

Organic farming emphasizes creating healthy soils using compost and green manures, crop rotations (including underseeding and intercropping), and having crop production integrated with a livestock enterprise. These management practices also act as a first-line of defence against pests. Pests, simply defined, are insects, weeds, or diseases that may affect the yield or quality of a crop.

This article will provide a brief introduction to many generic substances used by organic farmers and will list some potential products that are seeking regulation.

{Transfert technologique}

Accès au document : via le site du Centre d'agriculture biologique du Canada

Snyder, G.B., Finke, D.L., Snyder, W.E., 2008. Predator biodiversity strengthens aphid suppression across single- and multiple-species prey communities. *Biological Control*, Vol. 44 (1): pp. 52-60. [contact: gbsnyder@wsu.edu]

A positive relationship between predator biodiversity and improved pest suppression might be most clearly realized when several prey species are present, if a diversified prey base allows complementarity among predators to be realized. In two field experiments we manipulated diversity both within a guild of predatory insects (one versus four predator species) and among their herbivore prey (one versus two aphid species present). The strength of aphid suppression always increased with greater predator biodiversity, but this effect was independent of prey species diversity or identity, and no niche differentiation by aphid species was apparent among the predator species. This suggests that either niche partitioning among predators occurred but was not based on prey species identity or that the benefits of predator diversity for biological control were mediated by interactions within the predator community, such that a diverse resource base was not necessary to yield a positive relationship between predator biodiversity and effective herbivore suppression.

{Recherche appliquée}

Accès au document : via le site Science Direct (document pdf ou html)
Coût : 30,00 $ US

Tilmon K.J., Hoffmann, M.P., 2003. Biological control of Lygus lineolaris by Peristenus spp. in strawberry. *Biological Control*, Vol. 26 (3): pp. 287-292.
[contact: kjtilmon@facstaff.wisc.edu]

Peristenus digoneutis Loan (Hymenoptera: *Braconidae*) was introduced to the US for biological control of the tarnished plant bug, *Lygus lineolaris* (Palisot de Beauvois) (Hemiptera: *Miridae*), and has since spread through much of the northeast. The purpose of this study was to determine if P. digoneutis and a native congener, *Peristenus pallipes* (Curtis), parasitize *L. lineolaris* in strawberry (where it is a key pest), and what factors relate to parasitism levels. During 1997–1999 we monitored parasitism on 17 strawberry farms in 14 counties in eastern and western New York State. We found that in eastern NY (where *P. digoneutis* has been established since the early 1990s), overall mean parasitism was 19.7% (ranging from 0 to 70%), mostly by *P. digoneutis*. Mean parasitism was significantly lower (12.3%, ranging from 0 to 58%) in western NY (where *P. digoneutis* was first recorded in 1999), and was mostly by *P. pallipes*. *P. pallipes* parasitism was significantly lower in eastern than western NY, suggesting the potential for competitive interaction with *P. digoneutis*. The insecticide regime of a farm was an important factor influencing parasitism rate, which was 5- to 6.5-fold higher on organic or casually sprayed farms than on intensely treated farms, though pest density under these three regimes was not significantly different. *L. lineolaris* density, and parasitism rate in nearby alfalfa and abandoned fields were also significant factors for parasitism in strawberry.

{Recherche appliquée}

Accès au document : via le site Science Direct (document pdf ou html)
Coût : 30,00 $ US

Vu, Van H., Hong, Suk I., Kim, K., 2007. Selection of Entomopathogenic Fungi for Aphid Control. *Journal of Bioscience and Bioengineering*, Vol. 104 (6): pp. 498-505.
[contact: kkim@suwon.ac.kr]

Twelve strains of entomopathogenic fungi such as *Lecanicillium lecanii*, *Paecilomyces farinosus*, *Beauveria bassiana*, *Metarhizium anisopliae*, *Cordyceps scarabaeicola*, and *Nomuraea rileyi* were screened for aphid control. At 25°C and 75% relative humidity (RH), among tested entomopathogenic fungi, *L. lecanii* 41185 showed the highest virulent pathogenicity for both *Myzus persicae* and *Aphis gossypii*, and their control values were both nearly 100% 5 and 2 d after treatment, respectively. Moreover, at an RH of 45% and in a wide temperature range (20–30°C), *L. lecanii* 41185 also exhibited the highest virulence to *M. persicae*. The control value of *M. persicae* and the 50% lethal time (LT_{50}) decreased significantly as the applied conidial concentration increased. The 50% lethal concentration (LC_{50}) of the conidial suspension of this fungus was determined to be 6.55×10^5 conidia/ml. The control values of *M. persicae* resulting from the application of 1×10^7 and 1×10^8 conidia/ml were nearly the same and were significantly higher than that of 1×10^6 conidia/ml. The tested entomopathogenic fungi grew in a broad temperature range (15–30°C). *Lecanicillium* strains showed optimum growth at 25°C. The aerial conidia of *Lecanicillium* strains also could germinate in a broad temperature range (15–30°C) and *L. lecanii* 41185 was the only strain with conidial germination at 35°C.

{Recherche appliquée}

Accès au document : via le site de Journal of Bioscience and Bioengineering (document pdf)

Wyss, E., Daniel, C., 2004. Die Wirksamkeit von Einflugbarrieren gegen die Besiedlung von Broccoli und Kohlrabi durch die Kohldrehherzgallmücke *Contarinia nasturtii* (Diptera: *Cecidomyiidae*). [The effect of exclusion fences on the colonization of broccoli and kohlrabi by the Swede midge, *Contarinia nasturtii* (Diptera: *Cecidomyiidae*).] *Mitteilungen der Deutschen Gesellschaft für allgemeine und angewandte Entomologie*, Vol. 14 (1-6): pp. 387-390.
[contact: info.suisse@fibl.org]

The Swede midge *Contarinia nasturtii* (Diptera: C*ecidomyiidae*) is an important and wide spread pest in Europe. In Swiss organic vegetable production only the expensive product “Audienz” (active matter: Spinosad) is permitted. In addition, netting the entire crop surface can exclude the Swede midges from crops, but it has a negative influence on the microclimatic conditions and the labour and capital cost are often too high. Since it is known, that several vegetable key pest species spread within the crop or only a few centimetres above it, the use of vertical exclusion fences has been developed in Canada. The objective of our study was to exclude *C. nasturtii* from the crops by using a similar, but cheaper prototype of exclusion fence.

The studies were undertaken on two fields (broccoli and kohlrabi) and the effect of the fences (fenced in area: 15x20m for broccoli, 7.5x20m for kohlrabi; height of fences: 1.4m with a 0.25m overhang; 4 replications each field) was compared with an untreated control and with a treatment of “Audienz” (3 applications, 0.5l/ha). At harvest the damages were assessed by classifying the symptoms of 100 plants per treatment and replication in three (kohlrabi) or four (broccoli) categories. Inside the fences 100 plants near the fence and 100 plants in the centre were visually controlled.

The exclusion fences significantly reduced the damages caused by the Swede midge. The treatment of “Audienz“ reduced the damages, too, but in the broccoli trial, “Audienz“ had a significantly lower effect than the fences. The effectiveness of “Audienz” with 36.4% (broccoli) and 58.3% (kohlrabi), respectively, was lower than the effectiveness of the fences: 69.1% and 60.0% near the fence and 77.8% and 78.9% in the centre. The results are discussed.

{Recherche appliquée}

Accès au document : limité avec inscription, via le site orgprints.org (document pdf)

Zehnder, G., Gurr, G.M., Kühne, S., Wade, M.R., Wratten, SS.D., Wyss, E., 2007. Arthropod Pest Management in Organic Crops. *Annual Review of Entomology*, Vol. 52: pp. 57-80.
[contact: zehnder@clemson.edu]

Burgeoning consumer interest in organically produced foods has made organic farming one of the fastest growing segments of agriculture. This growth has not been supported adequately by rigorous research to address challenges such as arthropod pest management. The research that has been conducted, however, is complemented by research in aspects of conventional agriculture that may have applicability in organic systems, as well as by research in underpinning fields such as applied ecology. This article synthesizes the available literature in relation to a conceptual model of arthropod pest management strategies suitable for organic systems. The present work uses the four phases of the model to review the strategies in an agroecological context and provides a synthesis of the factors that influence the success of each phase. Rather than constituting a fringe science, pest management research for organic systems draws on cutting edge science in fields such as landscape and chemical ecology and has a bright future.

{Recherche appliquée}

Accès au document : via le site Annual Review (document pdf ou html)
Coût de l'article : 20,00 $ US

Zehnder, G.W., Murphy, J.F., Sikora, E.J., Kloepper, J.W., 2001. Application to rhizobacteria for induced resistance. *European Journal of Plant Pathology*, Vol. 107 (1): pp. 39-50.
[contact: zehnder@clemson.edu]

This article provides a review of experiments conducted over a six-year period to develop a biological control system for insect-transmitted diseases in vegetables based on induced systemic resistance (ISR) mediated by plant growth-promoting rhizobacteria (PGPR). Initial experiments investigated the factors involved in treatment with PGPR led to ISR to bacterial wilt disease in cucumber caused by *Erwinia tracheiphila*. Results demonstrated that PGPR-ISR against bacterial wilt and feeding by the cucumber beetle vectors of *E. trachiphiela* were associated with reduced concentrations of cucurbitacin, a secondary plant metabolite and powerful beetle feeding stimulant. In other experiments, PGPR induced resistance against bacterial wilt in the absence of the beetle vectors, suggesting that PGPR-ISR protects cucumber against bacterial wilt not only by reducing beetle feeding and transmission of the pathogen, but also through the induction of other plant defense mechanisms after the pathogen has been introduced into the plant. Additional greenhouse and field experiments are described in which PGPR strains were selected for ISR against cucumber mosaic virus (CMV) and tomato mottle virus (ToMoV). Although results varied from year to year, field-grown tomatoes treated with PGPR demonstrated a reduction in the development of disease symptoms, and often a reduction in the incidence of viral infection and an increase in tomato yield. Recent efforts on commercial development of PGPR are described in which biological preparations containing industrial formulated spores of PGPR plus chitosan were formulated and evaluated for use in a transplant soil mix system for developing plants that can withstand disease attack after transplanting in the field.

{Recherche appliquée}

Accès au document : limité avec inscription, via le site Springer Link (document pdf)
Coût : 32,00 $

ANNEXE : LIENS UTILES

Canada

Centre d'agriculture biologique du Canada
www.oacc.info

Réseau Biocontrôle (magazines de vulgarisation)
www.biocontrol.ca/bcf/main_f.html

États-Unis

Cornell University College of Agriculture and Life Sciences
Biological Control
Organic Insect and Disease Management Resource Guide

National Agricultural Library, Alternative Agriculture Information Center
www.nal.usda.gov/

National Sustainable Agriculture Information Service (ATTRA)
http://www.attra.org

Sustainable Agriculture Research and Education (SARE)
www.sare.org/index.htm

Europe

Danish Research Centre for Organic Farming (DARCOF).
Danemark (anglais)
www.darcof.dk

Forschungsinstitut für biologischen Landbau (FiBL)- Research Institute of Organic Agriculture
Suisse-Allemagne-Autriche (certaines informations disponibles en français)
www.fibl.org/francais/index.php

Institut National de la Recherche Agronomique (INRA), France
www.inra.fr/la_science_et_vous/dossiers_scientifiques/agriculture_biologique

Institut Technique de l'Agriculture Biologique (ITAB), France
Publications de la revue Alter Agri, d'actes de journées techniques, de dossiers spéciaux,etc.
www.itab.asso.fr

Nordic Association of Agricultural Sciences
Pays Scandinaves et Baltiques (anglais)
www.njf.nu/site/redirect.asp?p=1000

The Organic Research Centre, Elm Farm
Grande-Bretagne (United Kingdom) (anglais)
www.efrc.com
Organic Inform-Elm farm (bulletin d'information) : www.organicinform.org

Québec

Ecological Agricultural Projects
Université McGill
www.eap.mcgill.ca
- Plusieurs publications et liens

CRAAQ
Les sites d'Agri-Réseau
Quelques exemples :
- L'importance des éléments mineurs : des carences à la toxicité. Une préoccupation en agriculture biologique ?
- Lutter contre les insectes nuisibles en agriculture biologique : intervenir en harmonie face à la complexité
- Manuel des Intrants Bio, partie 1 production végétale et partie 2 production animale
- Moyens de lutte contre des mauvaises herbes spécifiques (8 documents)
- Engrais verts et faux semis : Influence sur la levée des mauvaises herbes en production maraîchère
- Cultures pièges et kaolin contre la chrysomèle rayée du concombre
- Étude d'efficacité de l'argile kaoline (Surround WP) pour lutter contre la pyrale des atocas (*Acrobasis vaccini* Rilay) et détermination d'un protocole d'application judicieux de matières fertilisantes dans la production de canneberges biologiques.
- Glumobile : mise au point d'un appareil mobile pour le piégage massif de certains insectes ravageurs en maraîchage biologique
- Les couvertures flottantes pour la hâtivité et le contrôle des insectes dans la carotte, la laitue et le radis

MAPAQ –section Protection des cultures
Lutte antiparasitaire

MAPAQ :
Homologation des pesticides pour usages limités, détermination des priorités pour 2008 en entomologie, malherbologie et pathologie. Voir les tableaux Horticulture biologique.

MDDEP
Recherche et développement de biopesticides et pesticides naturels à faible toxicité pour les organismes non ciblés et respectueux de l'environnement Phytopathologie-Entomologie (2006)
Sous la direction de Richard Bélanger et Jacques Brodeur, revue littérature et résultats de recherche.

Archives- Base de données

CABI : produits tels que CAB Abstracts, la collection des Compendia, et ressources Internet.
www.cabi.org
www.organic-research.com

Organic Agriculture Information website (Organic AgInfo)
www.organicaginfo.org/

The Organic Eprints archive. Réseau européen de recherche en Agriculture biologique
www.orgprints.org