

PLANT & PEST ADVISORY

CRANBERRY EDITION \$1.50

JUNE 5, 2003



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Insect Update

Sridhar Polavarapu, Ph.D., Specialist in Entomology

✓ **Blossomworm:** Larvae are completely nocturnal at this time. Only night sweeping will provide an accurate assessment of larval populations. Most of the larvae are in the last instar or close to the last instar stage. Because larvae in this stage can cause enormous damage to foliage and blossoms, you may have to take this into account in reaching a decision regarding the need for an insecticide intervention.

Several growers have used Confirm 2F, SpinTor 2SC, and organophosphates in the last week to manage Blossomworm populations. In spite of inclement weather and poor drying conditions, Confirm 2F and SpinTor 2SC appeared to have provided effective suppression of Blossomworm larvae. If you discover new infestations at this time, and considering that we are close to bloom, your insecticide choices are really limited to Confirm and Bts. Bts typically do not work as well against last instar larvae. You can also use SpinTor during bloom but you are required to follow certain precautions to safeguard honey bees. SpinTor is highly toxic to honeybees if bees are exposed directly to spray droplets or exposed to treated surfaces within 3 hours following treatment. If applications of SpinTor 2SC are desired during bloom, you may apply this insecticide late in the evening when most honey bees and other pollinators are not foraging.

✓ **Spotted fireworm:** Larval phenology is at least 4-7 days behind compared to the same time in the previous three years. Larvae are close to the final instar at this time. Several species of parasites now exit from these mature larvae. Organophosphates applied at this time may affect parasite activity. Larvae have also formed thick webbings and are difficult to control at this stage. Adult flight will begin in the following 5-7 days.

✓ **Sparganothis fruitworm:** Larval populations are generally lower this year compared to previous years. Most of the larval population is currently in the third and fourth instar stages. Sparganothis fruitworm has five larval instars. The bulk of the larval population will reach the pupal stage in the following 7-day period. Unless you have a major infestation, you may defer using an organophosphate application at this time. You can effectively control this insect with a post-pollination application of an organophosphate and protect fruit from this fruitworm damage. □

Phosphorus Fixation in Soil

Teryl Roper, Ph.D., University of Wisconsin-Madison Extension Horticulturist

Reprinted from *Cranberry Crop Management Newsletter, University of Wisconsin Extension, Vol. XVII, No. 2, May 20, 2003.*

Each year growers make applications of phosphorus containing fertilizers to supply plants with nutrients they require. What happens to that fertilizer once it reaches the soil surface? This article will seek to explain the process in language growers can use.

The need to add P fertilizer arises from the inability of soils to supply adequate amounts of orthophosphate (H_2PO_4^- and HPO_4^{2-}) for satisfactory crop growth. The reactions that P undergoes in soils are fundamentally different than for N or K and result in poor (25% or less) efficiency of recovery in a given year. In contrast, uptake of N or K fertilizer may be as high as 80%.

Fertilizers used by cranberry growers can contain phosphorus in one of four different formulations: Triple superphosphate, regular superphosphate, monoammonium phosphate, or diammonium phosphate. In order for a plant root to take up a phosphate ion it must be in the soil solution (liquid fraction of the soil). It cannot be bonded to any other ion.

When fertilizer containing P is applied to soil it goes through a sequence of reactions that are generalized into three components: 1) dissolution of the P fertilizer particle, 2) precipitation reactions, and 3) adsorption reactions.

Dissolution of the particle

Dry granular fertilizers must react with water to dissolve. Because the granules are concentrated salts, they attract water from the surrounding environment, including the air. As water reacts with the granules they dissolve and create a concentrated solution of the fertilizer that moves into the surrounding soil. Irrigation or rainfall hastens dissolution of the granules and movement into the soil.

Precipitation reactions

As the P dissolves from the granule it is present as a negatively charged phosphate ion (H_2PO_4^-). This negatively charged ion (anion) is very reactive with positively charged ions (cations) such as iron (Fe^{++}), Aluminum (Al^{++}), Manganese (Mn^{++}), or Magnesium (Mg^{++}). Added phosphate reacts almost immediately with cations to form relatively insoluble compounds. These compounds are not completely insoluble in water, but they are poorly soluble. Acid soils fix more P than neutral soils because as soil pH drops iron and aluminum ions become more available.

These are called precipitation reactions because as these compounds form they also aggregate and will settle out in a container of water.

As plants or other reactions remove P from the soil solution P is released from these compounds until equilibrium is reached. Unfortunately, P is not released into the soil solution nearly as quickly as plants can take P out of the soil solution.

Adsorption reactions

These relatively insoluble compounds can also react with the mineral fraction of the soil. Once the P combines with iron, aluminum, manganese, etc. and adsorbs to the soil minerals, its solubility declines further.

As a result of these reactions, P fertilizer that is applied to soils becomes plant unavailable fairly quickly—a few hours to a few days. While the total amount of P in the soil may increase over time, plant available P remains low and relatively constant.

Is all soil P available to plants?

The simple answer is no. Inorganic P in soils is found in three fractions: in solution, exchangeable, and insoluble. Only the P in solution is plant available. As this P is taken up from the soil solution it is replaced by P coming from the exchangeable pool of P (Fig 1).

The rate of release from the insoluble pool is very slow, too slow to contribute significantly to crop growth over a growing season. Thus, the P available to a crop is that which is capable of dissolution of the growing season. This is usually only a small fraction of the total P in the soil. Fertilizer P is generally more available for crop growth than soil P.

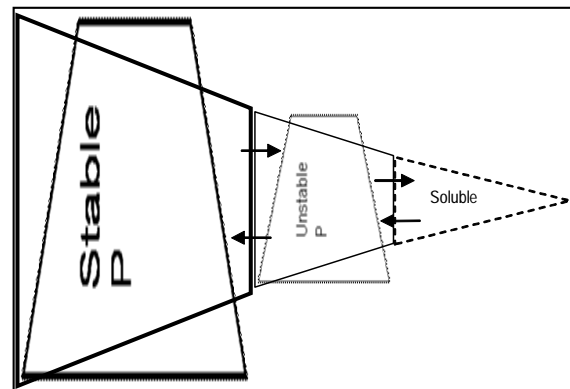


Figure 1. Relative amounts of P in the three pools available in soils. P can move from one pool to another, but moves very slowly.

One of the unique characteristics of P is its immobility in soil. P ions do not leach, as do nitrate or potassium ions, even in sandy soils. Thus P moves very slowly in soils and it is difficult to move P into the root zone without some sort of tillage. In perennial cropping situations, like cranberry, it is extremely important to add P fertilizer to the soil pre-plant.

So what does this mean for cranberry producers? Because P is tied up and made plant unavailable in the

See *P Fixation* on page 3

Phosphorus Fertilizer

Teryl Roper, Ph.D., University of Wisconsin-Madison Extension Horticulturist

Reprinted from *Cranberry Crop Management Newsletter*, University of Wisconsin Extension, Vol. XVII, No. 2, May 20, 2003.

Much has been written about the use of phosphorus fertilizers for cranberry production. Earlier this year the cranberry mineral nutrition research group met to discuss information we had about cranberry mineral nutrition and to discuss recommendations that we might make.

Based on research data on the effect of P fertilizer on yield we are recommending that cranberry growers use fertilizers with an N:P ratio of no more than 1:2.

The commonly used fertilizer 6-24-24 has an N:P ratio of 1:4, suggesting that it provides too much P in relationship to the amount of N. A fertilizer like 9-18-24, on the other hand, has a ratio of 1:2 and should provide enough P in relationship to N. A fertilizer such as 10-10-10 or 14-14-14 would also be acceptable.

Based on research results, we believe that if cranberry growers will reduce the amount of P fertilizer they use, yields will not drop IF: 1) at least 45 lbs P_2O_5 are applied per acre and 2) the number of fertilizer applications remains the same or increases.

Submitted by Sridhar Polavarapu, Ph.D., Specialist in Entomology. □

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soil relatively quickly, frequency of P application may be more important than the total amount of P applied.

Chemical soil testing is supposed to only extract the P that is the soil solution and, therefore, plant available. Existing soil tests extract too much P from cranberry soils, thus overestimating the plant available P. That is why your soil test may show that the soil has excessive P, but your vines may be low to barely sufficient. This underscores the importance of tissue testing as opposed to soil testing.

While P is critical to cranberry growth and production, it is typically also the limiting factor for algae growth in surface waters. When P leaves cranberry properties it can be a substantial environmental pollutant. Being conservative in applications of P fertilizer will save input costs and will help to protect the environment.

Submitted by Sridhar Polavarapu, Ph.D., Specialist in Entomology. □

Precision Ag with Handheld Mobile GIS/GPS for NJ Farmers

Jack Rabin, Associate Director for Farm Services, NJAES and George Horzempa, Director, Division of Rural Resources, NJDA

Announcing precision ag project

Many New Jersey farmers are interested in using precision farming technologies, including GPS (Global Positioning Satellites) and GIS (Geographic Information Systems) on their farms. However, interest is tempered by a confusing array of hardware and software and a lack of integration of various components. A lack of technical assistance further inhibits applications to the smaller fields and farms common to New Jersey and to our diversified crops and livestock.

That is changing. Rutgers Cooperative Extension (RCE), with a two-year grant from the NJ Department of Agriculture, is participating with farmers in innovative pilot demonstrations to deploy handheld mobile GIS/GPS units with software and tech support. Approximately seven farmers have been recruited from a cross-section of New Jersey commodities and regions. A partnership with NOFA-NJ and EPA Region II will enable added participation from diversified organic growers and small livestock producers. We want to make precision tools accessible to all farmers, not just large growers with large fields.

The goal of this project is to improve farm profitability and viability through precise management. At the same time, the burdens of compliance can be eased. This funded project is consistent with NJ Secretary of Agriculture Charles Kuperus' smart growth strategy for farming in the Garden State.

Why precision ag for smaller diverse NJ farms and fields?

Managing information is a critical component of farming operations. Growers collect significant amounts of data for record keeping, cost analyses and farm inputs. In addition, state and/or federal agencies require increasing information about on-farm use of land, labor, water, nutrients, pesticides, and other resources. In many cases, farm records are used to support decisions for both business and environmental management.

Geographic Information Systems (GIS), a database method used to record and map spatial information, and its related technology tool Global Positioning Satellite systems (GPS), used to locate the latitude and longitude of features on the earth, have enabled farmers throughout the country to improve both on-farm and off-farm management.

See *Precision Ag* on page 4

Small computers connected to GPS receivers can do everything from field mapping and scouting to data entry and maintenance. Information collected in the field is easily maintained and integrated in the office. These tools can be applied to integrated pest management (IPM), integrated crop management (ICM), wildlife damage, irrigation scheduling, tracking costs and returns, nutrient management, small farm and watershed management and other problems.

The use of mobile GIS (i.e. handheld computers with GIS/GPS capabilities) is the first truly affordable high technology tool that can help the typical New Jersey farmer who farms a diversified small to medium size (50-600 acres) farm on the urban fringe. The advantages of the mobile GIS systems are many and include mobility, efficiency in data entry and maintenance, and cost. The future of precision agriculture in New Jersey will be through the adaptation of high technology mobile GIS/GPS-based mapping and database management systems.

As a foundation for developing a mobile GIS, a grower will develop an accurate base map of his/her farm with Rutgers Cooperative Extension's assistance. The base map provides a digital picture of the farm, and accurate area and perimeter measurements of the delineated fields and management units. Once a base map is established, relevant data will be added to the GIS. For example:

- Location of irrigation systems: pipes, valves, risers
- Yield and nutrient data at specific locations in a field
- Fertilizer and pesticide use data
- Detailed crop and field histories for record keeping.

Growers could improve field applications of fertilizers, fungicides, and pesticides utilizing mobile GIS. For example:

- Maps can be created to guide farm machinery in the field during an application to avoid overlap.
- Growers and field scouts can utilize mobile GIS systems to create accurate maps of pest, water, and weed damage "on the fly".

Growers can also employ variable rate technology (VRT). VRT is the ability to vary the rate of agricultural inputs such as seed, chemicals, and fertilizer in response to changing local conditions through the integration of GIS/GPS and farm equipment such as seeders and sprayers. Some examples where VRT technology can be successfully implemented are:

- Mapping perennial weeds that require pre-emergence applications. By utilizing weed maps, growers can apply herbicides only to the areas requiring these materials, rather than to entire fields.
- Mapping and creating management zones. Farmers can utilize nutrient information gathered through soil samples in fields to map out zones for differing treatments in fields.

The use of mobile GIS also gives farmers the ability to access field and crop histories on demand in the field or on the road. This may enhance sales of some commodities in the future, for export, or may become a procurement requirement to be a supplying vendor to certain customers. From our experience at Rutgers, we believe that these tools are more useful on perennial crops such as tree fruit, than annual crops.

Project participation and grower outreach

Training sessions and discussion of specific needs will be conducted on farms with individual growers. Appropriate hardware and software will be suggested that best meets the needs of each farming operation.

Each grower participant will receive hardware, licensed software, configuration and long-term technical support from Rutgers Cooperative Extension. Rutgers Cooperative Extension will use its existing hardware for initial farm mapping.

Participating growers will be taking part in periodic workshops with Rutgers Cooperative Extension and the Department of Agriculture to discuss their problems, frustrations, successes, and ideas. The program will be structured to highlight the approach taken on each farm with a complete description of the progress made. In the second year of the program, the workshops will be expanded to include presentations by growers and Rutgers staff, with a target audience including non-participating growers, county agents, agriculture agency employees, as well as out-of-state participants.

Contact for further information

For examples of equipment and applications to New Jersey agriculture, RCE, NJAES and the Grant F. Walton Center for Remote Sensing and Spatial Analysis at Cook College have a web site on agricultural research projects using GIS/GPS at:

http://www.crssa.rutgers.edu/projects/gps/web_page/web_page.html

For further information on this project, contact Jack Rabin at rabin@aesop.rutgers.edu or 732-932-5000 ext. 610. □

MILLTOWN, NJ 08850
PERMIT #576
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Rutgers Cooperative Extension - NJAES
U.S. DEPARTMENT OF AGRICULTURE
Rutgers - The State University of New Jersey
Plant & Pest Advisory
18 College Farm Road
Cook College
New Brunswick, N.J. 08901-8551

PLANT & PEST ADVISORY CRANBERRY EDITION CONTRIBUTORS

Philip E. Marucci Center for Blueberry and Cranberry
Research & Extension (609-726-1590)

Bradley A. Majek, Ph.D., Weed Science

Peter Oudemans, Ph.D., Plant Pathology

Sridhar Polavarapu, Ph.D., Entomology and IPM

Nicholi Vorsa, Ph.D., Breeding, Genetics and Culture

Rutgers Cooperative Extension Agricultural Agent

Raymond J. Samulis, Burlington County (609-265-5050)

Ocean Spray Cranberries, Inc.

Dan Schiffhauer, Agricultural Specialist

Newsletter Production

Jack Rabin, Assisociate Director for Farm Services, NJAES

Cindy Rovins, Crop Management Communications Editor

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