Using Solid Oxygen Fertilizers to Alleviate Flooding Problems in Vegetable Production

Flooding affects crop production: Vegetable plants uptake oxygen from the soil matrix. Under flooding conditions, plants may not have enough oxygen to survive. Flooding has been a problem in Florida. Agriculture losses from flooding as a result of the hurricane Irene in 1999 and a storm (13.9 in) in 2000 were estimated at $77 and $13 million, respectively, in Miami-Dade County with nearly 19,000 acres of crop damage.

Slow-release oxygen fertilizers: Slow-release oxygen fertilizers are eco-friendly compound fertilizers. They are insoluble and inert if there is no water in the soil. In waterlogged or flooded soils, slow-release oxygen fertilizer will gradually release oxygen for up to 6 months. Meanwhile, they also provide calcium and/or magnesium nutrients.

Application of oxygen fertilizer: Application of slow-release solid oxygen fertilizers (e.g., magnesium peroxide plus additives) can effectively increase oxygen bioavailability in flooded soils, alleviate the problem, and reduce or exclude economic loss in vegetable production suffering from flooding. Application methods include before and after planting or sowing. The method before planting can save labor but the fertilizers may be wasted if there is no flooding. The other method requires more labor input because manipulation in crop plants is time consuming but this method may save the fertilizers if there is not a flooding problem during the growing season. We recommend applying the fertilizers before planting or sowing for vegetable production.

Exemplification: We grew traditional Italian basil (cv. Genovese OG) in 6 inch-pots with ProMix growth medium with (treatment) or without (the control) 1 g slow-release solid oxygen fertilizer incorporated into the growth medium. The plants were not flooded or flooded for five days after they were all 20 cm tall. Their chlorophyll contents were determined using SPAD 502 Chlorophyll Meter (Konica Minolta Holdings, Inc., Ramsey, New Jersey). The biomass was also measured after the five-day flooding. The results showed that the chlorophyll contents and biomass of the flooded plant with oxygen fertilization were both significantly greater than those of the control (Figure 1, 2 and 3).

Fig 1. The difference in growth of flooded basil plants with or without oxygen fertilization.

Fig 2. The chlorophyll content of the basil plants without flooding was significantly greater (p< 0.05) than those with flooding but without oxygen fertilization. There was, however, no difference in chlorophyll content of plants without flooding and those with flooding but also with oxygen fertilization.
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Summary and Conclusions: Slow release oxygen fertilizers are eco-friendly and affordable. They significantly increased oxygen bioavailability in the flooded soil grown basil. Therefore, they significantly alleviated reduction of chlorophyll contents and biomass of flooded basil plants and hence reduced economic loss caused by flooding. Oxygen fertilization is promising to become a new approach to minimize the negative impact of flooding on vegetable production in Florida.

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Using Solid Oxygen Fertilizers to Alleviate Flooding Problems in Vegetable Production (continued)

Pesticide Updates

Saflufenacil: On November 4, the Florida Department of Agriculture and Consumer Services (FDACS) approved the registration of BASF’s herbicide saflufenacil (Integrity®) to control broadleaf weeds in grain and silage corn and popcorn. The EPA registration number is 7969-279. (FDACS PREC Agenda, 12/3/09).

On November 4, the FDACS approved the registration of BASF’s herbicide saflufenacil (Sharpen®) to control broadleaf weeds in grain and silage corn, popcorn, cotton, small grains, sorghum, and soybean. The EPA registration number is 7969-278. (FDACS PREC Agenda, 12/3/09).

On November 4, the FDACS approved the registration of BASF’s herbicide saflufenacil (Treevix®) to control broadleaf weeds in non-bearing and bearing citrus and nut trees. The EPA registration number is 7969-276. (FDACS PREC Agenda, 12/3/09).

Pyraclostrobin: Based on a request by BASF, the EPA has approved tolerances for the fungicide pyraclostrobin (Headline®). Tolerances of importance in Florida include sorghum grain/forage/stover. (Federal Register, 10/28/09).

Registration SLN No. FL090003 (Danitol® ULV on citrus for Asian citrus psyllid) has been amended such that petroleum oil may be added at one to two quarts per acre as an adjuvant. (FDACS email, 11/25/09).

Under an interim EPA policy, pesticide dealers may be allowed to repair minimally-damaged containers. One source estimates several million pounds of pesticide (mostly as pesticide-impregnated fertilizer in bags) may be disposed of annually rather than utilized. (EPA OPP Update, 10/14/09).

Carbofuran: The EPA is moving forward to implement the May 2009 final rule revoking tolerances, or residue limits, for the insecticide carbofuran (Furadan®). The EPA reminds growers that carbofuran should not be applied to any food crops after December 31, 2009. Use of carbofuran after this date could result in adulterated food products, which would be subject to enforcement by the U.S. Food and Drug Administration. (EPA press release, 10/30/09).

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Novaluron: The FDACS has again submitted a petition to the EPA for emergency use (Section 18) of novaluron (Rimon®) in strawberry to manage sap beetles. (FDACS letter, 11/16/09).
Attracting Beneficial Insects to Your Farm

Earlier this fall Carolyn Saft, Suwannee County Extension Agent and I were preparing to teach a workshop on “attracting beneficial insects to your farm”. I wanted to collect samples of these insects for farmers to see and learn to identify. What happened next made a major impact on me! I searched several areas here on our farm at the North Florida Research and Education Center – Suwannee Valley. Most areas on the farm are kept clean and mowed and provided little hope for finding many beneficial insects. However, I found two small areas that were “gold mines” for discovering several species of “good bugs”. The first site was a planting of both native and introduced landscape plants and flowers. The native flowering plants like butterfly weed, frost weed, Rudbeckia, salvia (tropical sage), and swamp sunflower all had lots of good bugs. In addition, a popular non-native, crepe myrtle, was also loaded with good bugs. The second good collection site was a fall watermelon planting used for insect research purposes. One of the research trial requirements was “no insecticide sprays” to allow the silverleaf whitefly to build natural populations so Dr. Susan Webb, UF/IFAS Entomology Specialist could observe their feeding patterns. Well, as you can imagine, the whitefly populations did very well. But also, other beneficials such as lacewing, lady beetles, and big eyed bugs were very easy to find.

So the impact on me was the realization that we could do a lot more to attract beneficial insects to our farm. Here are a few key points to consider when trying to attract beneficials (from “Habitats for Beneficial Insects”, Cornell University, http://www.nysaes.cornell.edu/pp/resourceguide/appendix/appendix_b.php and “Natural Enemies and Biological Control”, UF/IFAS, http://edis.ifas.ufl.edu/in120).

Any organism that feeds on another organism is a natural enemy. Insects that are natural enemies of pests are called beneficial insects. Other arthropods such as spiders and certain mites also are beneficial. There are two main types of beneficial arthropods, predators and parasitoids. Predators, such as ladybugs and spiders, will attack several different kinds of insects, and will consume several types of prey throughout their life cycle. Parasitoids are wasps or flies that lay their eggs on or inside other arthropods; they are also called parasites. The egg hatches and the immature parasitoid feeds on the victim, called a host, eventually killing it. Each developing parasitoid kills only one host in the course of its life cycle, but parasitoids are more specific in the insects they attack than are predators.

Plant diversity in an agricultural setting generally adds stability to a system and helps encourage the presence of beneficial insects. There are different options for providing plant diversity depending on whether the main crops are annuals or perennials. Generally, crop diversity can be achieved over a period of time or in a area of a field using crop mixtures, crop rotations, border crops or windbreaks, or plants known to be attractive to beneficial insects. Landscape diversity will generally favor populations of beneficial insects while lack of diversity will generally increase insect pest outbreaks. Adding plant complexity to a system can be achieved by providing sites which beneficial insects may use to obtain nectar or pollen, survive on alternative insect pest species, find habitats in which to increase their numbers and/or as sites in which to overwinter.

Flowering plants may provide nectar that can increase the life span of a beneficial species and number of eggs it can produce. Such flowering plants can be used as part of the farm’s saleable crops as well as provide needed landscape diversification. In choosing which plants to use to add diversity, a good rule of thumb would be to avoid plants in the same family as the cash crop being grown since they may also serve as hosts for insects and diseases. Weeds may also play a significant role in adding plant diversity. Flowering weeds in the families Compositae (daisy), Labiatae (mint), and Umbelliferae (dill, Queen Anne’s Lace) are often cited in the literature as being able to support stable populations of natural enemies. Multiple blooming sunflower varieties are also excellent for attracting beneficial insects.

We are in the process of developing a plan here at the North Florida Research and Education Center – Suwannee Valley farm to incorporate some of these practices to encourage more beneficial insects in the future and use the farm to teach others these valuable IPM principles.

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“Colorado Potato Beetle, *Leptinotarsa decemlineata* (Say) and False Potato Beetle, *Leptinotarsa juncta* (Germar) (Insecta: Coleoptera: Chrysomelidae)”. This factsheet describes these two species of potato beetles that are found in the eastern states — distribution, description, life cycle, hosts, Key to the Leptinotarsa spp. of Florida and management. [http://edis.ifas.ufl.edu/IN303](http://edis.ifas.ufl.edu/IN303)

“The Fig”. This factsheet provides the history of fig cultivation, adaptation, description of the fig tree, its culture and management, pests, and fig cultivars. [http://edis.ifas.ufl.edu/mg214](http://edis.ifas.ufl.edu/mg214)

“Seed Production and Seed Sources of Organic Vegetables”. This report is a guide to organic seed production in Florida. Includes references and a list of organic, open-pollinated, and heirloom seed suppliers. [http://edis.ifas.ufl.edu/HS227](http://edis.ifas.ufl.edu/HS227)

“Storage Limitation Statements: Temperature - Herbicides”. This guide provides general temperature effects on storage properties of agricultural herbicides. A table is included that lists many of the common agricultural herbicides registered for use in Florida, with storage limitations statements. [http://edis.ifas.ufl.edu/P1160](http://edis.ifas.ufl.edu/P1160)

“Pesticides and Cholinesterase”. This factsheet describes cholinesterase, as well as how several pesticides in different pesticide families can affect cholinesterase levels in humans, and the importance of timely monitoring of cholinesterase levels for any who handle organophosphate or carbamate pesticides, which inhibit cholinesterase. [http://edis.ifas.ufl.edu/P1221](http://edis.ifas.ufl.edu/P1221)

“Pesticide Reregistration and Special Reviews”. This factsheet describes the regulations in place to ensure that pesticides are reviewed for health and safety to ensure that they meet current scientific and regulatory standards. [http://edis.ifas.ufl.edu/P1218](http://edis.ifas.ufl.edu/P1218)