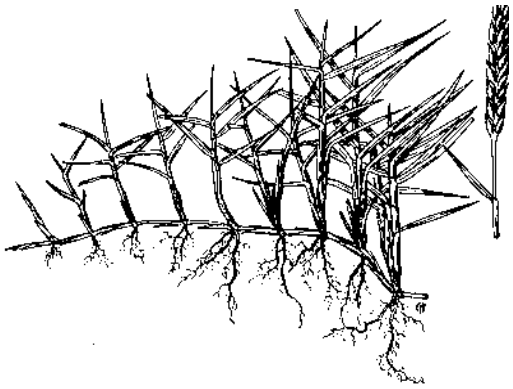
RUTGERS COOPERATIVE EXTENSION AT THE NEW JERSEY AGRICULTURAL EXPERIMENT STATION

PLANT & PEST ADVISORY

LANDSCAPE, NURSERY & TURF EDITION $1.50 AUGUST 21, 2003



INSIDE

Diseases of Turfgrass

Bruce B. Clarke, Ph.D., Specialist in Turfgrass Pathology

Bentgrass Dead Spot

We haven't seen much of this disease over the last two years, but now is the time of year when it can become troublesome on sand-based greens and tees in the Mid-Atlantic Region. The causal agent, *Ophiosphaerella agrostis*, induces small reddish-brown spots 0.5 to 1 inch in diameter. Spots usually do not coalesce and only enlarge to 4 inches in diameter. Affected areas eventually fade to a light tan color. Initially, symptoms may be confused with **dollar spot, copper spot, black cutworm** injury and golf ball injury. However, upon close inspection, black flask-shaped fruiting bodies (*pseudothecia*) can be found embedded in necrotic leaf and stem tissue. Active patches often have a half inch bronzed outer margin. Foliar mycelium is not apparent in the field.

The disease has been identified on numerous bentgrass cultivars and is most serious on high sand content greens and tees. To date, all reports have come from recently established sites (one to six years old). Outbreaks have not been observed on fairways. Environmental conditions that appear to enhance disease development include hot, dry weather. The disease also appears to be more common in sunny locations than in shaded areas. Although little is known about chemical control, benzimidazole (e.g., Cleary 3336 50W), dithiocarbamate (e.g., Fore Rainshield 80W), nitrile (e.g., Daconil Ultrex 82.5SDG), phenylpyrrole (e.g., Medallion 50WG) and phosphonate (e.g., Chipco Aliette Signature 80WG) chemical classes, as well as Spectro (a combination of chlorothalonil + thiophanate-methyl), provided the most effective control of bentgrass dead spot in tests conducted by Rutgers faculty during the last few years.

Of the sterol-inhibiting fungicides, only propiconazole (e.g., Banner) adequately controlled the disease, whereas myclobutanil (e.g., Eagle 40W) and triadimefon (e.g., Bayleton 50W) proved ineffective at the rates tested. Similarly, two experimental strobilurin fungicides (e.g., Insignia and Honor), consistently suppressed the disease, while the strobilurins trifloxystrobin (e.g., Compass 50WG) and azoxystrobin (e.g., Heritage 50WG) provided poor to fair control of bentgrass dead spot. Carboximide (e.g., Prostar 70W) and phenylamide (e.g., Subdue MAXX 2MC) fungicides and a strain of *Bacillus* subtilis (e.g., Companion I) did not control bentgrass dead spot, compared to untreated turf.

SEE DISEASES OF TURFGRASS ON PAGE 2

Emerald 70WG™, A New Fungicide for Golf Course Turf

A new fungicide called Emerald 70WG™ (active ingredient *boscalid*), received a federal label on July 21, 2003 for use on turfgrasses. Emerald is only labeled for use on golf course turf, but provides excellent control of **dollar spot** and **bentgrass dead spot**. Boscalid has a different biochemical mode of action from other dollar spot fungicides. It is in a family of fungicides called "carboximides" or "analides", which are regarded as having a moderate risk of resistance. This product can be used in rotation with fungicides in other chemical groups to reduce the risk of resistance. Only two sequential applications of Emerald are allowed before superintendents must rotate to another dollar fungicide. Emerald can be used in locations with resistance to the DMI, benzimidazole, and/or dicarboximide fungicides. For dollar spot control, Emerald is labeled at 0.13 to 0.18 oz/1000 sq ft. on 14-to-28 day intervals. In published reports, Emerald consistently provided excellent control of dollar spot when used preventively at the 0.13 oz rate on a 2-week interval. Although the use of 0.18 oz at 3 to 4 week intervals provided excellent control in several studies, disease development has occurred in other studies at these extended intervals. (Modified from article by Paul Vincelli, Kentucky Pest Newsletter, August 4, 2003).

Gray Leaf Spot

Gray leaf spot, caused by the fungus *Pyricularia grisea*, is very common on new seedings of perennial ryegrass in the tri-state area. Symptoms start as tiny, brown leaf and stem lesions within a 1 to 2 inch patch. In severe cases, the leaves curl and lesions may extend the entire width of the blade. As the disease progresses, patches coalesce into large (one to two feet) areas of blighted turf. Extensive foliar blighting occurs during warm (75-85^{0}F), wet weather. Newly established seedlings are more susceptible to infection than mature plantings. When conditions are conducive to disease development, the pathogen produces abundant one to two-celled, pear-shaped spores (conidia). For best results in the future, avoid high rates of nitrogen during July and August and extended periods of leaf wetness (i.e. water in the early morning hours). Fungicide studies conducted in New Jersey, Georgia, Maryland, and Kentucky have shown that Cleary 3336, Compass, ConSyst, Heritage, Spectro, and Zyban were most effective when applied on a preventive basis every 14 to 28 days beginning in mid-July. Chlorothalonil (e.g., Daconil) and the DMI (sterol-inhibiting) fungicides, such as propiconazole (e.g., Banner and Bayleton), have also provided effective control when disease pressure was moderate.

Marasmius

There have been numerous reports recently about the appearance of small mushrooms protruding from brown leaf blades. These structures, belonging to the fungus *Marasmius*, are approximately ½ to ¾ inch in length, and consist of a dark brown stem and a small tan to orange colored cap. **Marasmius** often appears in areas that have been thinned by brown patch. Although this fungus may appear to be pathogenic, it is actually invading dead and dying tissue and thus is not a threat to the surrounding turf.

Plant Diagnostic Laboratory Highlights

Richard J. Buckley, Laboratory Coordinator

Turf

The last two weeks provided ideal conditions for the most common summer turf diseases. Regular rains and nearly 100% humidity every day made most turf areas a veritable Petri dish of disease activity. The first week since the last newsletter was rather quiet, but since the day of the great blackout we have seen spectacular examples of **brown patch**, **pythium blight**, and **dollar spot**. Samples of each disease were submitted from golf courses in Delaware, Pennsylvania, New York, Connecticut, and several New Jersey counties. Other diseases of note include**: take-all** on newer bentgrass from Burlington County; **fairy rings** on bentgrass greens from Philadelphia; **leaf spot** on fine fescues from Mercer County; and **summer patch** on the white grub trials on our turf farm. The excitement among those of us in the turf pathology business has never been higher!

See Diagnostic Lab on page 3

Stem and Crown Rust

Both of these diseases are evident on susceptible Kentucky bluegrass and perennial ryegrass cultivars, respectively, at this time. As rust intensifies, the turf prematurely yellows and orange pustules called uredia (reproductive structures) appear on affected blades. To control both **stem and crown rust,** maintain adequate fertility and soil moisture, and apply Banner, Bayleton, chlorothalonil, Compass, Eagle, Heritage, or mancozeb, per manufacturer's recommendations.

Yellow Tuft

This disease, caused by the fungus *Sclerophthora macrospora*, is present on greens and irrigated landscape turf at this time. **Yellow tuft** (=Downy Mildew) occurs on almost all cool-season turfgrasses; however, it is usually only a serious problem on turf maintained at a low cutting height. Poorly drained or heavily irrigated sites are often associated with disease development. Infected turf appears stunted, off color (yellow to light green), and may exhibit slightly broadened leaf blades and dense clusters of shoots. Patches ranges in size from ¼ to 1 inch in diameter for bentgrass and red fescue turfs, and ½ to 3 inches for bluegrass and perennial ryegrass areas. Tufts are easily removed from the soil due to the absence of adventitious roots. To control, improve drainage, avoid over watering, mow only when the grass is dry, apply iron sulfate to mask symptom expression, and spray turf with Chipco Signature, Prodigy, or Subdue MAXX on a preventive basis (next spring) and repeat at 21 day intervals from late March to early June. ❑

DIAGNOSTIC LAB FROM PAGE 2

Besides the disease, all of the rain in August also brought on some unintended consequences. We have had a number of cup cutter plugs that were **water-logged**, **anaerobic**, or **just plain soggy**. These conditions can kill turf out right, but also can make it difficult to mow. There was lots of **scalping** evident on these plugs, and of course, **algae**. Most of the turf stressed or killed by the excess moisture was subsequently invaded by the opportunistic fungi *Leptosphaerulina*, *Curvularia*, and *Fusarium*.

We finally had our first confirmed case of **gray leaf spot**. We had seen some disease activity on the turf farm here in North Brunswick about a week ago. Of course, we are trying to get it here for research purposes, so I didn't think much of it. Yesterday, however, we got a sample from a ryegrass tee on a Delaware golf course that was devastated by the disease. The tees had been seeded recently, which makes an ideal situation for **gray leaf spot**.

In the middle of all the disease hype, **Anthracnose** remains the most common submission from golf turf this period. Samples of golf greens diagnosed with anthracnose have been sent to the laboratory from Pennsylvania, New York, Connecticut and Virginia as well as from golf courses in Atlantic, Camden, Essex, Morris, Monmouth, and Sussex Counties in New Jersey.

Landscape

The most exciting thing this week in ornamentals was the number of samples from nursery growers diagnosed with **Phytophthora root and crown rot**. Samples of **Phytophthora** were diagnosed on Rhododendron, Pieris, Juniper, and Prunus from Middlesex, Morris, and Gloucester Counties. Samples with **shade tree anthracnose** continue to trickle into the laboratory. We got six more just this week. The samples we are seeing at this time are all oaks. Infected oaks may not defoliate as readily, so symptomatic leaves would persist through the season. **Oak anthracnose** can also be confused with **bacterial leaf scorch** infected trees, so be careful with your diagnostics. Also of note, we had two samples of birch with **birch anthracnose** from Middlesex and Burlington Counties. Lastly, I just spent some time in a Christmas tree field and noticed some faint yellow spots on the needles of many Douglas fir. To my eye, the spots represent the beginning of **Rhabdocline needlecast**. Those spots will darken over the winter to the classic purplish color and erupt next May with fungal fruiting bodies. My point in mentioning it now is that we had an ideal infection period this spring, so if you did not have your treatments out, expect a lot of disease next spring. Just a thought to keep you going over the winter! ❑

Diseases of Ornamental Plants

Ann Brooks Gould, Ph.D., Specialist in Plant Pathology

I've received several calls in the past few weeks with folks asking "What's up with all the mushrooms this year?" You may have noticed that mushroom fruiting bodies have popped up all over the landscape. This phenomenon is directly related to all the wet weather of the past few weeks.

The different types of mushrooms in the landscape are well described in the following article by John Hartman of the University of Kentucky. Within the past few weeks you may have seen some of the fungi he talks about, especially **fairy rings**, **stinkhorns**, **earthstars**, and **birds-nest fungi**.

Mushrooms in the Landscape

John Hartman, University of Kentucky

Mushrooms grow and fruit in the landscape almost any time of the year, but fall is an especially good time to see a diverse number of these common, often ephemeral life forms. Mushrooms, also sometimes seen as toadstools, brackets, or conks, are the fruiting bodies of fungi, a diverse group of organisms that grow mostly as saprophytes, but sometimes as parasites or as symbionts. As saprophytes, fungi are sometimes regarded as the vultures of the plant world, scavenging on already dead plant material and breaking the complex plant structures into humus, thus recycling dead plants into the soil for future use. For most of their lives, mushroom fungi grow as fine threads of hyphae throughout the decaying vegetable matter, wood, or sometimes the live tree that is their home.

Mulch, especially wood chips, used as a landscape ground cover or to protect trees is a good substrate for a variety of mushrooms. But mushrooms can emerge out of the lawn or even the driveway in the absence of visible decaying vegetable matter. In such cases, the fungi are growing on decaying wood or dead tree roots buried in the ground. Some mushrooms such as mycorrhizal fungi growing in the lawn are symbiotic with live roots, the symbiosis benefiting both the fungus and the tree. Still others growing from the roots, the base of the tree trunk, or even up on the trunk and limbs may be parasites in the process of killing their host.

There are many mushrooms that inhabit wood chip mulch. The most endearing, perhaps, are the **bird's-nest fungi**. The fungus resembles a tiny cup or nest, about the size of a dime, and nestled in the bottom of the cup are tiny egg-like structures that contain the spores of the fungus. The bird's nest fungus is often found attached to small sticks wood chips in the mulch. Sometimes **earth-stars** are also in the mulch. Starting out as small puffball-like bodies, the walls of the earth-star fungus peel back in sections while remaining attached at the base and give the mushroom the appearance of a star when viewed from above. Beginning from an egg-like structure partially buried in the mulch,

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MUSHROOMS FROM PAGE 3
stinkhorns rapidly elongate to a pinkish stalk several inches in height. Also known as the phallus fungus, stinkhorns produce a slimy foul-smelling substance that gives them their name.

Mushrooms with typical stalks and caps are often found growing in the lawn, sometimes in circles called **fairy rings**. Also referred sometimes as **toadstools**, these fungi also grow from buried organic material such as a decaying root. Other mushrooms, such as the **shoestring root rot fungus**, infect the base of trees, causing **root and butt rot**. Another fungus, called the **dead man's fingers**, grows as hard, black projections resembling a mummified hand from the roots of live trees in the lawn. The dead man's fingers fungus also causes root rot disease. And yes, some toadstools are so tough they push their fruiting bodies right up through an asphalt driveway. Growing on wood or organic material buried beneath the drive, in their struggle for survival they can damage property.

In the meadow, **giant puffballs** are among the most spectacular of mushrooms. These white spheres, often baseball-sized, may grow to the size of a basketball. Mature puffballs will emit a cloud of powdery brown spores through an opening in the top when prodded.

Thus, mushrooms are an important part of the awe and wonder of nature that is present even in our own yards. They are mostly helpful in the natural scheme of things, keeping dead plant material from accumulating to intolerable levels. Mushrooms can also be enjoyed just for being fungi-for their uniqueness, variety, and unusual life habits.

Adapted from Hartman, John. 1998. Mushrooms in the Landscape. Kentucky Pest News, Number 830. http://www.uky.edu/Agriculture/kpn/kpnhome.htm. ❑

Ornamental/Turf IPM Notes

Steven K. Rettke, Ornamental IPM Program Associate

✔ **Pine Oystershell Scale:** A partial second generation occurs on Japanese Black Pine in the fall. Crawlers emerge in early September and blow with the wind to disperse, settling just beneath the needle sheath. Monitor declining Japanese Black Pines by peeling back needle pairs (like a banana). Look for yellow-orange crawlers (<1/8″) or the brown, oyster shaped adult scales (1/4″). Control trials have shown >90% control using a mixture of Orthene + 1% oil the first week of September.

✔ **Yellow Jackets** become a major nuisance this time of year when they develop an increased taste for sugars/starch over meat (they are excellent predators earlier in the year). A study in Passaic County determined that liverwurst was the most effective bait to trap yellow jackets. *(Source: Passaic Co. Office of Recycling.)*

✔ **Larch Casebearer (2375-2805 GDD):** A relatively uncommon pest of larch. The spring feeding of this caterpillar gives the tree a ragged look. Close examination of the needles shows feeding damage causing the browning of foliage. The caterpillar lives inside a case made of a mined needle lined with silk. This provides protection and is the prime reason it goes undetected by the untrained eye. It also overwinters in the case. The adult moths emerge in June/July from the case after pupating and then lay eggs at the base of the needles. The larva feeds inside the needle as a miner for the first two months and then produces the case from that needle. There are parasites that attack the casebearer, but they are unable to hold it completely in check. Tempo2 (cyfluthrin) is effective when the caterpillar is feeding in the fall or again in the spring.

✔ **Interpreting Soil Color:** Soil color can often tell us about soil properties that are related to plant growth. Observe the soil to determine these properties: Black/dark soils = Soils high in organic matter content. They absorb more heat and tend to warm up more quickly in the spring. Red or yellow soils = Well drained soils. They contain soil iron in the oxidized (rusted) state. Gray or blue soils = Poorly drained soils. These contain soil iron in the reduced state. (Note that the Marlton series of soil in South Jersey, however, is blue-green because of its base mineral color [greensand]). Gray mottles in the subsoil = Soils that are also somewhat poorly drained. These tend to be saturated with water at some period of the year. *(Ref: Heckman, J. Plant & Pest Advisory 2(6): 1996)*

✔ **Arborvitae Leafminer (1800-2200 GDD):** The silvery gray adult moth is present in late June through early August, laying eggs in the tips of foliage. Larvae hatch and begin feeding within foliage in mid-late August, through next spring. Foliar discoloration (yellowing) becomes apparent in late August. The presence of dead leaf tips interspersed among healthy foliage is a good indication of the presence of this pest. The dead tips are empty now. Look for the discoloration of the tips in late August that indicate the presence of the new larvae. Action during the fall will avoid the worst of the damage. The systemic pesticide Orthene (acephate) will control the larvae.

✔ **Carpenter Ants:** Carpenter ants can infest live trees, but their presence indicates that there is dead wood in that plant, and the tree is potentially a hazard. Carpenter ants rest in moist, rotted wood and excavate cavities, often leaving a hollow shell of live wood that may easily snap off during a windstorm or snow/ice load.

✔ **IPM and Nursery Sales:** Over a decade ago the IPM approach resulted in a 40% reduction in insecticide sprays at the University of California/Davis Arboretum Nursery. Five widely used landscape plants were rated according to insect damage, density and treatment efficacy. And then damaged vs. undamaged plants were compared to sales.

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Although heavily damaged plants sold more slowly than those with little or no damage, certain types of damage had little or no influence on customer preference. For example, leafminer mines and katydid chewing damage did not significantly reduce marketability. Plants in flower with lacebug damage sold faster than undamaged plants not in bloom. Customers also did not discriminate between undamaged plants from plants with several partially dead leaves.

The researchers concluded, "Complete control of certain pests is not required to sell some plants….some nursery pest control practices may be unnecessary. Even in the absence of quantitative thresholds, regular monitoring and decision making by a trained IPM scout can significantly reduce pesticide use in the nursery without reducing plant marketability." *(Source: Flint et al, Cal. Ag. 47(4): 1993, pp 4-7)*

✔ **Tree Staking:** No staking is necessary for newly transplanted trees that can stand by themselves or have branches to the ground. Compared to a rigidly staked trees, unstaked trees will: develop a 33% greater basal trunk area; grow 19% less in height; develop a 30% greater trunk taper; develop a stronger, larger root system; develop more uniform xylem to support itself upright; have few or no rubbing or girdling injuries. *(Source: Harris, Arbor Age)*

✔ **Weed Seeds:** Farmers say, "One years' seeding means 7 years weeding." This adage indicates how long weed seeds remain viable in the soil. For example, if a soil contains 10,000,000 (ten million) weed seeds per acre, 50% will typically decay per year. Assuming no replenishment through reseeding, at the end of 7 years the population will be reduced to approximately 100,000. This is a lower number, but still significant. Also realize that the weeds that emerge each year often account for less than 5% of the soil's weed seed population. *(Source: R.B. Taylorson, Univ. R.I. Turf Notes)*

✔ **Chinch Bugs:** Chinch bug damage looks a lot like drought stress. The turf yellows (yellow spots initially appear on individual blades) then dies, coalescing to become brown dead patches. Turf areas in full sun are most susceptible, particularly lawns of zoysia and fine fescue as well as lawns with heavy thatch. Second generation chinch bugs are found near the soil surface, at the edge of dead patches. Monitor by inserting a coffee can (with open ends) into the turf; fill with water and knead the turf; and wait several minutes for chinch bug s to float to the top of the water (if present). Control by maintaining irrigation and overseeding with endophyte-containing turf cultivars.

✔ **Turf Predator Research:** Several years ago researchers at the University of Kentucky studied naturally occurring beneficial organisms in lawns. It was determined that the primary predator attacking lawn pests were spiders, followed by ants, ground beetles, and rove beetles. In an experiment with **sod webworms** larvae approximately 75% were eaten by these beneficials on a non-pesticide treated site. On sites treated with broad-spectrum insecticides (e.g., Dursban), most predators were killed along with the sod webworms. However, very few predators re-established again even after 5-8 weeks later.

✔ **Alternative Thatch Control:** Thatch build-up can destroy turf if not properly managed, especially under drought conditions. Microorganisms and earthworms naturally decompose thatch. Their activity is influenced by organic matter, pH, water, temperature, and aeration. These factors can all be manipulated by the landscaper to "organically" reduce thatch by stimulating microbes.

Maintaining or increasing organic matter can be achieved by using organic fertilizers and organic soil conditioners. Topdress turf in the fall by adding 1/4 -1/2 cubic yard of compost /1000 sq. ft. Work the topdressing into the turf using drag mats, rakes, etc.

Fall liming of acidic soils, based on soil test results is recommended in order to adjust the pH between 6.0 to 6.8 (the range of optimal thatch decomposition). Acidic conditions have been shown to promote the accumulation of thatch. Also remember, long term use of fertilizers and certain fungicides can alter pH and thus promote thatch build-up.

Core aeration and /or verticutting will reduce thatch by increasing oxygen levels to turf roots, and thus increasing microbial activity (core can also be dragged as a topdressing). Adequate watering (not excessive) keeps the thatch moist, which also hastens decomposition. *(Source: Landscape IPM Notes Newsletter, Rutgers Cooperative Extension – no longer published)* ❑

Christmas Tree Shearing Workshop & Twilight Meeting

Thursday, August 28th, 2003, 5:30 to 7:30 pm
Simonson Christmas Tree Farm
260 Dey Road, Cranbury, NJ

Sponsored by Rutgers Cooperative Extension of Middlesex County

Program:

5:30 pm – Welcome**,** Bill Hlubik, Middlesex County Agricultural Agent, Rutgers Cooperative Extension (RCE)

5:35 to 7:00 - Christmas Tree Shearing Demonstration, Dr. Mark Vodak, Specialist in Forestry, RCE

7:00 to 7:30 - Pesticide Safety –Bill Hlubik

7:30 - Questions and Refreshments

1 Pesticide Core Credit will be available.

RSVP Required to Bill Hlubik or Sylvia Gresh at RCE of Middlesex County by August 26,2003 at 732-745-4394 or Hlubik@aesop.rutgers.edu.

Improving Drainage of Wet Soils with Gypsum

Joseph Heckman, Ph.D., Specialist in Soil Fertility

Higher-than-normal amounts of rainfall are stressful to crops grown on poorly drained soils. Use of gypsum to improve the structure and drainage of wet soils has a long history. The practice of applying gypsum (also called landplaster) to agricultural land began in Europe and the idea came to America around 1770. The New Jersey Agricultural Experiment Station published in 1953 an excellent bulletin entitled "Gypsum for Improving Drainage of Wet Soils". This article will summarize the major points of that bulletin, which is no longer in print, and offer a current perspective on how to use gypsum for soil improvement.

Application of finely ground gypsum improves soil drainage and aeration as a result of the binding of calcium to dispersed clay particles. This effect of calcium of bringing clay particles together into relatively unstable clusters is called flocculation. Calcium flocculation of clay particles is especially helpful on sodium or salt damaged soils. Although organic amendments such as manure or compost can also improve soil structure, the joint use of organic amendments and gypsum gives the best results (Figure 1).

The combination of calcium flocculation and organic matter decomposition can lead to the formation of relatively stable soil aggregates, improved soil structure and better water infiltration.

Wet spots are widespread on New Jersey farm fields. They typically occur in basins where there is no outlet for surface drainage. Because these low-lying positions often receive runoff from upland areas, the amount of water that needs to drain is far in excess of normal rainfall. Fine soil particles also tend to collect and settle in these wet spots, which further increases their tendency to puddle.

During dry years crops may grow fine but in wet years these ponded areas may result in reduced yield or in complete crop failure. Even a short period of ponding can cause stress to seeded or transplanted crops. Root development is curtailed due to lack of oxygen and due to the formation of toxic compounds in soil (reduced iron and manganese). Also, the crops may become starved for nitrogen because soil nitrate will be converted to gaseous forms of nitrogen that will be lost to the atmosphere.

Growers can still benefit from the research findings based on experiments conducted during the 1940's and 50's with the use of gypsum on New Jersey soils. The important findings and recommendations follow:

❖ Calcium sulfate applied in the form of the anhydrite ($CaSO_4$) or the hydrated form known as gypsum ($CaSO_4 \cdot 2H_2O$) were equally effective.

❖ Limestone ($CaCO_3$) also adds calcium to soil and improves flocculation, but gypsum is faster acting and more effective because gypsum has a much higher solubility.

❖ Applying organic amendments such as manure or compost in combination with gypsum is more effective for improving soil structure and water infiltration than either amendment applied alone.

❖ Gypsum is especially valuable for overcoming surface crusting. The recommended application rate of gypsum is 2 tons/acre. The gypsum should be applied to the soil surface with a lime spreader and disked in, followed by deep plowing, to achieve a through mixing with the plow layer. Plowing should be deeper than usual for the greatest benefit. Deeper tillage and subsoiling may increase the effectiveness of the gypsum application.

❖ Some poorly drained soils cannot be helped with gypsum. On soils that are poorly drained because of a clay bed below the plow layer the use of gypsum may do little to improve water infiltration. Digging a hole to explore the soil profile for deeper impenetrable layers can help to identify sites where gypsum may not be effective.

❖ The application of gypsum at the rate of 2 ton/acre is slightly acidifying. On loam soils the pH may decease by about 0.3 units.

❖ Gypsum is also an excellent source of plant available sulfur and calcium. The

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Chemistry of Gypsum

When calcium sulfate is hydrated ($CaSO_4 \cdot 2H_2O$), or combined with water, it is called gypsum, and when it is free of water, it is referred to as the anhydrite ($CaSO_4$). Gypsum contains 23% calcium and 19% sulfur while calcium sulfate contains 29% calcium and 24% sulfur. Calcium sulfate gradually converts to gypsum when in contact with water. Finely ground gypsum is many times more soluble in water than finely ground agricultural limestone or calcite ($CaCO_3$).

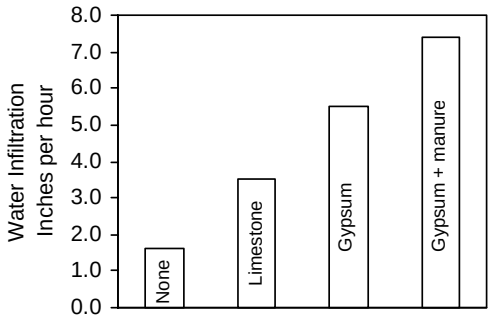

Figure 1. Effect of limestone, gypsum, and gypsum-plus-manure on water infiltration into a Sassafras soil. Limestone and gypsum were each applied at the rate of 4 tons/acre. Manure was applied at 10 dry tons/acre. Measurements were taken at 23 days after treatment.

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need for sulfur by New Jersey soils and crops is increasing as coal burning power plants reduce emissions of sulfur dioxide to curb acid rain. Calcium can compete with magnesium and potassium for plant uptake. Thus, be careful to monitor and maintain a good balance of calcium to magnesium to potassium on soils that may have low soil test levels.

❖ Studies conducted on New Jersey soils with gypsum applied to poorly drained sites in the 1950's demonstrated that timothy, rye, and corn yields were increased by 27 to 75%. It is reasonable to assume that when gypsum improves drainage of wet spots, comparable bene-fits are likely to occur with today's crops.

❖ In addition to improving drainage, gypsum can provide other agronomic benefits. Improved seedling emergence on crusting soils has been documented. Gypsum can also improve water acceptance into the soil, decrease runoff, and conserve water for use by crops. Although wet spots will benefit most from the application of gypsum, a blanket application to fields prone to surface crusting may also be beneficial.

❖ Avoid the use of some by-product gypsums such as phosphogypsum which are known to contain radium.

❖ Mined gypsum may cost $50 to $100/ton or $6.50/50 lb bag. Pelletized gypsum may cost $260/ton. Recycled wallboard gypsum costs about $65/ton.

❖ Considering that the beneficial effects of gypsum may last about three years, significant yield increases are required to make the outlay for gypsum economically viable.

References: Rinehart, J.C.; Blake, G.R.; Tedrow, J.C.F.; Bear, F.E. Gypsum for Improving Drainage of Wet Soils. New Jersey Agricultural Experiment Station Bulletin 772, June 1953. Rutgers University, New Jersey.

Shainberg, I.; Sumner, M.E.; Miller, W.P.; Farina, M.P.W.; Pavan, M.A.; Fey, M.V. Use of Gypsum on Soils: A Review. Advances in Soil Science, Volume 9, 1989. Springer-Verlag New York Inc. ❑

Weekly Weather Summary

Keith Arnesen, Ph.D., Agricultural Meteorologist

Temperatures averaged much above normal. Extremes were 97 degrees at Seabrook on the 15th, and 54 degrees at Belvidere on the 18th. Weekly rainfall averaged 1.17 inches north, 0.47 inches central, and 0.56 inches south. The heaviest 24 hour total reported was 2.03 inches at Belvidere on the 11th to 12th. Estimated soil moisture, in percent of field capacity, this past week averaged 88 percent north, 73 percent central and 66 percent south. Four inch soil temperatures averaged 73 degrees north, 77 degrees central and 77 degrees south.

Weather Summary for the Week Ending 8 am Monday 8/18/03

	RAINFALL			TEMPERATURE				GDD BASE50		MON
WEATHER STATIONS	WEEK	TOTAL	DEP	MX	MN	AVG	DEP	TOT	DEP	%FC
BELVIDERE BRIDGE	2.96	35.03	12.66	94	54	76.	6	2089	141	95
CANOE BROOK	.36	27.62	4.12	93	60	78.	7	1979	24	71
CHARLOTTEBURG	1.34	33.87	10.15	90	58	75.	7	1698	157	76
FLEMINGTON	.10	31.20	8.52	93	59	77.	6	2046	41	81
LONG VALLEY	.60	29.36	4.91	84	62	73.	5	1597	-137	79
NEWTON	1.64	30.94	9.07	91	59	76.	7	1895	116	80
FREEHOLD	.87	25.84	3.76	91	60	77.	5	2205	67	86
LONG BRANCH	.10	28.14	5.91	93	63	76.	4	2021	-38	57
NEW BRUNSWICK	.40	29.52	7.31	93	60	78.	5	2165	-58	86
TOMS RIVER	.91	27.11	4.32	93	65	78.	7	2185	140	87
TRENTON	.09	23.98	2.84	88	65	78.	4	2137	-189	49
CAPE MAY COURT HOUSE	.17	22.36	2.69	89	64	76.	2	2085	-117	52
DOWNSTOWN	1.25	24.53	3.73	91	65	78.	5	2233	-99	84
GLASSBORO	.24	25.63	3.87	92	63	79.	5	2361	52	61
HAMMONTON	.91	21.89	.10	93	65	79.	5	2333	21	84
POMONA	.44	21.89	1.91	93	65	78.	6	2186	30	51
SEABROOK	.38	27.09	7.13	97	65	79.	5	2418	74	64
ATLANTIC CITY MARINA	missing									
SOUTH HARRISON	.27	22.74	1.07	91	69	80.	NA	2341	NA	NA

WES KLINE — GDD BASE 40 PINEY HOLLOW Last Week 257 (Ending 8/11/03) This Week 264 (Ending 8/18/03)

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