

UV-blocking Plastic Films and Nets Influence Vectors and Virus Transmission on Greenhouse Tomatoes in the Humid Tropics

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References Cited

- Ajwang, P., H. J. Tantau, and C. V. Zabeltitz. 2002.** Insect screens for integrated production and protection in greenhouses: a review of the physical and technical basics. *Gartenbauwissenschaft* 67: 45-49.
- Antignus, Y. 2000.** Manipulation of wavelength dependent behaviour of insects: an IPM tool to impede insects and restrict epidemics of insect borne viruses. *Virus Res.* 71: 213-220.
- Antignus, Y., M. Lapidot, N. Mor, R. Ben-Joseph, and S. Cohen. 1996.** Ultra violet absorbing plastic sheets protect crops from insect pests and virus diseases vectored by insects. *Environ. Entomol.* 25: 919-924.
- Antignus, Y., M. Lapidot, D. Hadar, M. Messika, and C. Cohen. 1998.** Ultraviolet absorbing screens serve as optical barriers to protect greenhouse crops from virus diseases and insect pests. *J. Econ. Entomol.* 91: 1401-1405.
- Antignus, Y., D. Nestel, S. Cohen, and M. Lapidot. 2001.** Ultraviolet deficient greenhouse environment affects whitefly attraction and flight behaviour. *Environ. Entomol.* 30: 394-399.
- Attathom, S., P. Chiemsombat, T. Sutabutra, and R. Pongpanitanond. 1990.** Characterization of nucleic acid of a tomato yellow leaf curl virus. *Kasetsart J.* 24: 1-5.
- Barrek, S., O. Paise, and G.-L. Marie-Florence. 2004.** Analysis of neem oils by LC-MS and degradation kinetics of azadirachtin-A in a controlled environment. *Anal. Bioanal. Chem.* 378: 753-763.
- Brown, J. K., D. R. Frohlich, and R. C. Rosell. 1995.** The sweetpotato or silverleaf whiteflies; biotypes of *Bemisia tabaci* or a species complex? *Annu. Rev. Entomol.* 40: 511-534.
- Brown, S. L., and J. E. Brown. 1992.** Effect of plastic mulch color and insecticides on thrips populations and damage to tomato. *HorTechnology.* 2: 208-210.
- Cahill, M., F. J. Byrne, K. Gorman, L. Denholm, and A. L. Devonshire. 1995.** Pyrethroid and Organophosphate resistance in the tobacco whitefly *Bemisia tabaci* (Homoptera: Aleyrodidae). *Bull. Entomol. Res.* 85: 181-187.
- Chyzik, R., S. Dobrinin, and Y. Antignus. 2003.** Effect of a UV-deficient environment on the biology and flight activity of *Myzus persicae* and its Hymenopterous parasite *Aphidius matricariae*. *Phytoparasitica* 31: 467-477.

- Costa, H. S., and K. L. Robb. 1999.** Effects of ultraviolet absorbing greenhouse plastic films on flight behavior of *Bemisia argentifolii* (Homoptera: Aleyrodidae) and *Frankliniella occidentalis* (Thysanoptera: Thripidae). *J. Econ. Entomol.* 92: 557-562.
- Costa, H. S., K. L. Robb, and C. A. Wilen. 2001.** Increased persistence of *Beauveria bassiana* spore viability under high ultraviolet-blocking greenhouse plastic. *Hort. Sci.* 36: 1082-1084.
- Costa, H., K. L. Robb, and C. A. Wilen. 2002.** Field trials measuring the effect of ultraviolet absorbing greenhouse plastic films on insect populations. *J. ECONOMIC ENTOMOLOGY* Vol. 35, no. 4. 113-120.
- Csizinski, A. A., D. J. Schuster, and J. B. Kring. 1995.** Colour mulches influence yield and insect pest populations in tomatoes. *J. Am. Soc. Hort. Sci.* 20: 778-784.
- Denholm, I., M. Cahill, F. J. Byrne, and A. L. Devonshire. 1996.** Progress with documenting and combating insecticide resistance in *Bemisia*, pp. 577-603. In D. Gerling and R. T. Mayer (eds.), *Bemisia: 1995 taxonomy, biology, damage, control and management*. Intercept, Andover, UK.
- Doukas, D. 2002.** Impact of spectral cladding materials on the behaviour of glasshouse whitefly *Trialeurodes vaporariorum* and *Encarsia formosa*, its hymenopteran parasitoid. School of Plant Sciences. MSc dissertation, University of Reading, London, UK.
- Elad, Y. 1997.** Effect of solar light on the production of conidia by field isolates of *Botrytis cinerea* and on several diseases of greenhouse grown vegetables. *Crop Protect.* 16: 635-642.
- Elbert, A., and R. Nauen. 2000.** Resistance of *Bemisia tabaci* (Homoptera: Aleyrodidae) to insecticides in southern Spain with special reference to neonicotinoids. *Pest Manag. Sci.* 56: 60-64.
- Espinosa, P. J., P. Bielza, J. Contreras, and A. Lacasa. 2002.** Field and laboratory selection of *Frankliniella occidentalis* (Pergande) for resistance to insecticides. *Pest Manag. Sci.* 58: 920-927.
- Foster, S. P., I. Denholm, and A. L. Devonshire. 2000.** The ups and down of insecticide resistance in peach-potato aphid (*Myzus persicae*) in the UK. *Crop Protect.* 19: 873-879.
- Goldsmith, T. H. 1993.** Ultraviolet receptors and color vision: evolutionary implication and a dissonance of paradigms. *Vision Res.* 34: 1479-1487.
- Gomez, K. A., and A. A. Gomez. 1984.** Statistical procedures for agriculture research. Wiley, New York.
- Gonzalez, A. 2004.** Viral diseases control with UV-blocking films in greenhouses of southern Spain. International Symposium on Protected Culture in a Mild-Winter Climate, 23-27 March 2004. Kissimmee, FL.
- Goulson, D., L. C. Derwent, D. I. Pernagos, and T. Williams. 2003.** Effects of optical brighteners included in biopesticide formulations on the growth of crops. *Agric. Ecosys. Environ.* 95: 235-240.
- Greenough, D. R., L. L. Black, and W. P. Bond. 1990.** Aluminium-surfaced mulch: an approach to the control of tomato spotted wilt virus in solanaceous crops. *Plant Dis.* 74: 805-808.

- Horowitz, A. R., and I. Ishaaya. 1996.** Chemical control of Bemisia, management and application, pp. 537-556. *In* D. Gerling and R. T. Mayer (eds.), Bemisia: 1995 taxonomy, biology, damage, control and management. Intercept, Andover, UK.
- Kirchner, S. M., T. F. Doering, and H. Saucke. 2005.** Evidence for trichromacy in the green peach aphid, *Myzus persicae* (Sulz.) (Hemiptera: Aphididae). *J. Insect Physiol.* 51: 1255-1260.
- Kontsedalov, S., P. G. Weintraub, A. R. Horowitz, and I. Ishaaya. 1998.** Effects of insecticides on immature and adult western flower thrips (Thysanoptera: Thripidae) in Israel. *J. Econ. Entomol.* 91: 1067-1071.
- Kring, J. B. 1972.** Flight behavior of aphids. *Annu. Rev. Entomol.* 17: 461-492.
- Kring, J. B., and D. J. Schuster. 1992.** Management of insects on pepper and tomato with UV reflective mulches. *Fla. Entomol.* 75: 119-129.
- Kumar, P., H. M. Poehling, and C. Borgemeister. 2005.** Effects of different application methods of Neem against Sweetpotato Whitefly *Bemisia tabaci* Gennadius (Homoptera: Aleyrodidae) on Tomato plants. *J. Appl. Entomol.* 129: 889-897.
- Matteson, N., and L. I. Terry. 1992.** Response to colour by male and female *Frankliniella occidentalis*. *Entomol. Exp. Appl.* 63: 187-201.
- Matteson, N., I. Terry, A. Ascoli-Christensen, and C. Gilbert. 1992.** Spectral efficiency of the western flower thrips, *Frankliniella occidentalis*. *J. Insect Physiol.* 38: 453-459.
- Mazza, C. A., J. Zavala, A. L. Scopel, and C. L. Ballare. 1996.** Perception of solar UVB radiation by phytophagous insects: behavioral responses and ecosystem implications. *Proc. Natl. Acad. Sci. U.S.A.* 96: 980-985.
- Mazza, C. A., M. M. Izaguirre, J. Zavala, A. L. Scopel, and C. L. Ballare. 2002.** Insect perception of ambient ultraviolet-B radiation. *Ecol. Lett.* 6: 722-726.
- Mellor, H. E., J. Bellingham, and M. Anderson. 1997.** Spectral efficiency of the glasshouse whitefly *Trialeurodes vaporariorum* and *Encarsia formosa* its hymenopteran parasitoid. *Entomol. Exp. Appl.* 83: 11-20.
- Michelle, L. B., and J. R. Baker. 2000.** Comparison of greenhouse screening materials for excluding whitefly (Homoptera: Aleyrodidae) and thrips (Thysanoptera: Thripidae). *J. Econ. Entomol.* 93: 800-804.
- Mound, L. A. 1962.** Studies on the olfaction and colour sensitivity of *Bemisia tabaci* (Genn.) (Homoptera Aleyrodidae). *Entomol. Exp. Appl.* 5: 99-104.
- Mutwiwa, N. M., C. Borgemeister, B. V. Elsner, and H.-J. Tantau. 2005.** Effects of UV-absorbing plastic films on greenhouse whitefly (Homoptera: Aleyrodidae). *J. Econ. Entomol.* 98: 1221-1228.
- Prabhaker, N., N. C. Toscano, and T. J. Henneberry. 1998.** Evaluation of insecticide rotations and mixtures as resistance management strategies for *Bemisia argentifolii* (Homoptera: Aleyrodidae). *J. Econ. Entomol.* 91: 820-826.
- Premachandra, W.T.S.D., C. Borgemeister, E. Maiss, D. Knierim, and H. M. Poehling. 2005.** *Ceratothripoides claratris*, a new vector of tospovirus infecting tomatoes in Thailand. *Phytopathology* 95: 659-663.

- Reuveni, R., and M. Raviv. 1992.** The effect of spectrally modified polyethylene films on the development of *Botrytis cinerea* in greenhouse grown tomato plants. *Biol.Agric. Hort.* 9: 77-86.
- Rossel, S., and R. Wehner. 1984.** Celestial orientation in bees: the use of spectral cues. *J. Comp. Physiol. A.* 155: 605-613.
- Scherer, C., and G. Kolb. 1987.** Behavioural experiments on the visual processing of color stimuli in *Pieris brassicae* L. (Lepidoptera). *J. Comp. Physiol. A.* 160: 647-656.
- Schuster, D. J., T. F. Mueller, J. B. Kring, and J. F. Price. 1990.** Relationship of the sweetpotato whitefly to a new tomato fruit disorder in Florida. *HortScience* 25: 1618-1620.
- Scott, S. J., P. J. McLeod, F. W. Montgomery, and C. A. Hander. 1989.** Influence of reflective mulch on incidence of thrips, (Thysanoptera: Thripidae: Phlaeothripidae) in staked tomatoes. *J. Entomol. Sci.* 24: 422-427.
- Stavisky, J., J. Founderburk, B. V. Brodbeck, S. M. Olson, and P. C. Anderson. 2002.** Population dynamics of *Frankliniella* spp. and tomato spotted wilt incidence as influenced by cultural management tactics in tomato. *J. Econ. Entomol.* 95: 1216-1221.
- Steel, R.G.D., and J. H. Torrie. 1980.** Principles and procedures of statistics, 2nd ed. McGraw Hill, New York.
- Summers, C. G., J. P. Mitchell, and J. J. Stapleton. 2004.** Management of aphid-borne viruses and *Bemisia argentifolii* (Homoptera: Aleyrodidae) in zucchini squash by using UV reflective plastic and wheat straw mulches. *Environ. Entomol.* 33: 1447-1457.
- Suwwan, M. A., M. Akkawi, A. M. Al-Musa, and A. Mansour. 1988.** Tomato performance and incidence of tomato yellow leaf curl (TYLC) virus as affected by type of mulch. *Sci. Hortic.* 37: 39-45.
- Terry, L. I. 1997.** Host selection, communication and reproductive behaviour, pp. 65-118. *In* T. Lewis (ed.), *Thrips as crop pests*. CAB International, New York.
- Thoeming, G., C. Borgemeister, M. Setamou, and H. M. Poehling. 2003.** Systemic effects of Neem on Western Flower Thrips, *Frankliniella occidentalis* (Thysanoptera: Thripidae). *J. Econ. Entomol.* 96: 817-825.
- Thongrit, D., S. Attathom, and T. Sutabutra. 1986.** Tomato yellow leaf curl virus in Thailand.
- Vernon, R. S., and D. R. Gillespie. 1990.** Spectral responsiveness of *Frankliniella occidentalis* (Thysanoptera: Thripidae) determined by trap catches in greenhouses. *Environ. Entomol.* 19: 1229-1241.
- Vos, J. G., M.T.S. Uhan, and R. Sutarya. 1995.** Integrated crop management of hot pepper (*Capsicum* spp.) under tropical lowland conditions: effects of rice straw and plastic mulches on crop health. *Crop Protect.* 4: 445-452.
- Xu, R. M., Q. R. Zhu, and Z. L. Zhang. 1984.** A system approach to greenhouse whitefly *Trialeurodes vaporariorum* population dynamics and strategy for greenhouse whitefly control in China. *Z. Angew. Entomol.* 97: 305-313.