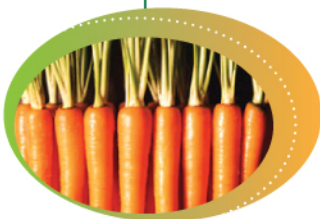


# Recueil Bionovation

Édition 2008



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



## **VOLET MALADIES PARASITAIRES**

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



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 pour ce volet :

- Les maladies bactériennes et cryptogamiques (blanc et moisissure grise chez le fraisier, tache, brûlure et flétrissure chez la tomate) et les solutions de rechange au cuivre utilisé pour le traitement de maladies en horticulture (en excluant la viticulture).

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<sup>1</sup>.

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<sup>1</sup> 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.



Agriculture et  
Agroalimentaire Canada

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Canada

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et Alimentation

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## TABLEAUX RÉCAPITULATIFS

1-PRATIQUES CULTURALES			
1.1- Approches diverses			
Approche	Culture	Pathogènes	Auteurs
Assainissement du feuillage, culture sur 1 rang	Fraise	Moisissure grise ( <i>Botrytis cinerea</i> ) Tache commune ( <i>Mycosphaerella fragariae</i> )	<a href="#">Schmid et al., 2005</a>
Biofumigation (glucosinolate)	Général	Champignons telluriques ( <i>Aphanomyces euteiches</i> var. <i>psi</i> , <i>Gaeumannomyces graminis</i> var. <i>tritici</i> , <i>Verticillium dahliae</i> )	<a href="#">Bellostas et al., 2006</a>
Général	Général	Général	<a href="#">Letourneau et al., 2006</a>
Solarisation Mycostop ( <i>Streptomyces griseovirides</i> )	Tomate	Flétrissure fusarienne ( <i>F. oxysporum</i> ) Verticilliose ( <i>Verticillium dahliae</i> )	<a href="#">Minuto et al., 2006</a>
1.2- Réduction du cuivre			
Extraits de PEN ( <i>Penicillium chrysogenum</i> )	Diverses	Blanc de la vigne ( <i>Uncinula necator</i> ) Mildiou de l'oignon ( <i>Peronospora destructor</i> ) Mildiou de la vigne ( <i>Plasmopara viticola</i> ) Mildiou des solanacées ( <i>Phytophthora infestans</i> ) Tavelure du pommier ( <i>Venturia inaequalis</i> )	<a href="#">Thürig et al., 2006</a>
Assainissement du feuillage, culture sur 1 rang	Fraise	Moisissure grise ( <i>Botrytis cinerea</i> ) Tache commune ( <i>Mycosphaerella fragariae</i> )	<a href="#">Schmid et al., 2005</a>
Chitosan + dose réduite de cuivre (sulfate de pentahydrate)	Pommes de terre	Mildiou des solanacées ( <i>Phytophthora infestans</i> )	<a href="#">Hadwiger et McBride, 2006</a>

2- CONTRÔLE BIOLOGIQUE : PRÉDATEUR, PARASITOÏDE OU ANTAGONISTE			
Approche	Culture	Pathogènes	Auteurs
Bactérie ( <i>Bacillus mycoides</i> ), levure ( <i>Pichia guilhermondii</i> )	Fraise	Moisissure grise ( <i>Botrytis cinerea</i> )	<a href="#">Guetsky et al., 2002</a>
<i>Cryptococcus albidus</i> (levure)	Fraise	Moisissure grise ( <i>Botrytis cinerea</i> )	<a href="#">Helbig, 2002</a>
<i>Gliocladium catenulatum</i>	Fraise	Moisissure grise ( <i>Botrytis cinerea</i> )	<a href="#">Lahdenperä, 2006</a>
<i>Trichoderma harzianum</i> ( <i>Bombus terrestris</i> comme agent disséminant de)	Fraise	Moisissure grise ( <i>Botrytis cinerea</i> )	<a href="#">Pinna et al., 2005</a>
<i>Trichoderma harzianum</i> (abeille comme agent disséminant de)	Fraise	Moisissure grise ( <i>Botrytis cinerea</i> )	<a href="#">Shafir et al., 2006</a>
Bactériophages	Général	Maladie bactérienne	<a href="#">Jones et al., 2007</a>
<i>Ampelomyces quisqualis</i>	Rose	Blanc de la rose ( <i>Sphaerotheca pannosa</i> var. <i>rosae</i> )	<a href="#">Pasini et al., 1997</a>
<i>Crinipellis pernicioso</i> (champignon)	Tomate	Tache bactérienne ( <i>Xanthomonas vesicatoria</i> )	<a href="#">Cavalcanti et al., 2007</a>
Extraits de composts, <i>Trichoderma asperellum</i> , <i>F. oxysporum</i> Fo47	Tomate	Flétrissure fusarienne ( <i>F. oxysporum</i> )	<a href="#">Cotxarrera et al., 2002</a>
Souches de bactéries	Tomate	Flétrissure bactérienne ( <i>Ralstonia solanacearum</i> )	<a href="#">Jetiyanon et Kloepper, 2002</a>
Souches de bactéries	Tomate	Flétrissure bactérienne ( <i>Ralstonia solanacearum</i> )	<a href="#">Lwin et Ranamukhaarachchi, 2006</a>
Mycostop ( <i>Streptomyces griseovirides</i> ) Solarisation	Tomate	Flétrissure fusarienne ( <i>F. oxysporum</i> ) Verticilliose ( <i>Verticillium dahliae</i> )	<a href="#">Minuto et al., 2006</a>
Bactéries endophytiques	Tomates	Général	<a href="#">Nejad et Johnson, 2000</a>
Acariens mycophages ( <i>Orthotydeus lambi</i> )	Vigne	Blanc de la vigne ( <i>Uncinula necator</i> )	<a href="#">English-Loeb et al., 2007</a>
<i>Ampelomyces quisqualis</i>	Vigne	Blanc de la vigne ( <i>Uncinula necator</i> )	<a href="#">Falk et al., 1995.</a>

## 3- ACTIVATION DES DÉFENSES NATURELLES ET PHYTOPROTECTION

Approche	Culture	Pathogènes	Auteurs
Lait de vache	Curcubitacées	Blanc des curcubitacées ( <i>Sphaerotheca fuliginea</i> )	<a href="#">Bettiol, 1999</a>
Extraits de PEN ( <i>Penicillium chrysogenum</i> )	Diverses	Blanc de la vigne ( <i>Uncinula necator</i> ) Mildiou de l'oignon ( <i>Peronospora destructor</i> ) Mildiou de la vigne ( <i>Plasmopara viticola</i> ) Mildiou des solanacées ( <i>Phytophthora infestans</i> ) Tavelure du pommier ( <i>Venturia inaequalis</i> )	<a href="#">Thürig et al., 2006</a>
Extraits de composts	Fraise	Moisissure grise ( <i>Botrytis cinerea</i> )	<a href="#">Welke, 2004</a>
Extraits de composts	Fruitière	Mildiou de la vigne ( <i>Plasmopara viticola</i> ) Tavelure du pommier ( <i>Venturia inaequalis</i> )	<a href="#">Larbi, 2006</a>
Une revue des biofongicides	Fruits et légumes en post-récolte	Général (pour prolonger la vie, utile post-récolte)	<a href="#">Tripathi et Dubey, 2004</a>
Propolis et pollen	Général	Propriétés antibactériennes utilisables en agriculture (testées in vitro)	<a href="#">Basim et al., 2006</a>
Glucosinolate	Général	Champignons telluriques ( <i>Aphanomyces euteiches</i> var. <i>psi</i> , <i>Gaeumannomyces graminis</i> var. <i>tritici</i> , <i>Verticillium dahliae</i> )	<a href="#">Bellostas et al., 2006</a>
Une revue des biopesticides, de leur mode d'action et de leur efficacité	Général	Général	<a href="#">Copping et Duke, 2007</a>
Une revue des biopesticides, de leur mode d'action et de leur efficacité	Général	Général	<a href="#">Copping et Menn, 2000</a>
Ptérocarpans (phytoalexines - composés de défense naturels des plantes)	Général	Général	<a href="#">Jiménez et al., 2008</a>
Bicarbonate de sodium et de potassium	Général	Moisissure grise ( <i>Botrytis cinerea</i> ) Général	<a href="#">Kuepper et al., 2001 (ATTRA)</a>
Une revue des biopesticides, de leur mode d'action et de leur efficacité	Général	Général	<a href="#">Rai, Mahendra et Carpinella M.C. (éditeurs), 2006</a>

3- ACTIVATION DES DÉFENSES NATURELLES ET PHYTOPROTECTION			
Approche	Culture	Pathogènes	Auteurs
Les pesticides « naturels » - un point de vue de l'Industrie	Général	Général	<a href="#">Rice, 1998</a>
Glucosinolate	Général	Champignons telluriques	<a href="#">Rosa et Rodrigez., 1999</a>
Huiles, sels, Neem/margousier, Milsana ( <i>Reynoutria sachalinensis</i> )	Rose	Blanc de la rose ( <i>Sphaerotheca pannosa</i> var. <i>rosae</i> )	<a href="#">Pasini et al., 1997</a>
Extraits de composts	Tomate	Tache bactérienne ( <i>Xanthomonas vesicatoria</i> )	<a href="#">Al-Dahmani, et al., 2003</a>
Silice	Tomate	Flétrissure bactérienne ( <i>Ralstonia solanacearum</i> )	<a href="#">Dannon et Wydra, 2004</a>
Huiles d'ail et de margousier, extrait d'algues, Serenade ( <i>Bacillus subtilis</i> ), Sonata ( <i>Bacillus pumilis</i> )	Tomate	Brûlure alternarienne ( <i>Alternaria solani</i> ) Tache septorienne ( <i>Septoria lycopersici</i> )	<a href="#">Wszelaki et Miller, 2005</a>
Extraits de vermicomposts	Tomate	Mildiou des solanacées ( <i>Phytophthora infestans</i> )	<a href="#">Zaller, 2006</a>
Extraits de bryophytes	Tomate, Général	Brûlure alternarienne ( <i>Alternaria solani</i> ) Mildiou des solanacées ( <i>Phytophthora infestans</i> ) Moisissure grise ( <i>Botrytis cinerea</i> )	<a href="#">Mekuria et al., 2005</a>



## FICHES RÉFÉRENCES

Al-Dahmani, J.H., Abbasi, P.A., Miller, S.A., Hoitink, H.A.J., 2003. [Suppression of Bacterial Spot of Tomato with Foliar Sprays of Compost Extracts Under Greenhouse and Field Conditions](#). *Plant disease*, Vol. 87 (8): pp. 913-919.

The efficacy of foliar sprays with compost water extracts (compost extracts) in reducing the severity of bacterial spot of tomato caused by *Xanthomonas vesicatoria* was investigated. Extracts prepared from composted cow manure, composted pine bark, an organic farm compost, or composted yard waste, applied as foliar sprays on tomato transplants, resulted in a moderate but statistically significant reduction in the severity of bacterial spot. The population of *X. vesicatoria* in infected leaves was reduced significantly by extracts prepared from composted cow manure. Efficacy of the water extracts was not affected by oxygen concentrations in the suspension during extraction, compost maturity, or sterilization by filtration or autoclaving. The degree of control provided by foliar sprays with the most effective compost extracts did not differ from that obtained with the plant activator acibenzolar-S-methyl. In the field in two growing seasons, foliar sprays with compost water extracts did not reduce the severity of foliar diseases, including bacterial spot. During the 1997 season, when the severity of bacterial spot in the field was high, foliar sprays with compost water extracts significantly reduced the incidence of bacterial spot on tomato fruit. Amending plot soil with several rates of composted yard waste did not lead to additional control of fruit disease over those only sprayed with extracts. Foliar sprays with a mixture of chlorothalonil and copper hydroxide or with acibenzolar-S-methyl reduced the severity of bacterial spot as well as incidence of spot on fruit.

{Recherche appliquée}

Accès au document : via le site APS Journals (document pdf ou html)

Basim, E., Basim, H., Özcan, M., 2006. [Antibacterial activities of Turkish pollen and propolis extracts against plant bacterial pathogens](#). *Journal of Food Engineering*, Vol. 77 (4): pp. 992-996. [contact: [ebasim@yahoo.com](mailto:ebasim@yahoo.com)]

The “in vitro” antibacterial activities of Turkish pollen and propolis extracts were investigated against 13 different species of agricultural bacterial pathogens including *Agrobacterium tumefaciens*, *A. vitis*, *Clavibacter michiganensis* subsp. *michiganensis*, *Erwinia amylovora*, *E. carotovora* pv. *carotovora*, *Pseudomonas corrugata*, *P. savastanoi* pv. *savastanoi*, *P. syringae* pv. *phaseolicola*, *P. syringae* pv. *syringae*, *P. syringae* pv. *tomato*, *Ralstonia solanacearum*, *Xanthomonas campestris* pv. *campestris* and *X. axonopodis* pv. *vesicatoria*. Among the tested bacteria, *A. tumefaciens* was the most sensitive one to 1/5 concentration of pollen extract, and the sensitivity of the bacteria followed the sequence *A. tumefaciens* > *P. syringae* pv. *tomato*, *X. axonopodis* pv. *vesicatoria* > *E. amylovora*, *P. corrugata*, *R. solanacearum*, *X. campestris* pv. *campestris* > *A. vitis*, *C. michiganensis* subsp. *michiganensis* > *E. carotovora* pv. *carotovora*, *P. savastanoi* pv. *savastanoi*, *P. syringae* pv. *phaseolicola* > *P. syringae* pv. *syringae*. *P. syringae* pv. *phaseolicola* was the most sensitive one to 1/10 concentration of propolis extract, and the sensitivity of the bacteria followed the sequence *P. syringae* pv. *phaseolicola* > *P. savastanoi* pv. *savastanoi*, *P. corrugata*, *R. solanacearum* > *E. carotovora* pv. *carotovora*, *P. syringae* pv. *syringae*, *E. amylovora*, *A. tumefaciens*, *A. vitis*, *C. michiganensis* subsp. *michiganensis*, *P. syringae* pv. *tomato*, *X. campestris* pv. *campestris*, *X. axonopodis* pv. *vesicatoria*. The least active concentrations towards the tested bacteria were 1/100 of the pollen extract and 1/1000 of the propolis extract. This study is the first report on the antibacterial activities of pollen and propolis against the plant pathogenic bacteria.

{Recherche appliquée}

Accès au document : via le site Science Direct (document pdf ou html)

Coût : 30,00 \$ US

Bellostas, N., Casanova, E., Garcia-Mina, J.M., Sorensen, J.C., Sorensen, H., 2006. [In vitro screening of the effect of three glucosinolate derived nitriles on soil-borne fungi](#). Poster presented at Second International Biofumigation Symposium, Moscow, Idaho, USA, 26-29 June 2006. [contact: [nabm@kvl.dk](mailto:nabm@kvl.dk)]

Glucosinolates are allelochemicals present in all plants of the order Capparales that are hydrolysed by endogenous enzymes (myrosinases) forming a variety of compounds with biological activity. 'Biofumigation' is the term used to describe the effect of these compounds on soil-borne pathogens and it has normally been attributed to isothiocyanates. At acidic pH and in the presence of redox co-factors such as glutathione, glucosinolate hydrolysis yields also nitriles, which are more hydrophilic and stable than isothiocyanates.

Three nitriles (allyl-, benzyl- and phenethyl cyanide) were tested against soil borne fungi of economic importance: *Aphanomyces euteiches* var. *psii*, *Gaeumannomyces graminis* var. *tritici* and *Verticillium dahliae*. The nitriles were initially tested at 1 mM and four additional concentrations were further tested in order to determine LD50.

At 1 mM, allyl cyanide showed in all cases less than 10% inhibition and it did not inhibit fungi growth at higher concentrations. LD50 of benzyl cyanide was 2.5 mM for *Verticillium* and *Aphanomyces*, whereas it was as low as 0.5 mM for *Gaeumannomyces*. LD50 of phenyl ethyl cyanide was 2.5 mM for *Verticillium*, 1.4 mM *Gaeumannomyces* and 1.25 mM *Aphanomyces*.

Although nitriles are generally less toxic than ITCs, their role in biofumigation should not be disregarded.

{Recherche appliquée}

Accès au document : via le site [orgprints.org](http://orgprints.org) (document pdf)

Bettiol, Wagner, 1999. [Effectiveness of cow's milk against zucchini squash powdery mildew \(\*Sphaerotheca fuliginea\*\) in greenhouse conditions](#). *Crop Protection*, 18: pp. 489-492.

[contact: [bettiol@cnpma.embrapa.br](mailto:bettiol@cnpma.embrapa.br)]

Efficacy of fresh cow milk was tested in five greenhouse experiments against powdery mildew (*Sphaerotheca fuliginea*) on zucchini squash (*Cucurbita pepo*). Plants were sprayed with milk at 5, 10, 20, 30, 40, and 50%, either once or twice a week. Additional treatments were fungicides (fenarimol 0.1 ml/l or benomyl 0.1 g/l) applied once a week and water as a control treatment. Severity of the powdery mildew was visually evaluated on individual leaves at weekly intervals and scored as percentage of leaf area infected for infected leaves. A negative correlation was found between the infected leaf area per infected leaf and milk concentration sprayed on plants for the five experiments. High concentrations of milk were more effective than the conventional fungicides tested. This study demonstrated that milk is an effective alternative for the control of powdery mildew in organic agriculture.

{Recherche appliquée}

Accès au document : via le site Science Direct (document pdf ou html)

Coût : 30,00 \$ US

Cavalcanti, F.R., Resende, M.L.V., Carvalho, C.P.S., Silveira J.A.G., Oliveira, J.T.A., 2007.  
[An aqueous suspension of \*Crinipellis pernicioso\* mycelium activates tomato defence responses against \*Xanthomonas vesicatoria\*](#). *Crop Protection*, Vol. 26 (5): pp. 729-738.  
[contact: [rossi@ufc.br](mailto:rossi@ufc.br)]

The efficacy of controlling bacterial spot in susceptible tomato plants by using a natural product was compared to a commercial resistance inducer. Plants were sprayed with (a) acibenzolar-S-methyl, ASM [Bion<sup>®</sup> 50 WG (0.2 g l<sup>-1</sup>)] and (b) a heterogeneous chitosan suspension (MCp) from *Crinipellis pernicioso* mycelium. Plants were challenged 4 d later with a virulent strain of *Xanthomonas vesicatoria*, under greenhouse conditions. In assessing disease, MCp-treated plants showed significant responses, reaching 87% of ASM protection performance against *X. vesicatoria* leaf spot. Tomato leaves exposed to MCp and ASM were assayed for pathogenesis-related enzymes, lignin deposition and soluble phenolic compounds. Induced resistance (IR) was evidenced by the enhancement of peroxidase (POX), polyphenol oxidase (PPO), and chitinase (CHI) activities at 1–72 h after spraying. These enzymes and phenylalanine ammonia-lyase (PAL) were also observed at 6, 9 and 12 d after spraying (DAS) interval. Treated and inoculated plants showed an increase in lignin deposition. The content of total soluble phenolic compounds decreased significantly by 9 and 12 DAS. The results suggest that (IR) was characterized by increased POX and PPO activities, improving lignification and, to a less extent, by CHI activity.

{Recherche appliquée}

Accès au document : via le site Science Direct (document pdf ou html)

Coût : 30,00 \$ 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](mailto: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*

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

Cotxarrera, L., Trillas-Gay, M. I., Steinberg, C., Alabouvette, C., 2002. [Use of sewage sludge compost and \*Trichoderma asperellum\* isolates to suppress Fusarium wilt of tomato](#). *Soil Biology and Biochemistry*, Vol. 34 (4): pp. 467-476. [contact: [lurdasc@porthos.bio.ub.es](mailto:lurdasc@porthos.bio.ub.es)]

It has been reported that plant growth media amended with composted bark suppress Fusarium wilts whereas media amended with composted municipal sludge aggravate this disease. However, in this study, a compost prepared from vegetable and animal market wastes, sewage sludge and yard wastes showed a high ability to suppress Fusarium wilt of tomato caused by *Fusarium oxysporum* f. sp. *lycopersici* race 1. The ability of this compost to suppress Fusarium wilt of tomato was compared with that of a peat mix (peat:vermiculite, 1:1 v/v) and a naturally suppressive soil from Chateaurenard, France. The compost and the soil from Chateaurenard were highly suppressive, whereas the peat mix was highly conducive. Amendment with this compost significantly ( $P < 0.05$ ) increased the suppressiveness of the peat mix. Biotic and abiotic properties were compared among these substrates. The peat mix was acidic, and had a low EC, whereas the compost was basic and a high EC. The compost–peat mix had a similar pH to the compost, however EC was approximately half that of the compost. The bacterial populations and microbial activity were highest in the compost and the compost–peat mix. Compost (10%; v/v), *Trichoderma asperellum* isolates isolated from natural compost–peat mix, and the nonpathogenic biocontrol agent *F. oxysporum* Fo47 isolated from Chateaurenard soil were inoculated into sterilized compost–peat mix and Chateaurenard soil to assess their ability to restore suppressiveness in the sterilized substrates. Both the natural compost and the *T. asperellum* isolates significantly ( $P < 0.05$ ) increased the suppressive ability of sterilized compost–peat mix and Chateaurenard soil. Fo47 was relatively the most effective biocontrol agent. The incidence of Fusarium wilt was lowest in tomato plants grown in either sterilized compost–peat mix or Chateaurenard soil inoculated with this strain. Our results show that the use of some composted sewage sludge in the plant growth medium is effective for suppression of Fusarium wilt at the early stage of plant growth. In addition, the *T. asperellum* isolates isolated from the suppressive compost–peat mix appear to have the potential to be a new alternative of biocontrol of Fusarium wilt.

{Recherche appliquée}

Accès au document : via le site Science Direct (document pdf ou html)

Coût de l'article : 30,00 \$ US



Dannon, E.A., Wydra, K., 2004. [Interaction between silicon amendment, bacterial wilt development and phenotype of \*Ralstonia solanacearum\* in tomato genotypes](#) . *Physiological and Molecular Plant Pathology*, Vol. 64 (5): pp. 233-243. [contact: [wydra@ipp.uni-hannover.de](mailto:wydra@ipp.uni-hannover.de)]

Silicon amendment significantly reduced bacterial wilt incidence expressed as area under disease progress curve for tomato genotypes L390 (susceptible) by 26.8% and King Kong2 (moderately resistant) by 56.1% compared to non-treated plants grown in hydroponic culture. However, wilt incidence in silicon-treated plants of genotype L390 reached 100% at 13 days post-inoculation (dpi), while in genotype King Kong2, plant death was retarded by 6 days, with 20% reduction of final wilt incidence. Bacterial numbers were significantly lower in silicon-treated compared to non-treated plants in King Kong2 at 2 dpi in midstems and in all organs at 5 dpi, and in Hawaii 7998 (resistant) in all organs at 2 dpi. Differences between genotypes were obvious on midstem level (5 dpi), where bacterial populations were generally significantly lower compared to roots. Increased tolerance was observed in genotypes L390 and King Kong2 with silicon treatment. Silicon accumulated in roots and was low in stems and leaves. Inoculation with *Ralstonia solanacearum* did not significantly affect silicon uptake and distribution. Negative correlations between root silicon content and bacterial numbers of midstems in genotypes Hawaii 7998 and King Kong2 suggested an induced resistance. Indications for an influence of host genotype and silicon treatment on the phenotypic conversion of *R. solanacearum* strain To-udk2-sb from fluidal to non-fluidal colonies in planta were observed.

This is the first report on the effect of silicon on a bacterial disease and in a silicon-non-accumulator plant.

{Recherche appliquée}

Accès au document : via le site Science Direct (document pdf ou html)

Coût de l'article : 30,00 \$ US

English-Loeb, G., Norton, A.P., Gadoury, D., Seem, R., Wilcox, W., 2007. [Biological Control of Grape Powdery Mildew Using Mycophagous Mites](#). *Plant Disease*, Vol. 91 (4): pp. 421-429.

We evaluated the efficacy of a mycophagous tydeid mite, *Orthotydeus lambi*, in controlling grape powdery mildew on mature vines of nine different grape cultivars and one unnamed hybrid grown in an experimental vineyard over a 3-year period. *O. lambi* became well established on all vines where they were released. However, some cultivars supported higher densities than others, depending on, among other factors, the presence and abundance of leaf trichomes in vein axils (domatia). The establishment of *O. lambi* substantially reduced powdery mildew on foliage and fruit, although the magnitude of disease suppression was greater on some grape genotypes than others, depending on mite density and innate susceptibility to grape powdery mildew. Treatments where *O. lambi* was used alone were as effective as fungicide. Significantly better disease control was found in treatments with both mites and fungicides. The mass of pruning material and leaf photosynthetic rates were significantly greater for vines with *O. lambi*, fungicide, or a combination of mites and fungicide compared with untreated vines. The combination of mites and fungicide resulted in significantly greater yield than mites or fungicide alone. Our results illustrate the potential of *O. lambi* for biological control of grape powdery mildew but also highlight limitations related to differences among grape genotypes in innate susceptibility to mildew and suitability for mites.

{Recherche appliquée}

Accès au document : via APS journal (document pdf)

Coût de l'article 14,00 \$

Falk, S.P., Gadoury, D.M., Cortesi, P., Pearson, R.C., Seem, R.C., 1995. [Parasitism of \*Uncinula necator\* cleistothecia by the mycoparasite \*Ampelomyces quisqualis\*](#). *Phytopathology*, 85: pp. 794-800.

Parasitism of *Uncinula necator* cleistothecia by the mycoparasite *Ampelomyces quisqualis* was widespread in the Vitaceae around New York State. Although *A. quisqualis* did not survive in naturally parasitized *U. necator* cleistothecia on grape leaves, it did overwinter in parasitized cleistothecia on the bark of grapevines. Although only 1% of the total population of cleistothecia on bark was parasitized, the bark may still be an important site for overwintering of *A. quisqualis* since the mycoparasite is located adjacent to developing powdery mildew colonies on leaves, analogous to that of healthy cleistothecia, which also overwinter on bark and release primary inoculum to infect emerging grape leaves. In vitro studies of parasitism of *U. necator* cleistothecia showed that infection occurs only during early stages of development prior to or at the earliest stages of the formation of appendages but before darkening of the cleistothecial wall. When *A. quisqualis* was applied to grapevines from colonized cotton-wick cultures suspended above vines, parasitism of cleistothecia on leaves increased compared to naturally occurring parasitism, although during a season with high rainfall the level of parasitism was similar by the end of the season. The impact of increased parasitism was a reduction in the number of cleistothecia dispersed from leaves to bark and a reduction (50 to 60%) in the number of cleistothecia overwintering on bark of grapevines. Thus, biological control of grape powdery mildew with *A. quisqualis* may be further enhanced by a reduction in the level of overwintering inoculum for the next season.

{Recherche appliquée}

Accès au document : via APS net – free Access (document pdf)

Guetsky, R., Shtienberg, D., Elad, Y., Fisher, E., Dinooor, A., 2002. [Combining biocontrol agents to reduce the variability of biological control](#). *Phytopathology*, Vol. 92 (9): pp. 976-985.

Two biocontrol agents, a yeast (*Pichia guilhermondii*) and a bacterium (*Bacillus mycooides*), were tested separately and together for suppression of *Botrytis cinerea* on strawberry leaves and plants. Scanning electron microscopy revealed significant inhibition of *Botrytis cinerea* conidial germination in the presence of *Pichia guilhermondii*, whereas *Bacillus mycooides* caused breakage and destruction of conidia. When both biocontrol agents were applied in a mixture, conidial destruction was more severe. The modes of action of each of the biocontrol agents were elucidated and the relative quantitative contribution of each mechanism to suppression of *Botrytis cinerea* was estimated using multiple regression with dummy variables. The improvement in control efficacy achieved by introducing one or more mechanisms at a time was calculated. *Pichia guilhermondii* competed with *Botrytis cinerea* for glucose, sucrose, adenine, histidine, and folic acid. Viability of the yeast cells played a crucial role in suppression of *Botrytis cinerea* and they secreted an inhibitory compound that had an acropetal effect and was not volatile. *Bacillus mycooides* did not compete for any of the sugars, amino acids, or vitamins examined at a level that would affect *Botrytis cinerea* development. Viable cells and the compounds secreted by them contributed similarly to *Botrytis cinerea* suppression. The bacteria secreted volatile and non-volatile inhibitory compounds and activated the defense systems of the host. The nonvolatile compounds had both acropetal and basipetal effects. Mixture of *Pichia guilhermondii* and *Bacillus mycooides* resulted in additive activity compared with their separate application. The combined activity was due to the summation of biocontrol mechanisms of both agents. This work provides a theoretical explanation for our previous findings of reduced disease control variability with a mixture of *Pichia guilhermondii* and *Bacillus mycooides*.

{Recherche appliquée}

Accès au document : via APS journal (document pdf)  
*gratuit*

Hadwiger, L. A., and McBride, P.O., 2006. [Low-level copper plus chitosan applications provide protection against late blight of potato](#). Online. Plant Health Progress [contact: [chitosan@wsu.edu](mailto:chitosan@wsu.edu)]

The organic grower can manage potato late blight, caused by *Phytophthora infestans* (Mont.) de Bary, with natural copper compounds such as copper sulfate pentahydrate, copper oxide, or copper hydroxide. However, recent environmental concerns about copper residues by the USDA's National Organic Program indicate a need to control late blight with reduced copper levels. This report describes a strategy for disease control using lower levels of copper sulfate pentahydrate in combination with a chitosan sticker and complexing agent. In excised leaf assays, this combination provided moderate control of late blight and protection against copper-related leaf yellowing at copper levels approximately 40 fold lower than those recommended for a commercial fungicide with copper hydroxide as the active ingredient.

{Recherche appliquée}

Accès au document : via le site Plant Health Progress (document pdf ou html)

Helbig J., 2002. [Ability of the antagonistic yeast \*Cryptococcus albidus\* to control \*Botrytis cinerea\* in strawberry](#). *Biocontrol*, Vol. 47 (1): pp. 85-99. [contact: [juergen.helbig@agrar.hu-berlin.de](mailto:juergen.helbig@agrar.hu-berlin.de)]

The yeast *Cryptococcus albidus*, originally isolated from mature strawberry fruits, was tested for antagonistic activity against *Botrytis cinerea*, the causal agent of grey mould in strawberries. Conidial germination and germ tube growth of conidia of *B. cinerea* were inhibited by a cell suspension of the antagonist in aqueous strawberry fruit pulp suspension (1%) after 6 and 24 hours of incubation. Application of a cell suspension ( $1 \times 10^6$  cells/ml) on detached strawberry leaf disks incubated at 10°C reduced incidence and conidiophore density of *B. cinerea* by 86 and 99%, respectively, but effectiveness was reduced at higher temperatures. Treatments with *C. albidus* during bloom of strawberries reduced incidence of grey mould on ripe strawberry fruits after harvest by 33, 28 and 21% in three years of field trials. The effectiveness of the yeast was increased when formulation substances (alginate, xanthan and cellulose) were added to the cell suspension.

{Recherche appliquée}

Accès au document : via le site SpringerLink (document pdf ou html)

Coût : 32,00 \$ US

Jetiyanon, K., Kloepper, J.W., 2002. [Mixtures of plant growth-promoting rhizobacteria for induction of systemic resistance against multiple plant diseases](#) . *Biological Control*, Vol. 24 (3): pp. 285-291. [contact: [kanchaleej@nu.ac.th](mailto:kanchaleej@nu.ac.th)]

Studies of induced systemic resistance using strains of plant growth-promoting rhizobacteria (PGPR) have concentrated on the use of individual PGPR as inducers against multiple diseases of a single crop. To date, few reports have examined the potential of PGPR strain mixtures to induce systemic resistance against diseases of several different plant hosts. The objective of this study was to select mixtures of compatible PGPR strains with the capacity to elicit induced systemic resistance in four hosts. The specific diseases and hosts tested in this study included: bacterial wilt of tomato (*Lycopersicon esculentum*) caused by *Ralstonia solanacearum*, anthracnose of long cayenne pepper (*Capsicum annuum* var. *acuminatum*) caused by *Colletotrichum gloeosporioides*, damping off of green kuang futsoi (*Brassica chinensis* var. *parachinensis*) caused by *Rhizoctonia solani*, and cucumber mosaic virus (CMV) on cucumber (*Cucumis sativus*). To examine compatibility, seven selected PGPR strains were individually tested for in vitro antibiosis against all other PGPR strains and against three of the tested pathogens (*R. solanacearum*, *C. gloeosporioides*, and *R. solani*). No in vitro antibiosis was observed among PGPR strains or against pathogens. Twenty-one combinations of PGPR and seven individual PGPR were tested in the greenhouse for induced resistance activity. Results indicated that four mixtures of PGPR and one individual strain treatment significantly reduced the severity of all four diseases compared to the nonbacterized control: 11 mixtures reduced CMV of cucumber, 16 mixtures reduced bacterial wilt of tomato, 18 mixtures reduced anthracnose of long cayenne pepper, and 7 mixtures reduced damping off of green kuang futsoi. Most mixtures of PGPR provided a greater disease suppression than individual PGPR strains. These results suggest that mixtures of PGPR can elicit induced systemic resistance to fungal, bacterial, and viral diseases in the four hosts tested.

{Recherche appliquée}

Accès au document : via le site Science Direct (document pdf ou html)

Coût de l'article : 30,00 \$ US

Jiménez-González, L., Álvarez-Corral, M., Muñoz-Dorado, M., Rodríguez-García I., 2008.  
[Pterocarpans: interesting natural products with antifungal activity and other biological properties.](#)  
*Phytochemistry Reviews*, Springer Netherlands, Vol. 7-1: pp. 125-154. [contact: [irodrigu@ual.es](mailto:irodrigu@ual.es)]

Among the phytoalexins with the highest antifungal activity is the isoflavonoid based group of pterocarpans. Here, we present a comprehensive inventory of the structures and sources of pterocarpans, and summarize some of their most interesting biological activities.

{Recherche appliquée}

Accès au document : via le site Springer Link (document pdf ou html)

*Coût de l'article : 32,00 \$ US*



Jones, J.B., Jackson, L.E., Balogh, B., Obradovic, A., Iriarte F.B., Momol M.T., 2007.  
[Bacteriophages for Plant Disease Control](#). *Annual Review of Phytopathology*,  
Vol. 45: pp. 245-262. [contact: [bjones@ufl.edu](mailto:bjones@ufl.edu)]

The use of phages for disease control is a fast expanding area of plant protection with great potential to replace the chemical control measures now prevalent. Phages can be used effectively as part of integrated disease management strategies. The relative ease of preparing phage treatments and low cost of production of these agents make them good candidates for widespread use in developing countries as well. However, the efficacy of phages, as is true of many biological control agents, depends greatly on prevailing environmental factors as well as on susceptibility of the target organism. Great care is necessary during development, production and application of phage treatments. In addition, constant monitoring for the emergence of resistant bacterial strains is essential. Phage-based disease control management is a dynamic process with a need for continuous adjustment of the phage preparation in order to effectively fight potentially adapting pathogenic bacteria.

{Recherche appliquée}

Accès au document : via le site Annual Review (document pdf ou html)

*Coût de l'article : 20,00 \$ US*

Kuepper, G., Thomas, R., Earles, R., 2001. [Use of Baking Soda as a Fungicide](#). NCAT/ATTRA Pest Management Series. ATTRA Publication #IP130/102. National Center for Appropriate Technology, Fayetteville, Arkansas. 4 p. [contact: [georgek@ncat.org](mailto:georgek@ncat.org)]

There has been considerable interest in the use of baking soda (sodium bicarbonate,  $\text{NaHCO}_3$ ) and potassium bicarbonate ( $\text{KHCO}_3$ ) to control powdery mildew and other fungal diseases of plants. This publication provides a brief survey of observations, research, and recommendations on the use of bicarbonates in horticulture.

While industry was in the process of developing bicarbonate products for commercial and home horticulture, a number of recommendations for using kitchen-grade baking soda also surfaced.

\*Various carbonates and bicarbonates have been proven effective against gray mold, the number one post-harvest disease of grapes. Researchers found that carbonates were more effective than bicarbonates at reducing gray mold (*Botrytis cinerea*) spore germination, and that sodium and ammonium bicarbonates were better than potassium bicarbonate.

{Transfert technologique}

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

Lahdenperä, Marja-L., 2006. [Gliocladium catenulatum as an antagonist against grey mould on strawberry](#). Paper presented at Pest, disease and weed management in strawberry - progress and challenges for the Nordic production: NJF seminar 389, Lepaa, Finland, 8-9 November 2006; Published in *NJF Report*, 2 (10), p. 15. Nordic Association of Agricultural Scientists.  
[contact: [riitta.koistinen@mtt.fi](mailto:riitta.koistinen@mtt.fi)]

*G. catenulatum* gave excellent control of *Botrytis* on strawberry in several field trials in Finland. In biological control the product based on this antagonist increased the amount of total yield from 5 to 21% and increased the marketable yield as well, but in integrated control even better results were obtained. A combined use of one *Gliocladium* treatment and two chemical applications turned out to be an especially effective control program.

*G. catenulatum* J1446 seems to affect also the shelf-life of strawberries in storage. *Gliocladium* treatments applied at the time of flowering resulted in a better preservation of strawberry fruits than untreated or chemical applications.

The application of *G. catenulatum* J1446 on strawberry is accepted by the EU only in an integrated management of *Botrytis* where the first spraying is made by *Gliocladium* and the two subsequent treatments with chemical fungicides. The national sales permits for different Prestop formulations have to be applied separately. Prestop Mix was finally registered in Finland in 2006, while the submission of Prestop WP is still in progress.

{Recherche appliquée}

Accès au document : via le site [orgprints.org](http://orgprints.org) (document pdf)

Accès aux extraits complets du séminaire : via <http://www.njf.nu/site/redirect.asp?p=1321>

Voir également la décision d'homologation de l'ARLA :

<http://www.pmra-arla.gc.ca/francais/pdf/prdd/prd2008-03-f.pdf>

Larbi, M., 2006. [Influence de la qualité des composts et de leurs extraits sur la protection des plantes contre les maladies fongiques](#). Dissertation (pour obtention d'un Doctorat), Institut de recherche de l'agriculture biologique FiBL, CH-Frick; l'Université de Neuchâtel.

Le potentiel suppressif de certains composts et de leurs extraits sur les maladies telluriques ou foliaires a souvent été démontré. L'efficacité des composts et/ou des extraits varie en fonction du type de compost et du système plante hôte-pathogène. Les raisons de cette variabilité demeurent encore en grande partie méconnues. De plus, les mécanismes d'inhibition des pathogènes par les composts et/ou les extraits de composts restent encore insuffisamment explorés.

La majorité des extraits de composts, in vivo, ont réduit significativement la sévérité de la tavelure du pommier (agent pathogène, *Venturia inaequalis*) et du mildiou de la vigne (agent pathogène, *Plasmopara viticola*).

Le mode de production de l'extrait (durée et rapport d'extraction), l'âge des composts utilisés, ainsi que la stérilisation du compost par autoclavage avant son extraction et de l'extrait lui-même après son extraction (par autoclavage ou par filtration à 0,2 µm) n'ont pas influencé l'efficacité des extraits.

L'application des acides humiques et fulviques des composts a également réduit significativement la sévérité de la maladie causée par *V. inaequalis*. In vitro, les extraits de composts n'ont pas inhibé la germination de conidies de *V. inaequalis*, mais l'ont au contraire stimulée. Par contre, l'activité de zoospores de *P. viticola* a été fortement inhibée par les extraits de composts (70 %), inhibition probablement due à la salinité des extraits.

Contrairement aux mécanismes mis en jeu dans la protection des plantes contre les maladies telluriques, le mécanisme d'inhibition des extraits des composts contre les maladies foliaires n'est pas lié à leur activité microbienne. Le principe actif contre *V. inaequalis* doit être soluble à l'eau, thermostable et déjà présent dans le compost avant son extraction. Étant donné que les extraits des composts ne montrent aucun effet fongicide contre *V. inaequalis*, le mécanisme d'action passe soit par la plante (éventuellement induction de résistance), soit par l'influence de la phyllosphère. En ce qui concerne la protection de la vigne contre *P. viticola*, une action directe des extraits sur le pathogène semble également jouer un rôle déterminant.

Les résultats obtenus mettent en évidence que les composts et les extraits possèdent un potentiel intéressant à protéger les plantes contre divers agents pathogènes. Des essais complémentaires dans les conditions pratiques s'avèrent ainsi nécessaires afin d'optimiser l'utilisation des composts et de leurs extraits et de déterminer les limites d'efficacité de ces techniques. À cet égard, l'application combinée de compost dans le sol et des extraits sur les feuilles pourrait s'avérer intéressante pour offrir une protection globale des plantes.

{Recherche appliquée}

Accès au document : via le site [orgprints.org](http://orgprints.org) (document pdf)

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](mailto: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](http://orgprints.org) (document pdf)

Lwin, M., Ranamukhaarachchi, S.L., 2006. Development of biological control of *Ralstonia solanacearum* through antagonistic microbial populations. International Journal of Agriculture and Biology. Friends Science Publishers, Faisalabad, Pakistan. 8: pp. 5, 657-660.  
[contact: [lwin399@gmail.com](mailto:lwin399@gmail.com)]

Potential antagonists were screened out and evaluated in-vitro and in-vivo as biological control agents (BCAs) against the bacterial wilt pathogen (*R. solanacearum*). Three selected antagonists (LR 3, LR 6 and LR 10) and 5 commercial BCAs (EM instant, EM5 (EM preserved with vinegar and distilled ethyl alcohol), EM-FPE, Bokashi (EM fermented compost) and *Bacillus subtilis*) were evaluated. All the BCAs reduced the bacterial wilt disease to various degrees. Among the BCAs tested, EM instant was the most effective, while the degree of disease suppression by other microbes varied with the time of application. The effects of EM-FPE and Bokashi were not different from EM instant. Among the antagonists isolated from infested soils, LR 10 showed the highest potential of disease suppression. The antagonists isolated from EM sources were effective to suppress against bacterial wilt pathogen. It means that EM contains some microbes, which can suppress the disease. Application method of biological control agent should be suitable for antagonist's action and prior to pathogen attack.

{Recherche appliquée}

Accès au document : via le site de Friends Science Publishers, International Journal of Agriculture & Biology  
<http://www.fsublishers.org>

Mekuria, T., Steiner, U., Hindorf, H., Frahm, J.P., Dehne, H.W., 2005. [Bioactivity of bryophyte extracts against \*Botrytis cinerea\*, \*Alternaria solani\* and \*Phytophthora infestans\*](#). *Journal of Applied Botany and Food Quality*. Blackwell Publishing, Berlin, Germany, 2005. Vol. 79 (2): pp. 89-93.

Plant extracts can be used as crude extracts, alternative sources of known fungicides, new leads for fungicides and resistance inducers for an integrated pest management strategy. They are the point of interest in discovery of organic pesticides. Though several phytochemical constituents and medicinal uses of bryophytes are known, their potentials in the course of crop protection remained yet little or unexplored. The scope of this work was to study extracts from 17 bryophytes as source of potential antifungal agents under in vitro and in vivo circumstances. Results showed that bryophyte extracts from *Bazzania trilobata*, *Diplophyllum albicans*, *Sphagnum quinquefarium*, *Dicranodontium denudatum* and *Hylocomium splendens* with high level of inhibition (> 50%) of the mycelial growth of *Botrytis cinerea* and *Alternaria solani*. Extracts of *B. trilobata* and *D. albicans* significantly reduced disease severity of *Phytophthora infestans* on tomatoes. In conclusion, the study indicated that extracts from bryophytes can be used as natural sources for alternative pest management tools.

{Recherche appliquée}

Accès limité au document (résumé) : via Cab Abstract

Se référer au journal de publication pour l'article.

Minuto, A., Spadaro, D., Garibaldi, A., Gullino, M.L., 2006. [Control of soilborne pathogens of tomato using a commercial formulation of \*Streptomyces griseoviridis\* and solarization](#). *Crop Protection*, Vol. 25 (5): pp. 468-475. [contact: [davide.spadaro@unito.it](mailto:davide.spadaro@unito.it)]

Mycostop® is a commercial formulation of strain K61 of *Streptomyces griseoviridis*. This strain was isolated from Sphagnum peat and can control or suppress some root rot and wilt diseases by colonizing the rhizosphere prior to pathogens. The present work was carried out to test the ability of the commercial formulation, combined or not with soil solarization, to control diseases of greenhouse-grown tomato. Data obtained from four trials carried out over 2 years (2001 and 2002) demonstrated that *S. griseoviridis* could play a role in the integrated control of tomato soilborne diseases. This study is among the first to test *S. griseoviridis*'s effectiveness against corky root rot caused by *Pyrenochaeta lycopersici* when it is applied throughout the irrigation system (10 l of water per m<sup>2</sup>). The biofungicide was very effective against *Fusarium oxysporum* f.sp. *lycopersici* and *Verticillium dahliae* in 2002 in artificially infested soils; however, in 2001 there was no statistically significant reduction of the vascular wilts compared to the control. Soil spraying was more effective than soil irrigation to control tomato wilts. The bacterial antagonist was not effective against *Fusarium* crown and root rot caused by *F. oxysporum* f.sp. *radicis-lycopersici*, when applied alone, but was less effective when applied with *S. griseoviridis*. Soil solarization provided good control of *V. dahliae* and *F. oxysporum* f.sp. *lycopersici*, but was also slightly less effective when combined with *S. griseoviridis*. A significant increase in fruit mass and a higher yield m<sup>-2</sup> was recorded when solarization and the biofungicide were applied together in 2001. This indicated there may be a potential additive effect of the commercial biofungicide and solarization in increasing tomato yield; however, it was not consistent and generally not significantly different from the inoculated control. Metham sodium provided the most effective control of corky root and greatest yield increase of all the treatments evaluated.

{Recherche appliquée}

Accès au document : via le site Science Direct (document pdf ou html)

Coût de l'article : 30,00 \$ US



Nejad, P., Johnson, P.A., 2000. [Endophytic Bacteria Induce Growth Promotion and Wilt Disease Suppression in Oilseed Rape and Tomato](#). *Biological Control*, Vol. 18 (3): pp. 208-215.

To determine whether bacteria isolated from within plant tissue can have plant growth-promotion potential and provide biological control against soilborne diseases, seeds and young plants of oilseed rape (*Brassica napus* L. cv. Casino) and tomato (*Lycopersicon lycopersicum* L. cv. Dansk export) were inoculated with individual bacterial isolates or mixtures of bacteria that originated from symptomless oilseed rape, wild and cultivated. They were isolated after surface sterilization of living roots and stems. The effects of these isolates on plant growth and soilborne diseases for oilseed rape and tomato were evaluated in greenhouse experiments. We found isolates that not only significantly improved seed germination, seedling length, and plant growth of oilseed rape and tomato but also, when used for seed treatment, significantly reduced disease symptoms caused by their vascular wilt pathogens *Verticillium dahliae* Kleb and *Fusarium oxysporum* f. sp. *lycopersici* (Sacc.), respectively.

{Recherche appliquée}

Accès au document : via le site Science Direct (document pdf ou html)

Coût de l'article : 30,00 \$ US

Pasini, C., D'Aquila, F., Curir, P., Gullino, M.L., 1997. [Effectiveness of antifungal compounds against rose powdery mildew \(\*Sphaerotheca pannosa\* var. \*rosae\*\) in glasshouses.](#) *Crop Protection*, Vol. 16 (3): pp. 251-256.

The efficacy of several antifungal compounds, chosen among salts, oils, plant extracts, and of the hyperparasitic fungus *Ampelomyces quisqualis*, were tested in seven glasshouse trials against powdery incidence (55% of untreated leaves infected in six out of seven trials), all the antifungal compounds and the biocontrol agent *A. quisqualis*, applied individually, provided satisfactory control of mildew on roses (*Sphaerotheca pannosa* var. *rosae*) in Sanremo (N. Italy). In the presence of a high disease powdery mildew. Most treatments were as efficient as the fungicide dodemorph, which, sprayed at weekly intervals, provided a 75% average efficacy throughout the trials. Among the test compounds,  $\text{KH}_2\text{PO}_2$ , at 0.5 and 1%, offered good and consistent disease control,  $\text{NaHCO}_3$ , at 0.5%, showed a satisfactory level of activity, while at 1% it was phytotoxic. Wine vinegar, applied at 5 and 10%, gave good control, but acetic acid was phytotoxic. JMS Stylet oil, the canola oil, Synertrol and neem extract provided satisfactory disease control. Fatty acids formulated as potassium salts significantly and consistently reduced powdery mildew severity, but caused some phytotoxicity. Milsana, a concentrated extract from leaves of *Reynoutria sachalinensis*, only partially controlled powdery mildew. Several strategies based on the rotation of different antifungal compounds, with or without the application of dodemorph, provided very good, consistent disease control. The potential of some of the antifungal compounds and of the biocontrol fungus *A. quisqualis* against rose powdery mildew is discussed.

{Recherche appliquée}

Accès au document : via le site Science Direct (document pdf ou html)

Coût : 30,00 \$ US

Pinna, M., Gamba, U., Spagnolo, S., 2005. [Impiego di \*Bombus terrestris\* \(L.\) per la diffusione di antagonisti naturali di \*Botrytis cinerea\* \(Pers.\) in ambienti protetti coltivati a fragola](#) [Using *Bombus terrestris* (L.) to disseminate natural antagonists of *Botrytis cinerea* (Pers.) in protected strawberry cultivation.]. Paper presented at "La difesa delle colture in agricoltura biologica" convegno AIPP (Associazione Italiana Protezione Piante - Italian Association for plant protection), Cesena (FO) Italy, 23-24 novembre 2004; Published in TURCHI, ANNALISA and SALVATI, MARCELLO, Eds. *BOLLETTINO DI AGRICOLTURA BIOLOGICA A CURA DEL CRAB (Reference Centre for organic farming)* (2): pp. 59-68. PROVINCIA DI TORINO (Turin province, Italy). (italien) [contact: [info@agribiocentro.it](mailto:info@agribiocentro.it)]

Three years of investigation (2002-2004) proved the efficacy of using the pollinator insect *Bombus terrestris* to disseminate natural antagonists of *Botrytis cinerea*. The trials were conducted in greenhouses on strawberry cultivations and showed the possibility of biological control of *Botrytis cinerea*.

In 2002, the efficacy of the dissemination of *Trichoderma harzianum* with *Bombus terrestris* was comparable with the chemical control obtained by fungicides.

{Recherche appliquée}

Accès au document : via le site [orgprints.org](http://orgprints.org) (document pdf)

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>

### Chapters

- 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*

Rosa, E., Rodrigues. P., 1999. [Towards a more sustainable agriculture system: the effect of glucosinolates on the control of soil-borne diseases](#). *J Hortic Sci Biotech*, Vol. 74 (6): pp. 667-674.

The effect of glucosinolates and compounds derived from them, and the effect of amendments with brassicas, on soilborne microorganisms deleterious to crop plants is reviewed. It is concluded that soil amendment with brassicas has a beneficial effect on the control of some soilborne pathogens, probably due to isothiocyanates derived from the breakdown of glucosinolates. Residues from brassica crops could be incorporated directly into the soil or brassicas could be used as intercrops. Further research is recommended on the biological activity of the specific degradation products of glucosinolates and on the identification of species and cultivars yielding higher levels of isothiocyanates.

{Recherche appliquée}

Accès au document : via le site The Journal of Horticultural Science & Biotechnology  
(document pdf ou html)

*Coût de l'article : 30,50 \$*

Schmid, A., Daniel, C., Weibel, F., 2005. [Effect of cultural methods on leaf spot \(\*Mycosphaerella fragariae\*\) and gray mold \(\*Botrytis cinerea\*\) damage in strawberries](#). *BioControl*, Vol. 50 (1): pp. 179-194. [contact: [info.suisse@fibl.org](mailto:info.suisse@fibl.org)]

Damage of leaf spot, caused by *Mycosphaerella fragariae* and gray mold also called Botrytis fruit rot, caused by *Botrytis cinerea*, average fruit weight and yield were evaluated with regard to cultural methods over two years. Leaf spot damage decreased significantly by around 90% due to leaf sanitation (removal of dead and leaf spot infected leaves in early spring) and by 50% due to plantation in a one-row-system instead of a two-row-system. When all leaves including the healthy green ones were removed in early spring average fruit weight decreased significantly by 10%. Fruit sanitation - the third treatment – did not influence any of the measured parameters.

Neither leaf sanitation nor fruit sanitation (removal of damaged fruits during harvest) reduced *B. cinerea* damage significant. Only the combination of a one-row-system, leaf sanitation and fruit sanitation almost halved (not significantly) *B. cinerea* damage in the first crop year compared to a two-row-system without leaf and fruit sanitation. *B. cinerea* damage correlated significant positive with the biomass of plants by  $R^2 = 0.47$ . According this study and the cited literature it is suggest for humid Central European conditions to apply a one-row system combined with leaf sanitation in early spring and fruit sanitation during harvest if fruit density is high to reduce the risk of damages in larger dimension caused by *M. fragariae* and *B. cinerea*.

{Recherche appliquée}

Accès au document : via Ingenta Connect (document pdf)

Coût de l'article 42,00 \$

Shafir, S., Dag, A., Bilu, A., Abu-Toamy, M., Elad, Y., 2006. [Honey bee dispersal of the biocontrol agent \*Trichoderma harzianum\* T39: effectiveness in suppressing \*Botrytis cinerea\* on strawberry under field conditions](#). *European Journal of Plant Pathology*, Vol. 116 (2): pp. 119-128.

[contact: [shafir@agri.huji.ac.il](mailto:shafir@agri.huji.ac.il)]

*Botrytis cinerea*, which causes grey mould, is a major pathogen of many crops. On strawberry, isolates of *Trichoderma* spp. can effectively control *B. cinerea*, but frequent application is necessary. Bees can be used to disseminate biological control agents to the target crop. We tested the ability of honey bees to disseminate *Trichoderma harzianum* T39 to control *B. cinerea* in strawberry in the field during the winter in Israel over two consecutive seasons. We used the recently developed 'Triwaks' dispenser for loading the bees with the *T. harzianum* inoculum. During both years, grey mould developed in late January in untreated control plots; at low to medium disease levels it was partially controlled by fungicide treatment, and was best controlled in bee-visited plots. At high disease levels neither chemical nor biological control was effective. To assess the spatial distribution of inoculum by bees, we sampled flowers up to 200 m from the hives and found effective levels of *T. harzianum* even at 200 m. The approach used in this study provides an effective control of grey mould in strawberry in conditions of low to medium grey mould incidence.

{Recherche appliquée}

Accès au document : via le site SpringerLink (document pdf ou html)

Coût : 32,00 \$ US



Thürig, B., Binder, A., Boller, T., Guyer, U., Jiménez, S., Rentsch, C., Tamm, L., 2006.  
[An aqueous extract of the dry mycelium of \*Penicillium chrysogenum\* induces resistance in several crops under controlled and field conditions.](#) *European Journal of Plant Pathology*,  
Vol. 114 (2): pp. 185-197. [contact: [lucius.tamm@fibl.ch](mailto:lucius.tamm@fibl.ch)]

We have examined the effect of Pen, an aqueous extract of the dry mycelium of *Penicillium chrysogenum*, on plant–pathogen interactions. Pen controlled a broad range of pathogens on several crop plants under greenhouse and field conditions. Pen protected grapevine from downy and powdery mildew (caused by *Plasmopara viticola* and *Uncinula necator*), tomato from early blight (caused by *Phytophthora infestans*), onion from downy mildew (*Peronospora destructor*) and apple trees from apple scab (caused by *Venturia inaequalis*) to a similar extent as fungicides such as copper and sulphur or well-known inducers such as benzothiadiazole or b-aminobutyric acid. Pen had no major direct fungicidal effect and is thus supposed to protect plants by activating their defense mechanisms. The raw material for extraction of Pen was available in constant quality, a prerequisite for commercial application. Under certain conditions, Pen caused phytotoxic side effects. The symptoms mostly consisted of small necrotic spots or, more rarely, of larger necrotic areas. The development of the symptoms was dependent on several parameters, including concentration of Pen, the number of applications, the persistence on the plant tissue, the plant species and variety and environmental conditions. In grapevine, a partially purified fraction of Pen was much less toxic than the crude Pen extract, but protected the plants to a similar extent against *P. viticola*. Our data show that Pen has interesting and unique properties as a plant protection agent, but more research is needed to further reduce its phytotoxic side effects.

{Recherche appliquée}

Accès au document : via Springer Link (document pdf)

Coût de l'article 32,00 \$

Tripathi P., Dubey, N.K., 2004. [Exploitation of natural products as an alternative strategy to control postharvest fungal rotting of fruit and vegetables](#). *Postharvest Biology and Technology*, Vol. 32 (3): pp. 235-245. [contact: [pramilatripathi\\_bhu@rediffmail.com](mailto:pramilatripathi_bhu@rediffmail.com)]

Chemical fungicides provide the primary means for controlling postharvest fungal decay of fruit and vegetables. Continuous use of fungicides has faced two major obstacles—increasing public concern regarding contamination of perishables with fungicidal residues, and proliferation of resistance in the pathogen populations. The ultimate aim of recent research in this area has been the development and evaluation of various alternative control strategies to reduce dependency on synthetic fungicides. Several non-chemical treatments have been proposed for fungal decay control. Although these approaches have been shown to reduce postharvest rots of fruit and vegetables, each has limitations that can affect their commercial applicability. When used as stand-alone treatments, none of the non-chemical control methods has been clearly shown to offer a consistently economic level of disease control that warrants acceptance as an alternative to synthetic fungicides. Recently, the exploitation of natural products to control decay and prolong storage life of perishables has received more and more attention. Biologically active natural products have the potential to replace synthetic fungicides. This review deals with exploitation of some natural products such as flavour compounds, acetic acid, jasmonates, glucosinolates, propolis, fusapyrone and deoxyfusapyrone, chitosan, essential oils and plant extracts for the management of fungal rotting of fruit and vegetables, thereby prolonging shelf life.

{Recherche appliquée}

Accès au document : via le site Science Direct (document pdf ou html)

Coût : 30,00 \$ US

Welke, S.E. 2004. [The effect of compost extract on yields of strawberries and the severity of \*Botrytis cinerea\*](#). *Journal of Sustainable Agriculture*, Vol. 25 (1): pp. 57-68.  
[contact: [Myriad64@sympatico.ca](mailto:Myriad64@sympatico.ca)]

The effect of compost extracts on strawberry yields and in the suppression of grey mould, *Botrytis cinerea*, in strawberries was studied over a period of two growing seasons on an organic, market garden farm in the southern interior of British Columbia. Composts were prepared both anaerobically and aerobically as well as at a 8:1 and 4:1 water to compost dilution in order to determine if preparation method and concentration changed any suppressive effect. Anaerobically prepared compost extract had little effect on strawberry yields yet reduced the severity (0.38 0.16) of *Botrytis cinerea* compared to water sprays (1.02 0.36). Aerobically prepared extracts improved yields (1.70 0.08 t/ha) over the control (1.36 0.11 t/ha) and water spray (1.37 0.09) treatments and also reduced disease severity. Dilute extract reduced the incidence of the disease to a greater extent than all other treatments.

{Recherche appliquée}

Accès au document : via Ingenta Connect (document pdf)  
Coût de l'article 35,00 \$

Wszelaki, A. L., and Miller, S. A. 2005. [Determining the efficacy of disease management products in organically-produced tomatoes](#). Online. Plant Health Progress [contact: [miller.769@osu.edu](mailto:miller.769@osu.edu)]

Seize produits thérapeutiques ou combinaisons de produits utilisés en régie biologique ont fait l'objet de tests visant à en évaluer l'efficacité relativement aux maladies de la tomate. En 2002, l'incidence des maladies a été plutôt faible, et aucun traitement n'a permis de réduire considérablement l'incidence de la maladie comparativement au groupe témoin. En 2003, la brûlure alternarienne et la tache septorienne sont survenues assez tard dans la saison. La bouillie bordelaise, l'hydroxyde de cuivre, les huiles d'ail et de margousier, l'extrait d'algues et le Serenade ont tous contribué à endiguer la propagation de la maladie comparativement au groupe témoin. Les parcelles traitées au Sonata ont donné les plus beaux fruits.

Sixteen disease control products or product combinations used in organic production systems were tested for efficacy against tomato diseases. Disease pressure was low in 2002, and no treatment significantly reduced disease relative to the control. In 2003, early blight and Septoria leaf spot developed late in the season, and Bordeaux mixture, copper hydroxide, garlic and neem oils, seaweed extract, and Serenade reduced disease development compared to the control. Plots treated with Sonata yielded the most marketable fruit.

{Recherche appliquée}

Accès au document : via le site Plant Health Progress (document pdf ou html)

Zaller, J.G., 2006. Foliar spraying of vermicompost extracts: effects on fruit quality and indications of late-blight suppression of field-grown tomatoes. *Biological Agriculture & Horticulture*, 24: pp. 165-180. [contact: [johann.zaller@boku.ac.at](mailto:johann.zaller@boku.ac.at) or <http://www.dib.boku.ac.at/zaller.html>]

The effect of foliar sprays with aqueous vermicompost extracts on growth, yields, morphological and chemical fruit quality and natural infection with late blight disease *Phytophthora infestans* on three tomato varieties (*Lycopersicon esculentum* Mill., cv. Diplom F1, cv. Matina, cv. Rheinlands Ruhm) was investigated in a field experiment. Extracts were prepared of vermicompost produced from fruit, vegetable and cotton waste by redworms (*Eisenia fetida* Sav., *Lumbricidae*); tap water served as control treatment. Foliar application (spraying) of vermicompost extracts did not affect plant growth, biomass or nutrient allocation, or yields and number of fruits of the three tomato varieties; however, for several dates it significantly reduced the number of flowers produced. Foliar vermicompost spraying either increased or decreased peel firmness dependent on tomato variety and increased fruit circumference consistently as well as contents of nitrogen but decreased L-ascorbic acid compared with water sprayed fruits. All other measured parameters of fruit quality (dry matter, C, N, P, K, Ca, Mg, glucose and fructose content) were similar for vermicompost and water sprayed plants.

Natural infection of leaves, stems and fruits by *P. infestans* was generally very low under the experimental conditions; however, across varieties, only half as many vermicompost sprayed plants showed clear signs of *P. infestans* infection as water sprayed plants; the severity of the infection was unaffected by the two spraying treatments. In conclusion, these results suggest that the use of vermicompost might be considered more in organic farming not only as a substitute for peat in potting media but also as foliar sprays for fertilization and biological control.

{Recherche appliquée}

Accès au document : via le site de «University of Natural Resources and Applied Life Sciences, Vienna»

[http://www.boku.ac.at/zoology/download/zaller/Zaller\\_2006BAH.pdf](http://www.boku.ac.at/zoology/download/zaller/Zaller_2006BAH.pdf)

## ANNEXE : LIENS UTILES

### Canada

Centre d'agriculture biologique du Canada  
[www.oacc.info](http://www.oacc.info)

Réseau Biocontrôle (magazines de vulgarisation)  
[www.biocontrol.ca/bcf/main\\_f.html](http://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/](http://www.nal.usda.gov/)

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

Sustainable Agriculture Research and Education (SARE)  
[www.sare.org/index.htm](http://www.sare.org/index.htm)

### Europe

Danish Research Centre for Organic Farming (DARCOF)  
Danemark (anglais)  
[www.darcof.dk](http://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](http://www.fibl.org/francais/index.php)

Institut National de la Recherche Agronomique (INRA), France  
[www.inra.fr/la\\_sciences\\_et\\_vous/dossiers\\_scientifiques/agriculture\\_biologique](http://www.inra.fr/la_sciences_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](http://www.itab.asso.fr)

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

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

## Québec

Ecological Agricultural Projects  
Université McGill  
[www.eap.mcgill.ca](http://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* Riley) 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 piégeage 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](http://www.cabi.org)  
[www.organic-research.com](http://www.organic-research.com)

Organic Agriculture Information website (Organic AgInfo)  
[www.organicaginfo.org/](http://www.organicaginfo.org/)

The Organic Eprints archive. Réseau européen de recherche en Agriculture biologique  
[www.orgprints.org](http://www.orgprints.org)