

# PLANT & PEST ADVISORY

CRANBERRY EDITION \$1.50

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## Cranberry Utilization Guidelines for NJ's Crop Year 2000

October 4, 2000

The New Jersey Department of Environmental Protection (NJDEP) has issued a Certificate of Authority to Operate (CAO) to New Jersey cranberry growers to use the excess cranberries from the 2000 harvest as an organic soil conditioner/fertilizer **off-site** for a three-month period. The cranberry growers who generate the berries are directly responsible for ensuring that the cranberries are properly managed.

NJDEP will **not** require growers to conform to guidelines for **on-site** utilization. Growers who wish to manage their own excess cranberries on their own farm should follow appropriate management practices available from Rutgers University. If a grower accepts berries from another grower and wants to manage the material on his/her farm it may necessitate securing a permit from NJDEP.

Following is a copy of the *Cranberry Utilization Guidelines for New Jersey's Crop Year 2000, October 4, 2000* for New Jersey cranberry growers who will transport his/her excess cranberries for **off-site** utilization.

Further details on the NJDEP CAO will be mailed to growers. Some issues of note are:

1. When transporting the cranberries off-site, appropriate measures must be taken to ensure that there is no spillage
2. A letter must be sent to the Bureau of Resource Recovery and Technical Programs and the County Environmental Coordinators, depending on which county the cranberries were grown, stating the dates and volume of material received by the **off-site** location
3. **Off-site** users of the material **MUST** follow the *Cranberry Utilization Guidelines*
4. NJDEP reserves the right to revise or terminate the CAO if they get any complaints of odors or any impact on the environment

For further assistance, contact Karen Kritz (New Jersey Department of Agriculture) by telephone at (609) 984-2506 or e-mail [agukrit@a.state.nj.us](mailto:agukrit@a.state.nj.us).

### LAND SPREADING OFF-SITE

These criteria have been developed in consultation with Rutgers University and the New Jersey Department of Agriculture in order to assist New Jersey cranberry growers in the off-site utilization/land application of cranberries for soil amendment purposes. Through land

*See Guidelines on page 2*

application, cranberries are considered an organic soil conditioner, increasing soil organic matter and improving tilth. Cranberries contain essential plant nutrients, which can increase soil fertility. The residual product also contains vines, leaves, and stems remaining from harvest. It is estimated that if the entire NJ surplus were utilized as a mulch or soil amendment, between 65 and 200 acres of land would be needed, depending on whether the fruit is incorporated or used as a surface mulch.

**Land Reclamation Projects**

No land reclamation projects for quarries/mines shall take place until DEP issues a written authorization for a site-specific reclamation plan.

**General Considerations (Setbacks/Application Rates)**

If these criteria are followed, fruit will be applied off-site on farm fields as a soil conditioner or fertilizer in accordance with accepted agricultural practices and in a safe, nuisance free manner. Based on the low sugar and high astringency (tannin content) of cranberry fruit, fruit to be used is not expected to be attractive to vermin such as rats or mice. The following general criteria should be followed:

- Fruit should not be land applied or mulched within 250 feet from an occupied residential dwelling.
- Fruit should not be land applied/mulched within 50 feet of a property line.
- Fruit should not be land applied/mulched on fields with a slope of more than 2%.
- 1,200 barrels/acre (about 1" of fruit) is the maximum land application rate and the fruit shall be incorporated within 72 hours.
- When used as mulch on blueberry fields, the application rate shall be limited to 400 barrels/acre.
- Fruit shall not be land applied on frozen ground.

**Nutrient Content of Cranberries**

Cranberries contain essential plant nutrients that can be recovered by other crops. Cranberries contain the following plant nutrients and fertilizer values. Fertilizer values are based on July 2000 prices and are meant only as a rough estimate.

| Nutrient       | Lbs./1,200 bbls/acre | Per Acre Value   |
|----------------|----------------------|------------------|
| N              | 75 – 90              | \$38 – 45        |
| P              | 7 – 9                | \$9 – 12         |
| K              | 100 – 200            | \$27 – 32        |
| <b>Total/A</b> |                      | <b>\$74 – 89</b> |

Source: University of Wisconsin Extension

**PH Considerations**

The effect of land application of cranberries on soil pH may be a consideration. Land application of cranberry fruit to blueberry fields may prove beneficial in soils that are above optimum pH (blueberries prefer acidic soil conditions). Many blueberry growers cur-

rently utilize cranberry leaves as mulch around their plants. For land application on other crops, concern for low soil pH can be addressed by soil pH test taken 4-8 weeks after land application. These tests will indicate the amount of lime, if any, that needs to be added.

**Stockpiling Before Application**

1. Fruit should not be stockpiled for greater than 30 days;
2. Within 150 feet of the property line;
3. On lands with slopes greater than 5%;
4. Within 500 feet of an occupied residential or commercial building not located on the site; and
5. Growers should locate the staging areas in a manner that prevents accumulation of surface water on site without resulting in a discharge of leachate to drainage ditches, permanent or intermittent water bodies or offsite and does not cause an adverse impact to natural drainage conditions or surrounding properties.

**ANIMAL/WILDLIFE FEED**

Timing for making silage compared to cranberry harvest may be compatible. Cranberries can be an acceptable component of livestock rations. Research from the 1970's showed dairy cattle fed well on cranberry corn mixtures of up to 30% cranberry. Fruit could be mixed when silos are filled or bunker silos could be capped with a layer of cranberries. The acidity of the fruit should aid in the fermentation process.

For feeding of wildlife such as deer, piles of cranberries shall be no greater than 5 cubic yards per acre with a single pile being no more than 1 cubic yard. Individual piles shall be evenly distributed throughout the acreage. Wildlife feeding shall be initiated in accordance with the written approval and written guidance established for such practice by the DEP's Division of Fish, Game and Wildlife. If the area is to be hunted over, baiting laws shall apply.

**PRACTICES TO AVOID**

- Discharging of fruit "down stream" with harvest flood.
- Depositing of fruit within natural wetlands.
- Dumping into piles on farm (except what is allowable under guidelines)
- Depositing of fruit into surface waters.
- Stockpiling fruit within sight of a public road. □

# Residual Cranberry Fruit as a Soil Amendment

Saratha Kumudini, Ph.D., Plant Physiology

The addition of organic matter to the soil by incorporating plant residue has been used as a common means of enhancing mineral soils. Organic matter can improve the water holding capacity and the cation exchange capacity of soils as well as improve soil tilth. Soybean and corn growers near Bordentown have spread pressed cranberry fruit + rice hull supplements on their acreage with success. The New Jersey Department of Agriculture cited the growers as reporting improved soil tilth and increased yields (N applications may need to be amended).

Plant organic matter is also a source of mineral nutrients. It is important to note that the use of plant or other organic residues as a nutrient amendment differs from mineral fertilizer use. Mineral fertilizers provide nutrients in forms which are readily available for plant uptake without the added benefits of improved water holding capacity or increased cation exchange capacity of the soil. Furthermore, mineral fertilizers are generally prepared to deliver nutrients at a rapid rate, even when plant demand may be low.

Nutrients in organic matter are converted by a soil-mediated process before they become available for plant use. It is through the decomposition of organic material that the nutrients in the organic matter are released to the soil. Soil-borne organisms convert the organic material into mineral form as part of their life cycle. Therefore, the chemical and physical conditions that impact the soil organisms also impact the rate at which the residue material releases its nutrient content. Soil organisms that “mineralize” organic material are stimulated by warm and moist conditions, which also stimulate plant growth. In this manner, plant residue can effectively work as a slow-release fertilizer and provide more nutrients during warm, moist conditions (e.g. growing season) and less during cool, dry conditions (e.g. fall/winter). Organic growers generally use the incorporation of organic material as a means of adding nutrients to their soils.

## Soil-Mediated Organic Matter Decomposition

Plant organic residues are degraded by some types of invertebrates such as millipedes, sow bugs, snails and

slugs, as well as by soil microorganisms. The invertebrates shred the plant materials, creating more surface area for action by soil microorganisms such as fungi, bacteria, and actinomycetes. The soil microorganisms do most of the work of breaking down organic matter to produce carbon dioxide, water, heat, and humus (relatively stable organic end product). The grower, by incorporating the fruit or mechanical break up of the fruit material will therefore aid the soil microorganisms to do their job more effectively.

Of the many elements required for microbial decomposition, carbon and nitrogen are the most important. Carbon provides both an energy source and the basic building block that makes up about 50 percent of the mass of microbial cells. Nitrogen is a crucial component of the proteins, nucleic acids, amino acids, enzymes and co-enzymes necessary for cell growth and function.

The ideal C/N ratio for rapid decomposition is 30:1, or 30 parts carbon for each part nitrogen by weight. The optimum ratio is 30:1 because at lower ratios, nitrogen will be supplied in excess and will be lost quickly to leaching or as ammonia gas. Higher ratios mean that there is not sufficient nitrogen for optimal growth of the microbial populations, so organic material degradation will proceed at a slow rate and may lead to sequestering of nitrogen, lowering nitrogen availability. Calculations of the C/N ratio of cranberry fruit suggest the value can be as high as 80:1. Organic material of high C/N ratio like cranberry fruit are generally recommended for fall application (Plante and Voroney, 1998). The high C/N ratio will result in lower availability of nitrogen and other minerals both from the organic matter as well as the soil during the fall. It is expected that death and decay of the microbes will occur the following spring, releasing the nutrients in time for the spring growing season when nutrient demand is higher (Voroney, personal communication).

## Particle Size

Microbial activity generally occurs on the surface of the organic particles. Therefore, decreasing particle size, which increases surface area, will encourage microbial activity and increase the rate of decomposition. The process of incorporating organic material into the soil would increase the surface area of material in contact with the soil.

*See Amendment on page 4*

**Table 1: Nutrient composition of cranberry fruit**

| Components      | Application at 1 Ton/acre<br>(20 barrels/acre)<br>lbs/acre | Application at 20 Ton/acre<br>(400 barrels/acre)<br>lbs/acre | Application at 60 Tons/acre<br>(1,200 barrels/acre)<br>lbs/acre |
|-----------------|--|--|---|
| Nitrogen (N)    | 1.50   | 30   | 90  |
| Phosphorous (P) | 0.14   | 2.8  | 8.4   |
| Potassium (K)   | 2.00   | 40   | 120   |

## Aeration

Oxygen is essential for the metabolism and respiration of aerobic microorganisms, and for oxidizing the various organic molecules present in the organic material. The tillage operation to incorporate the material will help aerate the soil for increased microbial activity. Low aeration may lead to anaerobic decay of organic residues (fermentation of organic residues is what is generally thought to cause odor problems in composts).

## Moisture

A moisture content of 50-60% is generally considered optimum for decomposition. Microbial induced decomposition occurs most rapidly in the thin liquid films found on the surfaces of the organic particles. Moisture limitation (<30%) inhibits bacterial activity, whereas excess moisture (>65%) results in slow decomposition, odor production in anaerobic pockets, and nutrient leaching. The moisture content of cranberry is high (85-88%). Mechanical means of breaking the outer fruit coat would accelerate the drying process and incorporation processes should attempt to mix the fruit with the drier soil to generate a soil layer which approaches the desired moisture content. It is recommended that the spreading of organic material be attempted on a dry morning. The length of the day and the dry conditions will help the organic material dry quickly.

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- Richard, T.L. and N. M. Trautmann. 2000. *The science and engineering of composting*. Cornell Univ.
- Voroney, P. Associate Professor, soil microbiology, Dept. of Land Resource Science, Univ. of Guelph, Guelph, Canada □

# Soil Acidification: Possible Effect of Residual Cranberry Fruit

Joseph R. Heckman, Ph.D., Soil Fertility and Saratha Kumudini, Ph.D., Plant Physiology

Much of the soils in the Mid-Atlantic region are naturally acidic. Producers who produce non-acid loving crops may be concerned about addition of materials that could further increase the acidity of their soils. Mineral and organic acids have different abilities to acidify. The ability of different materials to acidify can be tested in the laboratory by estimating how much lime must be added to neutralize the material (Table 1).

Addition of organic matter with low pH such as cranberry fruit (2.5-2.9) has raised concerns about possible acidification of soils. A laboratory test of the equivalent acidity of the juice extracted from cranberry fruit suggests that it has a lower capacity to acidify than many mineral nutrients applied at the same rate. The ability of the cranberry fruit, as a whole, to acidify a soil will probably depend on more than the juice acidity equivalent, although the pH is largely dependent on soluble carbonaceous acids. Further, the soil's inherent ability to buffer pH changes must also be considered when evaluating the potential of a new soil amendment to change the pH. The ability of soils to resist changes in pH are mainly dependent on their cation exchange capacity. Soils high in organic matter have a greater ability to buffer against appreciable changes in pH. The addition of cranberry fruit will increase the organic matter content of the soil and possibly buffer the soil against further pH changes. In order to evaluate this, soil pH values should be taken 4-8 weeks after the application of the soil amendment. If the soil test (and depending on target pH of the crop to be grown) indicates that lime is needed, the lime should be applied at the recommended rate prior to the next growing season.

**Table 1. Equivalent acidity and percentage nitrogen values of mineral fertilizers and cranberry fruit.**

| Material                                 | Equivalent acidity<br>(lb. CaCO <sub>3</sub> per 100lbs) | N% by weight       |
|--|--|--------------------|
| Urea <sup>2</sup>                        | 84   | 46                 |
| Ammonium sulfate <sup>2</sup>            | 110  | 20.5               |
| Monammonium phosphate <sup>2</sup>       | 58   | 11                 |
| Diammonium phosphate <sup>2</sup>        | 70   | 17                 |
| Cranberry fruit (fresh wt.) <sup>3</sup> | 0.1  | 0.075 <sup>1</sup> |

<sup>1</sup>Based on 85% moisture content and 0.5% N concentration.

<sup>2</sup>Amount of calcium carbonate required to neutralize 100lb of the chemical (as reported by Pritts and Hancock, 1992).

<sup>3</sup>Amount of calcium carbonate required to neutralize the juice extracted from 100lb of fresh cranberry fruit cv. Stevens (Rutgers Cooperative Extension).

Pritts and Hancock, 1992. *Highbush Blueberry Production Guide*. Northeast Regional Agricultural Engineering Service, Ithaca, NY.

# Composting of Cranberry Fruit and Leaves

Barbara Rogers, Ph.D., Soil Ecology

When composting cranberry fruit and leaves, the moisture content, porosity and pH of the mixture need to be adjusted. The cranberry fruit are too wet (about 85% moisture content) and the pH of both the cranberry fruit and leaves are too low (2.5-4.0) for optimum composting.

The moisture content of the cranberry fruit and leaves mixture should be reduced to about 60% with a dry material like wood chips. The addition of the wood chips would reduce the moisture content of the material and increase the porosity of the mixture at the same time. For example, if wood chips with a 30% moisture content are used to reduce the moisture content of a mixture of cranberry fruit and leaves to 60%, 47,000 lbs. of wood chips would need to be added to a mixture of 60,000 lbs. of cranberry fruit (assuming 85% moisture content) and 5,000 cranberry leaves (assuming 40% moisture content). The pH of the mixture can be increased with compost or lime. If compost is used to adjust the pH, it can replace a portion of the wood chips, depending on the moisture content of the compost. The correct mixture of materials needs to be calculated for each individual case depending on the type of amendments and the proportion of cranberry fruit and leaves. For the protection of surface water and groundwater, runoff and percolation also need to be managed.

General information about how to get the correct compost mixture, operate the composting process and protect water quality can be found on the Cornell Composting Web site (<http://www.cfe.cornell.edu/compost>) and in the Natural Resource, Agriculture, and Engineering Service (NRAES) on-farm composting handbook (<http://nraes.org>). A composting video and technical manual can be borrowed from the Rutgers Blueberry/Cranberry Research and Extension Center at 609-726-1590. If you need technical assistance with composting cranberry fruits and leaves, you can contact Dr. Barbara Rogers, Research Associate in Solid Waste Management, from Rutgers Cooperative Extension at 732-932-0521. □

## Technical Assistance Available

### Permits

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### Composting

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### Also available:

“On-Farm Composting Handbook” - Easy to read manual on all aspects of composting including, site selection, machinery/equipment requirements, costs of production and marketing agricultural compost.

“Blueberry Waste Composting” - video, of use in cranberry fruit composting due to similarities in the fruit.

Contact Dr. Kumudini about the above items. □

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## Honey Bee Post Doc Position

*Reprinted from Bee Aware, September, 2000, Mid-Atlantic Apiculture Research and Extension Consortium (MAAREC)*

The final announcement for the honey bee post doc position has gone out to recruit an individual to work at the Rutgers Blueberry and Cranberry Research and Extension Center. This person will work on mite and pollination research and is funded from money secured from the New Jersey legislature. The position will be a welcome addition to the MAAREC efforts and is planned for early 2001. □

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**Varroa mite infestations have become such a serious problem that maintaining bee colonies without chemical treatment is virtually impossible.**

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**Editor's Note: This is the last issue of the Cranberry edition of the Plant & Pest Advisory for the 2000 season. Thank you for subscribing.**

## Screening Mites from Honey Bees

*Sarah Tarshis, Information Specialist, USDA Agricultural Research Service (ARS)*

*Reprinted from Bee Aware, September, 2000, Mid-Atlantic Apiculture Research and Extension Consortium (MAAREC)*

Battling the varroa mite has become a sticky job – literally. Entomologist Jeff Pettis, who is with the ARS Bee Research Laboratory in Beltsville, MD, has been looking for a way to snag mites that have been threatening honey bees for years. Through his experiments with sticky paper, a nonchemical control evolved.

The mites, which attach to and feed on bees, can become dislodged through the bee's self-grooming or from smoke and chemical treatments applied by beekeepers. Pettis used sticky paper at the bottom of bee colonies to collect the dislodged mites for experiments.

We noticed that many of the mites on the sticky paper were still alive and that they could easily reattach as the bees reentered the colony and walked across the bottom board," said Pettis. As a result, he created something called the Beltsville screen insert to help control the mite population.

The screen insert works by creating a 1- to 2-inch gap between the bottom board and the hive bottom. The insert's wire mesh allows the mites to fall through the screen and onto the hive bottom so they can't reattach to bees. Monthly samples of the fallen varroa showed that the screen insert reduced the mite populations by about 15 percent. Though not sufficient alone, the Beltsville screen insert can contribute to integrated pest management practices.

Honey bees produce \$270 million worth of honey, beeswax, and other hive products and pollinate nearly \$10 billion worth of crops annually. Their conservation is of national and international importance. Improved varroa mite control will be valuable to people involved in the US beekeeping industry, including hobbyist and commercial beekeepers who rent their colonies for pollination services.

Researchers are continually developing and improving the screen, but it's already being advertised for sale.

"It's wonderful to be working with Beltsville scientists in selling a product that keeps us from having to rely totally on chemicals," says Steve Forrest of Brushy Mountain, a beekeeping supply company in Movarian Falls, NC. Forrest says the screen is selling very well and hasn't generated any returns or complaints from beekeepers.

Varroa mite infestations have become such a serious problem that maintaining bee colonies without chemical treatment is virtually impossible. Currently, the common pesticide approved for use as a parasitic mite control for honey bees is Apistan – a strip that contains the chemical tau-fluvalinate. Varroa, however, have begun to show resistance to the chemical, so scientists are looking for alternatives such as the screen.

As safe and effective chemical controls continue to be researched and developed, the screen insert will complement Apistan in assisting beekeepers with the control of invading varroa. □

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