

PLANT & PEST ADVISORY

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Integration of Ornamental Aquatic Plant Production in Cranberry Farming

Gef Flimlin, Ocean County Marine Extension Agent

Introduction

The cranberry industry in New Jersey and the country has had a challenge over the past 5 years because of decreased returns on their crop. During the same time, there has been a precipitous increase in the number of backyard water gardens which incorporate a pond with fish and landscaping. The market for the aquatic plants has grown steadily but there has been no production of these plants in New Jersey. Almost all of the plants have been brought in from other states and many of those orders were shorted. This indicates the market far surpasses supply.

At the same time, it was noticed by the marine extension agent that several of the aquatic plants that were being sold at garden centers were growing wild in the cranberry farm irrigation ditches and ponds that he drove by through the Pine Barrens. The idea grew that there might be a way to have the cranberry farmers grow the plants to supplement their income from the berries and create a new industry in New Jersey.

Activities

After an initial change in the proposed farmer/partner, a very industrious cranberry grower from Vincentown, Tom Budd decided to participate in the aquatic plant project. He has already been working with the faculty from the Blueberry/Cranberry Research Station so he is somewhat indoctrinated into the Rutgers process and the concept of applied research. The consultant on the project is the retired President of Aquatic Gardens and Koi Company, Don Schnoor, Sr. I worked with him in the past trying to integrate fish culture into the Rutgers Hydroponic Tomato Facility in Columbus. Eventually that has come to fruition also from our original suggestion.

Tom Budd already had a large hoop greenhouse (30 x 100) with raised racks for growing seedlings. The first steps were to purchase clear plastic to cover the hoops, and install plywood and lumber to create raceways on the racks. These were covered with Firestone Pondguard liners to create raceways. Two tanks sunk into the ground at the end of the two 100' raceways store submersible pumps that send water to the

See Aquatic Plants on page 2

other end and recirculate it past the plants. A third and fourth raceway were eventually constructed and another small holding tank has been made from lumber and plastic liner outside the greenhouse to hold plants needing deeper water. A fifth raceway was put together in an adjacent greenhouse.

Initially, we ordered 125 plants of 9 varieties which were delivered in late May and placed in the raceways. All were subsequently split and grew well. Some of that batch was sold in August 2002. The rest continued to be split and grown for propagation stock. Several other orders were placed and delivered by the end of 2002. In total over 60 varieties of plants were grown.

Overwintering of the plants was not as successful as had been hoped, yet 48 varieties still remain. We had been lulled into a false sense of what winter was supposed to be in New Jersey because of the last several, and the very cold weather froze the water in some of the raceways. This eventually killed some of the less hardy plants which had been cut from their roots for propagation. The plants still in pots seemed to do better. This confirmed a decision to focus more on winter hardy plants instead of some of the tropicals.

The original idea was to use only Pinelands native plants but that did not work. Plants were grown in the greenhouse, divided to increase numbers and then these would be used as propagation stock. This gave the grower the experience of the process. We will hopefully re-examine the plant list and move toward more native plants that can be moved out into the bogs for more growout. There is presently a consideration of adding some culture of ornamental snails as an add-on to the project, but at another site. In the spring of 2003, a one-acre bog near the road will be divided by the farmer to put out water lily plants. These will be done in different colors and used to propagate the water lilies for sale and as a holding site before shipment.

On March 29, Aquaculture XI was held at the Rutgers EcoComplex in Columbus. The program was called "Hydroponics, Aquaponics, and Ornamental Aquatic Plants." There were about 30 people in attendance and an array of excellent speakers addressed these issues very well. The program included both a classroom session about the basics as well as a trip to the new Aquaponics system that has been built at the Rutgers Hydroponic Tomato Greenhouse at the EcoComplex and Tom Budd's farm where the aquatic plants are growing. A cranberry grower from Massachusetts who is presently trying to grow fish at a cranberry farm attended with the Aquaculture Extension Specialist that he is working with to evaluate the process for inclusion into his operation. The reviews from the course evaluation by the Rutgers

Office of Continuing Professional Education were quite complementary. By the end of the day we had about 4 or 5 groups of people who were excited about continuing on with growing ornamental aquatic plants. One high school student was also interested in growing snails and tadpoles for sale.

The retired businessman Don Schnoor has set up a website on E-bay to sell the plants both retail and wholesale. He has devised a method of shipping which cuts costs and can deliver healthy plants within 3 days at a low price. The group is still looking for other farmers to participate as grower/suppliers, but the response from the workshop is very encouraging. A special twilight meeting for the prospective growers was done in late May to advise them of the tools that they will need to move forward, assess their commitment to growing and survey them to order seedlings from Florida for them to grow. These plants will be specifically ordered to supply the market that will be coming through the web based Frog Hollow Aquatics that Mr. Schnoor has set up. There are presently 4 committed to participating in this cooperative style of growing with two more waiting to make a final decision. Any farmers interested in growing ornamental aquatic plants should contact Gef Flimlin at Rutgers Cooperative Extension of Ocean County at Flimlin@aesop.rutgers.edu or 732-349-1152.

The plants that were bought and propagated were:

Arrowhead	Candy Stripe Reed
Double Flowering Arrowhead	Variegated Giant Reed
Variegated Yellow Iris	Variegated Dwarf Sweetflag
Blue Iris	Blue Bell
Red Iris	Bog Lily
Golden Sweetflag	Spider Lily
Thalia Dealbata	Variegated Spider lily
Dwarf Papyrus	Zephyr Lily
Umbrella Palm	Green Taro
Variegated Water Celery	Variegated Taro
Flowering Rush	Violet Stemmed Taro
Corkscrew Rush	Black Magic Taro
Horsetail Rush	Variegated Cattail
White Pickerel Rush	Dwarf Cattail
Blue Pickeral Rush	Lizard's Tail
Yellow Dixie Deb	Crushed Ice Sagittaria
Violet Katherine Cornay	Orange Canna
Purple King Creole	Yellow Snowflake
Cardinal Flower	Dwarf Palm Umbrella
RV Professor Claude	Water Poppy
Golden Club	

There is Something Fishy about that Cranberry Bog!

Dale Leavitt, Roger Williams University, Bristol, RI; Brad Morse, Double M Cranberry Company, Inc. Rochester, MA; Scott Soares, Massachusetts Department of Food & Agriculture, Boston, MA; Ken Bergstrom, Western Massachusetts Center for Sustainable Aquaculture, Amherst, MA; and Keith Wilda, Western Massachusetts Center for Sustainable Aquaculture, Amherst, MA

During the recent troubled times for the cranberry industry, there have been numerous attempts to find alternative crops that are capable of being cultivated within the footprint of a cranberry farm. Many of the alternative crops suggested are oriented toward utilizing upland acreage apart from the actual bogs. Few crops permit the use of the actual wet bog area as this represents a very unique growing area where few commercially viable crops are capable of growing. One alternative crop that may provide an opportunity for utilizing the bog area is a modification of relatively new technology for growing freshwater fish.

An engineer at Clemson University was experimenting with using single cell aquatic plants, called phytoplankton, to consume soluble nitrogen coming from wastewater treatment plants. Dr. David Brune was designing systems to enhance the removal of soluble nitrogen products from nutrient-enriched water using phytoplankton when it was suggested that the technology might be applied to removing nitrogen waste products generated by intensive fish farming. Compounds such as ammonia and nitrite, a derivative of the microbial processing of ammonia, result from the metabolism of fish and can be toxic if allowed to build to high levels within the fish culture system. Dr. Brune designed the Partitioned Aquaculture System (PAS) to intensively farm fish in a phytoplankton-enriched culture system.

The partitioned aquaculture system is a fish growing system that is comprised of two distinct components, hence the term partitioned. The first component is a shallow water open pond system, 18–24 inches deep, that permits light penetration through the entire water column and ensures that the photosynthetic phytoplankton have enough sunlight to allow the cells to grow and reproduce. As the plant cells proliferate, they consume soluble organic nitrogen, i.e. fertilizer, in the form of ammonia and nitrate, the end-product of

the microbial processing of ammonia. By maintaining a rapidly growing pond of phytoplankton, the water quality needed for fish to grow can be sustained within the pond system even when loaded with high densities of fish.

The second component of the PAS is the deeper (4 feet) fish rearing area. This area is constructed as a series of flow-through raceways separate from the shallow pond area. The fish are held in the raceways where they can be fed, monitored and maintained with ease due to their being confined within the pen area. In general, the fish growing area is approximately 5% of the total pond area.

Water is circulated between the two partitions of the system using a large paddlewheel. Because the water is maintained at one level and there is no need to lift water with energy consuming pumps, the use of a paddlewheel to push/pull the water through the culture system results in a very high flow system with a minimum input of energy. We are currently moving approximately 6,000 gallons per minute through our system with a one-half horsepower hydraulic motor.

The demonstration Bog/PAS Fish Farm constructed at Double M Cranberry Company (Rochester, MA) is located on a 1.4 acre bog with a 20x60 foot fish growing area constructed in the upland adjacent to the bog. The bog area was flooded to approximately 18 inches and a barrier was installed through the center of the bog to promote water circulating throughout the full bog. The fish growing area was split into twelve fish pens to allow for growing various size-classes or species of fish while permitting the farmer to keep them separate.

We currently are evaluating largemouth bass, yellow perch and brown bullheads (horned pout) in the system with the thought of marketing fish for both food and pond stocking. The growth of the fish during a short trial run last summer (2002) was promising and a full-scale assessment of the system is underway during the 2003 growing season, including a complete evaluation of the

See Fish on page 6



Insect Update

Sridhar Polavarapu, Ph.D., Specialist in Entomology

✓ **Spotted fireworm:** Adult flight started about a week ago. The trap captures are expected to peak in the next 5-7 days in most locations. This moth lays most of the eggs in large masses of 100-300 eggs per mass on several weed species most notably **leather leaf, red maple, red root, loosestrife, briars, and grasses**. Removal of these weeds may discourage egg laying by spotted fireworm in the bog and thereby reduce the larval populations.

The majority of these eggs are expected to hatch 7-10 days before the traditional date of removal of honeybees from cranberry bogs (typically around July 5). Therefore, in some locations the timing of organophosphate sprays applied post-bloom may be too late for managing this insect. This is more so in years (such as this year) where spotted fireworm is the major pest target for post-bloom insecticide applications. Confirm 2F applied towards the end of June should provide good control of spotted fireworm and other caterpillar populations.

✓ **Sparganothis fruitworm:** Sparganothis larval populations in many bogs are not as high as in previous years. This year Sparganothis may not be the most important target for your post-pollination insecticide applications. Adult emergence is a bit later this year than usual. Pheromone trap catches are not expected to peak until the end of June. Confirm 2F applied for spotted fireworm management will also control newly hatched larvae of Sparganothis fruitworm.

✓ **Cranberry rootworm:** If you have experienced Cranberry rootworm problems in previous years, help is on the way (see below). Adult emergence is expected in the following 4-7 days. Adults can cause damage to both leaves and berries. I do not recommend the use of an organophosphate or carbamate insecticide during bloom for adult suppression because this application will significantly affect honey bee activity and pollination. I will have additional information in the next issue of the newsletter regarding managing the grub stage of this pest.

✓ **EPA approves tolerance for imidacloprid on cranberry:** I just received information from Bayer that EPA approved Section 3 label for imidacloprid (Admire 2F) for use on cranberries. We are yet to receive the State DEP approval. This insecticide will be useful in managing **scarab grubs, rootworms, and leafhoppers**. I will have additional information in the next issue of the newsletter. □

Worker Protection Standard Inspections

Raymond J. Samulis, Burlington County Agricultural Agent

Some growers have expressed concern over the seemingly abundant messages to expect DEP inspectors this year for both the Worker Protection Standards as well as irrigation issues. The Worker Protection Standards have been in place for many years; however, a little bit of review never hurts anyone. Growers have asked me what an average inspection for Worker Protection Standard might entail. If you will remember back a few years, one of the first parts of the Worker Protection Standard program was to establish a central location for information to be posted and available for the workers' review. In fact, a few years ago, our office was one of the first to produce a complete Worker Protection Standard package that could be used on the farm. Since that time, commercial companies like Gemplers now have complete posting packages, and also separate individual parts for the bulletin board. Some items that must be included on the bulletin board are the Worker Protection Standard poster, application records, and location of emergency facilities. Another part of the program entails the actual training of the workers, which can occur as a group function, and must include giving each worker a training booklet.

Another important part of the Worker Protection Standard program is the availability of a decontamination site that should include water, soap, towels, etc. Also, inspectors will most likely check for a plan to deal with the transportation of and assistance to workers in case of an emergency. It is a common technique for the inspectors to verify the truth of what the farmer said by asking the workers various questions about items available to them around the farm. Be sure to verify that the workers know where the bulletin board is, and that they are aware of the training materials that they should have. A total lack of knowledge by the workers of any of these will assure even closer scrutiny on other items. While the abovementioned items are common to all types of farms, be aware that there are additional requirements for each specific type of operation. For example, nurseries and greenhouses have more specific requirements regarding reentry intervals and posting requirements where needed. Fortunately, our Rutgers web site has a new section on farm safety, which contains the complete checklist for Worker Protection Standard inspections. You can view it at <http://www.rce.rutgers.edu/farmsafety/>. This web site contains information on Worker Protection Standards as well as many other farm safety topics. Be sure to listen to the sound effects at the beginning!

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Pesticide Safety Around the Farm

Bill Coli, UMass Extension Farm Safety Coordinator

Reprinted from *Healthy Fruit-UMASS Fruit News Letter*, Vol. 11(9) June 3, 2003: <http://www.umass.edu/fruitadvisor/>.

Those of us who use pesticides certainly make every effort to do so in accordance with label conditions regarding rates, personal protective equipment (PPE), re-entry intervals (REIs), pre-harvest intervals (PHIs) and the like, and take pains to be sure that farm workers and family members are not exposed to pesticides. With the passage in 1996 of the Food Quality Protection Act (FQPA), additional attention has been paid by the EPA to concerns about worker exposure and potential dietary effects of pesticides on children.

However, studies conducted at the Pacific Northwest Agricultural Safety and Health Center (PNASHC) have indicated that children may be exposed to pesticides in other ways (See "Pesticides and Farming: Are Children in Harm's Way?" NIOSH Ag. Research Centers Update, Spring 2003, Vol. 1, No. 2). The PNASHC found "elevated" levels of agri-chemicals in household dust in homes of agricultural workers compared to the general public. A recent report on the studies went on to add that "children of pesticide applicators also had higher levels of pesticide metabolites" in their urine than children whose parents did not work in agriculture.

Another PNASHC study of 44 pre-school children of non-agricultural workers who live in close proximity to sprayed agricultural areas found that levels of pesticide metabolites in their urine increased during the spraying season and returned to normal after the end of the season. Of course the situation in Massachusetts is likely very different from Washington State in terms of the size of agricultural areas being treated with pesticides. Nonetheless, as noted by the PNASHC study authors, it would still seem prudent to consider ways "to strike a proper balance between the risks and benefits of agricultural pesticide use", and minimize potential exposure of our families and our neighbors.

Applicators cannot completely avoid exposure to the chemicals that they apply. Exposure occurs during any of the many activities involved in the spraying operation, including transporting the pesticide, tank filling and mixing, container rinsing, sprayer maintenance, pesticide storage and early re-entry to treated areas.

Exposure can involve contact with pesticide vapors and aerosols, the concentrated pesticide formulation in a liquid, granular, or powder form, and the spray mixture itself. Workers absorb chemicals into the body through the skin, eyes, respiratory (breathing) or digestive system

(swallowing). Studies have shown that good personal hygiene practices reduce the risk of long term health effects.

General Recommendations

- Read and understand the product label and material safety data sheet before application.
- Bathe or shower after completion of pesticide application, including shampooing hair thoroughly and cleaning under nails.
- Put on clean clothing.
- Clothing worn during application must be washed daily after each use.
- Launder all clothing used for spraying separately from the family's regular clothes.
- Personal protection equipment should be cleaned daily after use.
- Discard any clothing that is heavily soiled with pesticide concentrate.

Preparation for Laundering

- Remove pesticide granules from cuffs and pockets outdoors (in the field).
- Discard (according to label instructions) any garment saturated with a full-strength chemical.
- Handle soiled clothing with chemical resistant gloves.
- Use disposable plastic garbage bags for temporary storage of pesticide-soiled clothes before washing.
- Pre-treat pesticide-soiled clothes with a laundry stain removal product intended for oily stains when an oil-base (emulsifiable) formulation has been used.
- Pre-treat heavily soiled areas.
- Read the pesticide label for information.
- Pre-rinse pesticide-soiled clothing: on pre-soak cycle of automatic washer or presoaking in a suitable container (dump water on field) or spray/ hose the garment outdoors (away from children and pets).

Laundering

- Isolate pesticide-contaminated work clothes and wash them separately from the regular family laundry to avoid contamination.
- Do not overcrowd clothes in the washing machine.
- Use hot water (140°F) setting.
- Use full water level.
- Use normal wash cycle (about 12 minutes).
- Use more detergent than recommended by product label.
- Use fabric starch. Pesticide residues cling to the starch and are removed in the subsequent wash cycle when the starch is washed away.
- Choose a heavy-duty detergent (liquid or powder).
- Re-wash clothing two or three times.
- Line dry clothing to avoid contamination of the dryer and to allow sunlight to break down pesticide residues.

See *Pesticide Safety* on page 6

fish for human consumption. Results of the full-scale production run will be available during the winter of 2003-4.

In our attempts to find an acceptable replacement for the cranberry, we have identified a series of criteria that must be met in order to warrant further investigation of the crop. These include:

- The integrity of the bog must be maintained to permit a return to cranberry farming when the profitability of the cranberry crop is restored,
- The skills of the cranberry farmer must be sustained through activities that take advantage of their unique capabilities,
- The land must be maintained in a farming mode, preferentially where the bog wetlands are maintained as an agricultural unit,
- The system must prove to be economically viable and provide a reasonable income to the farmer.

Given these criteria, we are very enthused about the potential for application of a modified partitioned aquaculture system within a cranberry bog to farm fish. We are continuing our studies to prove the economic and environmental viability of growing fish within a cranberry bog system.

Submitted by Gef Flimlin, Ocean County Marine Extension Agent. □

- Run the empty washer through a full/wash rinse cycle afterward.

Instructions for Cleaning Protective Equipment

- Wear rubber gloves while cleaning equipment.
- Wash hard hat or waterproof hat, goggles, face shield, apron, boots with hot soapy water, rinse and dry.
- Wash the respirator face-piece only. Before cleaning, remove the cartridges.
- Wash the respirator in warm soapy water, rinse and air-dry.
- Check seals and valves for signs of damage or wear.
- Store the respirator and cartridges in a sealed plastic bag.
- Last wash your gloves with hot soapy water, rinse and dry.
- Inspect and replace any worn or damaged protective equipment.

Adapted from the Institute of Rural and Environmental Health, University of Saskatchewan by Craig Hollingsworth.

Submitted by Win Cowgill, Hunterdon County Agricultural Agent. □

Many of the county agricultural agents meet with various officials of the Bureau of Water Allocation of the DEP as well as with enforcement personnel. Due to continued water shortages and competition for water supplies, expect increased enforcement activities this summer. Enforcement inspections have already begun in Northern and Central New Jersey. Remember to keep your water use logbooks current. Our office still has a supply of these pocket books we designed for keeping records of your water use. We were told that in the not too distant future, the DEP would be looking for comments regarding updating their regulations for agricultural water use. As agents, we are on top of this issue; however, it will also be imperative for growers to give input on how some of these proposed changes may effect their operation. We are currently having philosophical arguments with them as to whether the water allocation permits should reflect actual water used or water needed under extreme drought conditions where no rainfall occurs. All of the allocations were designed to reflect the latter in order to provide farmers with the necessary water. It will be in our best interest to continue protection of the water allocations as they are currently designed.

With increased competition for water in our state, this issue is not going away. Agriculture needs to be on the forefront of this issue and if farming is to be preserved in the "Garden State" farmers need adequate amounts of water to remain in business. Additionally, this state needs farmland and open space to benefit water resources and the environment. □

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