Glucosinolates, Allyl Isothiocyanate, Dazitol™
Plant Extracts and Agricultural Pesticide Uses

“Glucosinolates (GSL), found in *Brassica* species, are of interest due to the potential for using their degradation products as fumigants...When hydrolyzed by the enzyme myrosinase, GLS produce D-glucose, sulfate, isothiocyanates (volatile mustard oils), thiocyanates and nitriles (Larsen, 1981; Poulton and Moller, 1993). Isothiocyanates (ITC) and nitriles have been demonstrated to control fungi (Charron and Sams, 1999; Mayton *et al.*, 1996; Sarwar *et al.*, 1998) bacteria (Delaquis and Mazza, 1995), nematodes (Mojtahedi *et al.*, 1993 and 1991), insects (Noble *et al.*, 1999) and some weed seeds in laboratory experiments (Al-Khatib *et al.*, 1997). Allyl isothiocyanate (AITC) is the predominant ITC produced by Indian mustard (*B. juncea*). The objective of this experiment was to determine the effectiveness of biofumigation with Indian mustard and AITC for control of *Sclerotium rolfsii* Sacc., the causative agent of Southern blight of tomato. Result: Volatiles released from Indian mustard were effective in controlling *S. rolfsii* mycelial growth with LC50 and LC90 (lethal concentration with 50 and 90% kill) at 0.6 and 2.1 g·L⁻¹, respectively...Biofumigation with Indian mustard and other *Brassica* sp. may provide growers with an affordable, environmentally safe control for *S. rolfsii* mycelia if used in an integrated management system.

Source: http://soils.ag.uidaho.edu/mmorra/gluc/

Test Data on Dazitol™ as a Soil Fumigant
Source: http://www.kswproducts.com/champon/Test%20Data/test.htm

1. Effectiveness of Champ All Natural Products as an Alternative to MBr in Controlling Various Pests in Tomatoes (summary report on Manley Farms). Dr. Dakshina Seal, Univ. of FL-IFAS.
2. Evaluation of Dazitol (Champs) on Plant Parasitic Nematodes by Glades Crop Care: Manley Farm Field Trial
3. Manley Farm Field Trial, Analysis Results, Eden Bioscience
4. Control of Fusarium and Phytophthora Using Champon 100% Natural Product (Dazitol): Dr. Dakshina Seal, Univ. of FL-IFAS, Homestead
5. Control of Aphids on Stocks Using Natural and Chemical Insecticides: Dr. Dakshina Seal, Univ. of FL-IFAS, Homestead
6. Laboratory Bioassay to Control Aphids on Potatoes Using Champon’s Nature’s Cide (Dazitol): Dr. Dakshina Seal, Univ. of FL-IFAS, Homestead
7. Two Reports on Insect Pest Control Using Dazitol on Bell Pepper: Dr. Dakshina Seal, Univ. of FL-IFAS, Homestead
8. Laboratory Insect Control Trials Against Three Pest Insects: Philip Koehler, Dept. of Entomology and Nematology, Univ. of FL - Gainesville
9. Field Trials of Dazitol in Chile (Spanish)
10. Field Trials of Dazitol in Colombia. Summary: efficacy is equal to Endosulfan.
11. Activity of Biocide Dazitol Against Some Phytopathogenic Fungi (Bulgaria)
12. Use of Dazitol for Turfgrass (Orangebrook County Club, South Florida)


(ITCs)...play a major role in the suppression of fungal pathogens and thus are integral to biofumigation."


Daugovish, O, Downer, J, Becker, O, Methyl Bromide Alternatives and Outreach Conference, **2003**, *Exploring Biofumigation Potential of Mustards*


Florida Grower magazine, A Spicy Alternative to Methyl Bromide, 1998, p.8


Frick, Switzerland, OILB/IOBC working group, 15-16 March 1999, Expelling Slugs, Snails and Earthworms with Allyl-Isothiocyanate


Happold, F.C., Jones, G.L., and Pratt, D.B. Utilization of Thiocyanate by

Harper, S.H.T. and Lynch, J.M. The Role of Water-soluble Components in

Harvey, B.L., and Downey, R.K. The inheritance of erucic acid content in

Harvey, Stephanie Gail and Sams, Carl E., Methyl Bromide Alternatives and
Outreach Conference, 2000, *Allyl Isothiocyanate Releases from Juncea
Suppresses Mycelial Growth of Sclerotium Rolfsii*

Hasapis, X. and MacLeod, A.J. Effects of Metal Ions on Benzylglucosinolate
Degradation in *Lepidium sativum* Seed Autolysates. *Phytochemistry* 1982, 21,
559-563.

Hedley, M.J., Nye, P.H., and White, R.E. Plant-induced Changes in the
Rhizosphere of Rape (*Brassica napus* var. Emerald) Seedlings. II. Origins of the

Hedley, M.J., White, R.E., and Nye, P.H. Plant-induced Changes in the
Rhizosphere of Rape (*Brassica napus* var. Emerald) Seedlings. III. Changes in L
Value, Soil Phosphate Fractions and Phosphatase Activity. *New Phytol.* 1982b,
91, 45-56.

Heijbroek, W. The Influence of Resistant Cruciferous Green Manure Corps on
Beet Cyst Nematodes. Mededeling Nr. 8. Instituut voor Rationele

Hill, C.B., Williams, P.H., Carlson, D.G., and Tookey, H.L. Variation in
112(2), 309-313.

Coupled column liquid chromatography for the trace determination of polar
pesticides in water using direct large-volume injection: Method development

Hogge, L.R., Reed, D.W., Underhill, E.W., and G.W. Haughn. HPLC Separation
of Glucosinolates from Leaves and Seeds of *Arabidopsis thaliana* and their
Identification using Thermospray Liquid Chromatography/Mass Spectrometry. *J.

Hogger, C.H., Barone, M, Oberer, C., OILB/IOBC working group, 15-16 March
1999, *Control of Soil Pests, Subgroup on Slugs and Other Pests*


Miller, D.B. Determination of Methylisothiocyanate by an HPLC Trapping and Derivatization Procedure. LC GC 1988, 6, 842-846.


Petroski, R.J. and Tookey, H.L. Interactions of Thioglucoside glucohydrolase and Epithiospcifier Protein of Cruciferous Plants to Form 1-Cyanoepithioalkanes. Phytochemistry 1982, 8, 1903-1905.

Phipps, P.M. Control of Cylindrocladium Black Rot of Peanut with Soil Fumigants Having Methyl Isothiocyanate as the Active Ingredient. Plant Dis. 1990, 74, 438-441.


Rodriguez-Kabana, R., Methyl Bromide Alternatives and Outreach Conference, 2002, *Nematoxity of Propylene Oxide and Allyl Isothiocyanate* Summary: “Results indicate that there is a degree of synergism between propylene oxide and allyl isothiocyanate as suggested by tomato plant response and control of *M. incognita*. The combination of these chemicals may permit significant reductions in the rates of propylene oxide required for control of plant pathogenic nematodes.”

Rodriguez-Kabana, R., Methyl Bromide Alternatives and Outreach Conference, 2000, *Comparative Studies on the Nematicidal Activities of Garlic and Mustard Oils* Summary: “The nematicidal activities of allyl isothiocyanate of and mustard oil were several-fold higher than that of garlic oil.”


Seamons, C., Brown, J, McCaffrey, J. and Lloyd, J., Methyl Bromide Alternatives and Outreach Conference, **2003**, *Using Brassica Seed Meal For Biological Control of Black Vine Weevil in Nursery Trees*


Slevin, J, and Tommalieh, Z., Methyl Bromide Alternatives and Outreach Conference, 2003, *Commercialization of a Soil Fumigant with Fungicidal, Nematicidal, and Insecticidal Control: Biofumigant Dazitol Takes Hold in the Middle East, Replacing Methyl Bromide*


United States Department of Agriculture, Agriculture Research Service, Locke, J. and Bowers, M., American Phytopathological Society, 1997, *Effect of Botanical Extracts on the Population Density of Fusarium Oxysporum in Soil* 1. “The pepper extract reduced population densities of F.o.c. in soil by 99.9%.” 2. “Observation of the lack of background microflora on dilution plates suggests that the pepper extract may effect a wide range of soil fungi, and may create a biological vacuum...Further research on the soil ecology when these extracts are added to soil is needed.” 3. “The observed reduction in the pathogen population coupled with an environmentally-friendly rapid breakdown in soil suggests that these extracts may have an important role in biologically-based management strategies. One plausible scenario is that a natural extract be incorporated into soil to initially reduce the pathogen population.” 4. “If natural plant products can reduce populations of soilborne plant pathogens, then these plant extracts have potential as environmentally-safe alternatives for methyl bromide as critical components in integrated management programs.”

Note: “Pepper extract” = Dazitol™
ARS said its scientists have agreed that chemicals exuded from plants affect the surrounding soil, thereby favoring specific populations of microorganisms. Scientists said that after about three years in the soil, apple trees promote fungal growth that may cause disease. The scientists said that planting wheat may "starve out" the fungi, thereby eliminating the threat of disease. ARS cautioned that these findings are preliminary and need much more research before they could be applied in widescale tests in orchards.

Mayton, H., Olivier, C., Vaughn, S., Loria, R, 1995, *Fungicidal Activity of Brassica Species is Correlated to Allyl Isothiocyanate Production in Macerated Leaf Tissue*. Summary: We are especially interested in several species in the mustard family which contain high levels of compounds called glucosinolates that break down to volatile antifungal compounds when plants are macerated. We found that the plant's ability to suppress fungal growth was highly correlated to the release of a compound termed allyl isothiocyanate...Our research indicates that these plants may be useful as economical and environmentally friendly potato management practice for the control of dry rot.

United States Federal Register: May 20, 1996 (Volume 61, Number 98), Rules and Regulations, *Allyl Isothiocyanate Exemption From the Requirement of a Tolerance*, Page 25152-25153. Environmental Protection Agency, 40 CFR Part 180, [PP 5F4445/R2235; FRL-5366-4] Allyl Isothiocyanate as a Component of Food Grade Oil of Mustard; Exemption from the Requirement of a Tolerance, Environmental Protection Agency, Final rule. The insecticide and repellent Allyl isothiocyanate is exempt from the requirement of a tolerance for residues when used as a component of food grade oil of mustard, in or on all raw agricultural commodities, when applied according to approved labeling.


Ware, G.W. *Pesticides, Theory and Application*. Freeman: San Francisco, 1983.


