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Countertop Production of Predatory Mites for Public Distribution

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Predatory mites can be an effective and sustainable way to control arthropod pests. However, a majority of the public do not know about them, how to use them, or how to obtain them. Additionally, if a supplier is located, costs of shipping and handling are greater than the cost of the mites due to their perishability. In the past, rearing predatory mites involved raising pest arthropods for them to eat as well as the predatory mites themselves. Keeping both populations separate and healthy can be difficult. This project is part of a statewide research grant to determine how best to rear predatory mites on countertops for use in distribution and education of the public. Several different rearing procedures were assessed to determine the easiest and most effective method for rearing and distribution. The best method was rearing the predatory mites in dishes with water "moats" to contain them, feeding them pollen, and providing cotton balls for egg laying and subsequent distribution. Extension agents participating in the trials are poised to promote this program statewide to interested extension agents and clientele. Clients with whitefly, spider mite, or thrips damage can be given a cotton ball in a plastic baggie to take home to provide biological pest control, along with being educated about biological control. UF/IFAS Extension will be able to lead the way in promoting biological control with the public, reducing chemicals in the environment, and providing clients with immediate pest control solutions.

Predatory mites can be an effective and sustainable method to control arthropod pests (Arthurs et al., 2009; Flint et al., 1998). However, there are several issues limiting their adoption into the average production schedule or the average homeowner's arsenal for pest control. A majority of the public do not know about them, how to use them, or how to obtain them (Dreistadt, 2007). Even growers are not sure how they can fit in with commercial production that will require some pesticides (Hassan et al., 1994; Osborne et al., 1985). In addition, if a supplier is located, costs of shipping and handling are greater than the cost of the mites due to their perishability, and mites often arrive in poor condition because of shipping conditions.

Rearing your own predatory mites would overcome some of these difficulties, but is not well documented. Predatory mites are produced commercially in a patented method that includes rearing live prey (Osborne, 2011 personal communication). Keeping prey and predator populations separate and healthy can be difficult, and easier methods have been explored by Dr. Lance Osborne utilizing the ability of some predatory mites to survive on pollen and other food (McMurtry et al., 1997). This project was developed as part of a statewide research grant to determine how best to rear predatory mites *Amblyseius swirskii* and *Neoseiulus californicus* on countertops for use in distribution and education of the public through Cooperative Extension offices and to develop a way for smaller commercial growers to rear their own biological controls. Several different rearing procedures were assessed in 10 county extension offices statewide to determine the easiest and most effective method for rearing and distribution.

Materials and Methods

Predatory mite rearing kits were sent to 10 sites. The kits included the equipment to produce predatory mites in a "jug" method, in a large open dish method and in a smaller open dish method. Food for the predatory mites could be sugar mites (mites and rearing equipment for these were also provided) or pollen (both peach pollen and granular bee pollen were provided). Water could be supplied in various ways—through capillary action from cotton wicks, or through cotton supports in a water moat. All systems included a water moat to contain the mites. The habitat for the predatory mites could be bran, oats, or a textured plastic support with cotton fluff for egg laying. Extension agents receiving the kits were encouraged to try different methods and combinations to determine the easiest way to rear the mites.

The jug method required a gallon jug filled approximately one third with slightly moistened bran. The jug was placed on a small support in a larger container partially filled with water and a cap of insect excluding screen secured over the top. Sugar mites were introduced into the bran to reproduce and provide prey for the predatory mites. As populations increased, aliquots of the bran could be removed and distributed to provide populations of predatory mites as needed.

The large open dish method required a dish at least 20 cm in diameter and supported in a larger container partially filled with water to contain all mites. The dish was partially filled with rolled

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oats or bran, and a water supply provided via various methods. Sugar mites could be introduced into the grain habitat and/or pollen could be used to feed the predatory mites. Water was originally supplied with a plastic centrifuge tube approximately 2.5 cm long filled with water and topped with cotton for mite access. This system was difficult because the water had to be topped up frequently. Another method tried was a small plastic cap with a moistened cotton pad, which also had to be topped up frequently, but was easier to access. A final method tried was a plastic container approximately 2.5 cm deep and 2.5 cm wide. A cotton wad used for dental work was inserted through a cut in the cap to wick the moisture out. In addition, partially dried banana slices were tested as a moisture/food source.

The smaller open dish method was conducted in a 25-cm dish partially filled with water. A 6 × 6 cm textured plastic support/habitat was placed on three cotton pads in the water to raise it up out of the water and provide a place for the mites to access the moist cotton. A predatory mite population was introduced in bran from a commercial sachet onto the plastic support. A small fluff of cotton was provided for egg laying with a glass slide cover over the cotton to keep it from blowing away. Mites were fed approximately 0.037 g of pollen each week. Pollen was either commercially produced peach pollen or granules of commercially produced bee pollen. During the experiment, cattail pollen was found to be an excellent food source by Dr. Osborne, and agents were encouraged to collect cattail pollen to feed the mites.

Results and Discussion

Extension agent experience was varied. Agents who used sugar mites to feed the predatory mites usually ended up with the sugar mites taking over all habitats and overwhelming the predatory mites. Systems that were only fed pollen were successful in maintaining a predatory mite population. The use of bananas to supplement water and food was problematic and some were successful and some not. If the banana was not dried to the proper consistency there were issues with fruit flies and mold. Mold could be an issue in any of the systems if careful control of water was not maintained.

Of the various systems, the jug system was the worst. Agents found it difficult to get bran in and out of the narrow mouth jug. Even when a wider mouth jug was used, the moisture levels were difficult to maintain without mold growth, and sugar mites survived much better than the predatory mites. The large open dish method used grains that sometimes became infested with mold, and if used with sugar mites also had overwhelming prey populations. The small dish method was the most successful, but did require more frequent attention to water levels than the other methods. Currently some hybrid methods are being tested with large open dishes with grain for habitat, but no grain mites. The use of cotton fluff for predatory mite egg laying and as a distribution system was successful and easier to use than aliquots of grain. It was easy to check for visible numbers of predatory mites and eggs on the fluff, whereas on grain, populations were not as visible nor were they as consistent in number. The final test of success will be when the Master Gardeners in each of the 10 sites begin large scale production and distribution in the next year.

Literature Cited

Arthurs, S., C. L. McKenzie, J. Chen, M. Dogramaci, M. Brennan, K. Houben, and L. Osborne. 2009. Evaluation of *Neoseiulus cucumeris* and *Amblyseius swirskii* (Acari: Phytoseiidae) as biological control agents of chilli thrips, *Scirtothrips dorsalis* (Thysanoptera: Thripidae) on pepper. Biolog. Control 49:91–96.

Dreistadt, S.H. 2007. Biological control and natural enemies: Integrated pest management for home gardeners and landscape professionals. UC Statewide IPM Program, University of California, Davis. <http://www.ipm.ucdavis.edu/PDF/PESTNOTES/pnbiocontrol.pdf>.

Hassan, S.A., F. Bigler, H. Bogenschütz, E. Boller, J. Brun, J.N.M. Calis, J. Coremans-Pelseneer, C. Duso, A. Grove, U. Heimback, N. Helyer, H. Hokkanen, G.B. Lewis, F. Mansour, L. Moreth, L. Polgar, L. Samsøe-Petersen, B. Sauphanor, A. Stäubli, G. Sterk, A. Vainio, M. van de Veire, G. Viggiani, and H. Vogt. 1994. Results of the Sixth Joint Pesticide Testing Programme of the IOBC/WPRS Working Group—Pesticides and Beneficial Organisms. Entomophaga 39:107–119.

McMurtry, J.A. and B.A. Croft. 1997. Life-history of phytoseiid mites and their roles in biological control. Ann. Rev. Entomol. 42:291–321.

Osborne, L.S., L.E. Ehler and J.R. Nechols. 1985. Biological control of the twospotted spider mite in greenhouses. Univ. of Fla., Inst. of Food and Agr. Sci., Agr. Expt. Sta. Bul. 853 (technical). <http://mrec.ifas.ufl.edu/lso/SpMite/b853a1.htm>.

Flint, M.L. and S.H. Dreistadt. 1998. Natural enemies handbook. University of California Press.