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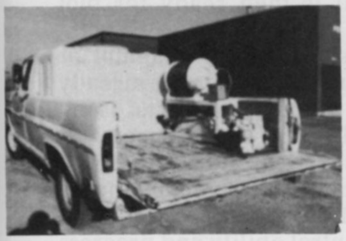

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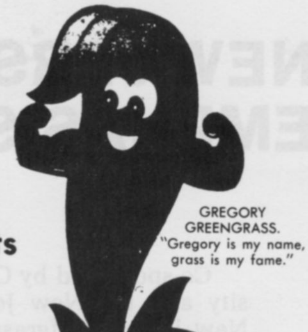

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NEW JERSEY TURFGRASS EXPO '78 EMPHASIS ON TURF PRODUCTION

Co-sponsored by Cook College-Rutgers University and the New Jersey Turfgrass Foundation, New Jersey Turfgrass Expo is one of the largest state turfgrass educational programs and trade shows. Expo '78 was no exception. Total registration was 876 for two and a half days of educational programs and a trade show that included 59 exhibitors.

The educational sessions were planned largely for those with a professional interest in turf production. Wednesday sessions were of general interest, focusing on perspectives, insect, weed, and disease control. These subjects are of common interest and we have included abstracts of most.

Thursday, the sessions split up into groups interested in golf and fine turf, and those interested in athletic field, lawn, sod and utility turf. Some of these sessions are also abstracted.

Several awards were presented at the annual banquet on Thursday night. Two students received awards. The N.J. Turfgrass Hall of Fame Student Awards went to Christopher Carson, a four-year student, and David Johnson, a winter course student. The Hall of Fame Student Awards were made in honor of the late Jack Ormond, who was inducted into the Hall of Fame last year.

The Hall of Fame Award this year was presented to Wiley Miner. He has made many outstanding contributions to the sod industry.

The Metropolitan Golf Course Superintendents Association presented an award to Dr. Ralph Engel and Dr. C. Reed Funk for bentgrass variety improvement.

The N.J. Irrigation Association donated $2000 for an irrigation system for the Rutgers turf plots.

The N.J. Turfgrass association donated $1500 to Sami Ahmad for further research on grub resistance to insecticides.

They also put $5000 in an escrow fund for a turfgrass room on Rutgers campus. Plan is to add to this fund until it, and hopefully, matching funds from the university, accrue into a sufficient amount.

Following are abstracts from some of the many outstanding turf leaders who spoke at Expo '78.

Procedures of Pesticide Development

Ernie Koch, Stauffer Chemical Company

From initiation in a test tube, through EPA procedures, to the market place, a chemical goes through five years and 10 million dollars worth of testing for efficacy and safety.

A chemist initially comes up with a derived chain molecule that he feels may have potential. The first stage is planning. There must be a target and non-target market for it. Much of the planning is done on the blackboard.

The chemist then goes to the library to determine if his chain derivative is something the company holds a patent on. It might be something totally new or might infringe upon someone else's patent and cannot be further pursued.

If it can go ahead, then it must be determined in what form it will be used, wettable powder, emulsifiable concentrate, etc.

The chemical is tested against insects, plant disease and for herbicidal qualities. If it is to be an insecticide, it is tested on insects one by one, then in a mass test for LD_{50}.

If it is to be a herbicide, it is tested on cultivars, weed species, and other plants and categorized. Other formulations, or analogs, of the proposed chemical are also tested.

More of the material is made and chemists run tests to determine the most efficient rate. Equipment and methods of application must also be developed. The chemical is then ready for plot tests.

A chemical that comes on the ornamental or horticulture market is usually one that has already been through all of the agricultural tests, is an analog, or is being tested for an add-on use.

Test plots for the chemical must be small enough to glean good data, yet large enough to be tillable and workable. The chemical is tested on these large plots for its control ability and progress is plotted over a period of years.

Toxicity data is extremely important. Rats are initially used for oral toxicity data and albino rabbits for dermal toxicity. The material is sent to government laboratories for fish and wildlife toxicity data. It is also sent to universities to gather further efficacy data.

Biochemistry, that is, the metabolites and their routes, must be known before the chemical goes on the market.

Five years later, after all the testing, there might (or might not) be a safe, marketable, effective, pesticide.

Turfgrass Insect Control Update

Dr. Louis Vasvary, Extension Entomology Specialist, Cook College, Rutgers University

White grubs seem to be the highlighted problem, depending upon location and level of turf management. There are good insecticides appearing on the horizon.

Factors for control of grubs are: selection of chemical, depending upon the thatch layer; and a variation in location. The selection process in developing resistance is fairly precise and can occur over short distances. Precise timing is necessary.

The adult Japanese beetle feeds on over 250 host species. Where there are adults there are grubs. Periodic sampling as a normal procedure in a management program will help to keep ahead of the population. A low density population is easier

to control.

In New Jersey and the surrounding region, August is the time to catch the grubs in their second instar stage. There is quite a size variation with the third instar, requiring heavier application rates.

Control with Dylox and Proxol have been consistent throughout New Jersey. Diazinon and Dursban do a good job where the organic matter and thatch is low. Milky spore disease, a natural control, works nicely at about 20 pounds per acre. The length between application and control is extensive, but control lasts up to three years.

Black turfgrass ataenius is somewhat a problem in New Jersey. Dylox and Proxol, with the same active ingredient, are the only labeled products.

Chinchbugs seem to prefer fescues and bentgrasses in the sunlight, but will attack Kentucky bluegrass with a heavy thatch layer. The brown grass resulting is not only a result of the chinchbug sucking the plant juices, but its toxic saliva. Aspon, Diazinon, Dursban, Ethione, and Sevin are some of the control insecticides. Application should be followed by one-half to three-fourths inches of watering-in.

Sod webworm controls are similar to chinchbugs and include Baygon. Timing is important as there are about five species of sod webworm in New Jersey and their life cycles tend to overlap. Watering-in is not critical and it is best, even, to keep the area dry for a half day or more following application. Same goes for cutworms.

Billbugs are fairly common in New Jersey. Programs against the adult stage have proved most successful so far. The billbug usually overwinters in the adult stage. However, it has been found overwintering in the last grub stage on some sod farms.

Application against the adult stage should take place in late April or early May. Diazinon and Baygon are registered.

Billbugs often occur together with white grubs. The billbug grubs can be differentiated because they have no legs beyond the head region.

Mound ants are a problem, particularly on some golf courses. They tend to prefer areas where there is uniform particle size in the subsoil. They maintain an aphid population that feeds on the roots of turfgrass and the mound ants themselves are not active during the day.

Control is difficult but is best when the mounds are disturbed and Diazinon, Dursban or Sevin used. Reapplication should be within two weeks.

Keeping accurate records of pesticide application, including for what, when, where, and how much will aid in diagnosing failures if the problem continues after pesticide application.

Studies of Japanese Beetle Grub Resistance

Dr. Sami Ahmad, Associate Research Professor of Entomology, Cook College, Rutgers University

This basic toxicology work was performed in light of the Japanese beetle becoming the major insect pest of turf across the Eastern Seaboard and its apparent resistance to the cyclodiene insecticides (aldrin, dieldrin). Organophosphates and carbamates were to be studied to determine their potential for development of resistance by the grubs.

Grubs, from a resistant population in River Vale, N.J., were individually isolated and insecticide applied. In these tests, dieldrin and an organophosphate insecticide, chlorpyrifos (Dursban), were to be compared.

Chlorpyrifos was applied to each grub at a rate of 20 micrograms per grub. Mortality peaked at four days and continued through seven. Because of this, the grubs were exposed for eight days and a final mortality rate determined. Dieldrin was similar except that the mortality continued for 14 days.

Symptoms of insecticidal poisoning of the grubs were determined. A healthy grub weighs about 220 milligrams. Once poisoned it loses body fluids until its weight is about half that. It has a yellow or brown color and is essentially paralyzed (moribund). Dr. Ahmad has adopted S for the shrunken body, Y for the yellow color, and M for the moribund state, developing a term for this condition: SYM.

It was found that the amount of chemical required to produce death of 50% of the grub population was normal. However, the amount required to produce death in 95% of the grub population was very high, for dieldrin about 1800 micrograms. Essentially the same was true for chlorpyrifos. This indicates a level of resistance in the population.

In another test, Dr. Ahmad tested adult beetles from a population with no apparent resistance to the chemicals and found that they were quickly killed. The River Vale population again proved resistant.

Bendiocarb, a carbamate insecticide, gave much the same results. Both have a similar mode of action and are metabolized by the same enzymes.

Dr. Ahmad's further research will attempt to determine if this resistance is widespread. He will also be working with insecticides with different modes of action.

Athletic Field Construction Procedures

Dr. H.W. Indyk, Extension Turf Specialist, Cook College, Rutgers University

Because of the increased use of athletic field facilities, there is a need to be more conscientious in constructing athletic fields.

Soil is basic. Compacted soil cannot be bypassed or good results will be short-lived. The soil should be prepared as a proper environment for seed.

In determining drainage characteristics, the physical properties of the soil should be taken into consideration. Poor drainage characteristically affects compaction. Turf should be aerified with a spoon-type aerifier and selective weed control used to remove the grass plants' competition.

Astroturf can be the right choice for a given situation. It takes a $300,000 initial investment however, and requires another $250,000 every three years to replace. Maintenance costs of astroturf are actually higher than for natural.

Solving problems inherent with an athletic facility calls for a "meeting of the minds" of all concerned, that is, those concerned with making decisions.

There are several things that can be looked at.

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Topsoil can be modified. A drainage system can be properly installed. Backfill should be some type of coarse material. Dr. Indyk noted one instance in which blue stone was used.

Proper grade is necessary to insure good surface drainage. It is also necessary to construct so that water can be added. Dr. Indyk strongly recommends an underground irrigation system.

Soil and sand mixing is best done off-site. A combination of lime and fertilizer should be incorporated after the soil is spread. Fine grading is then performed.

Seed or sod can then be added. Seed takes longer. Sod should be looked at at the farm. Insist on certified sod.

A new concept in athletic field construction, that of using 100% sand of a certain quality, is showing good, deep root growth. A drainage system is still installed and a good supply of irrigation water is needed.

Good sod grown on sandy soil should be used. Avoid sod with heavy-textured soil. Processed sod, with all soil washed off, is also very good.

One final point Dr. Indyk made was that the field manager should also be the one to decide how, and at what frequency, the field should be used.

Fertilization of Athletic Fields

Jerry Hutchinson, Turf Specialist, Holbrook, NY

A fertilization program is important to growing turf on an athletic field. Hutchinson's program includes 2 pounds of nitrogen per 1000 square feet in the fall along with 2,4-D at one pound and Banvel D at 4 ounces per acre.

Overseeding should be carried out after the last game. Then in spring, April through May, a fertilization program, preemergence crabgrass killer, and Banvel D at 4 ounces. 2,4-D is not applied in the spring as it seems to injure the turf.

A summer feeding includes 2 pounds of nitrogen per thousand and an insecticide for chinchbugs, Proxol for grubs.

Complete renovation of a field was carried out. A roadgrader prepared the grade at approximately $300 per day. It took about 2 days.

A mixture of 50% Kentucky 31, 25% Manhattan, and 25% Adelphi was spread over bare soil at a rate of 8 pounds per thousand. A modified Rogers seeder was used. It has 7 gauge blades on 3-inch centers. Milled spacers were added. The modified gear box makes the blades spin opposite the direction of the tractor wheels. The seed was applied twice at half-rates of 4 pounds in a criss-cross pattern. A 16-4-4 starter fertilizer was used and the grass seemed to jump up.

In another seeding, the seed was put one inch down. A mixture of Citation and Warren's A-34 was used. Good root growth was observed six weeks after germination.

Hutchinson recommends Dachtal and has experienced no problems with Betasan, if the seed is up.

Lawn Disease Problems

Dr. Spencer Davis, Jr., Extension Specialist in Plant Pathology, Cook College, Rutgers University

Recognition is the primary factor in combatting turfgrass disease. The problem is often not disease, but competition, fertilization practices, or combinations of factors such as these.

A plant pathologist can always find disease fungi in a sample, however, they are often just there and not actually causing a disease problem. Brown spots in one case were diagnosed for disease, but it was found that the problem was letting clippings lie too long. Always look at the surroundings for possibilities other than disease.

A good field test for dollar spot was noted. A plug, pulled and placed in a jar for 24 hours, will show a white mycelial growth. The growth can also be noticed in the early morning dew.

Pythium can look like brown patch—but pythium chemicals won't work on brown patch. Recognition, again.

Winter Fertilization of Lawns

Dr. Ralph E. Engel, Turfgrass Research and Teaching, Cook College, Rutgers University

Winterkill of turf is greater when excessive amounts of fertilizer are applied just prior to winter. Work distribution can be enhanced and there is less chance of burn with dormant fertilization.

Some disadvantages of dormant fertilization include: some increase in leeching loss; early spring growth may not be necessary; and leaf spot disease may be worse.

Dormant fertilization is more useful on Kentucky bluegrass in areas of less severe winters. Dr. Engel still thinks fall season fertilization is best but would much rather see dormant winter fertilization than spring fertilization, especially in the New Jersey region.

Bentgrass makes a good response to dormant fertilization in December. *Poa annua* also responds better. There is really no data on fine fescue response.

Inorganic quick release forms of fertilizer are the best for a dormant program. They are normally applied at rates of 1-2 pounds, maybe 2½. The best, *Poa annua* free, dormant fertilization program was achieved with urea versus three slow release types.

A Successful Lawn Care Business

Robert H. Brewster, Consultant, Bellport, NY

The first point in maintaining a successful lawn care business, as most in the business are aware of, is educating the customer. One point to keeping a customer happy though, is to promise only what you can fulfill.

Rig men should be trained so that they are true representatives of your business. Be professional. A soil probe, hand magnifying lense, knife, etc., can help make you look professional.

The proper materials should be selected for each job. Proper scheduling and routing go with this. Timing application deadlines to include all customers within the time period is important.

Checkbacks are required after each application. Spot treatment equipment should be carried on checkbacks. Answering customer's complaints quickly and precisely can help keep them.

Anticipating seasonal problems can keep things rolling smoothly.

Maintain individual customer records. Use three lawns of an area as guides. Monitor and evaluate them.

Comparing agronomist's calendars can help in anticipating application programs. Keep a rain gauge in your area of business. Precipitation can vary across town. Keep pest data, phenological data, weather data, and application dates.

Make rig men aware of things they may notice, pests, etc. Know the various species of grasses and pest hosts. Know phenological data.

A report may say spray a certain date for a certain pest. What if it is late that year? Flowering of Inkberry may provide an indication of when to spray for the second instar of Japanese beetle grubs. Queen Anne's lace, Rose-of-Sharon or Hydrangea in bloom may provide indications, depending upon what's in your area. *Kalmia latifolia* in bloom might be the best timing for a spring application to catch the last instar before pupae.

Seed Mixtures for Sod Production

Dr. C. Reed Funk, Turfgrass Breeding, Cook College, Rutgers University

Because of apomixis, a form of asexual plant reproduction, seed is being developed with genetic uniformity and hybrid vigor. A blend is defined as two or more cultivars of the same species. A mixture is two or more species.

In a test, two diseases, stripe smut and Helminthosporium leaf spot were introduced to turf plots.

On a Merion/Newport plot, the Merion was more aggressive and took over in a year. After three years it developed stripe smut. A Pennstar/Fylking plot has been good throughout six years of the test.

A blend of 38 bluegrasses was planted. The average performance was identical to the average of its components. In the last two years of the test, the best components have been gaining dominance. The performance of such a blend is determined by the varietal composition at the time of observation. It can change rapidly due to a change in composition, disease, insects, management or environment.

Weaker varieties only serve as dilutents. They add little or nothing to long term performance. Grasses similar in appearance, disease reaction, and growth cycle show no advantages or disadvantages, one over the other.

For best results, no aggressive component should have a serious weakness. A blend or mixture will sometimes perform only as well as its poorest component, however, it seldom performs better than its best component.

A blend or mixture should contain the best varieties available that complement each other. Blends are most normally successful in stress environments.

Dr. Funk recommended that ryegrass be avoided in New Jersey sod production. However, some of the fine fescues might be considered for certain uses.

Some of the newer chewings fescues, Highlight, Kokett, Jamestown and Banner, are more competitive with Kentucky bluegrass. Dawson and Golfood are good creeping red fescues. Ruby and Fortress are good spreading fescues. C-26 and Scaldis are good hard fescues.

Some good hard fescues are being found. Dr. Funk expects to see increased use of them.

The Future and Concerns of Recycled Water

Dr. Harry L. Motto, Associate Research Professor of Soils, Cook College, Rutgers University

The cost of water has risen from $17 per acre foot in 1957 to $90 per acre foot in 1977 (California figures). It is projected that water will cost $190 per acre foot by 1987. Because recycled water will be available in much greater supply and will cost about $3-4 per acre inch, it's use will be more feasible. The federal government is also now pushing land use in effluent disposal.

Waste water contains some 9 pounds of nitrogen per acre inch. The nitrogen is in highly available forms and is highly usable at low and continuous rates. At higher rates, it will probably leech to some extent.

Phosphorus is available at about 2.3 pounds per acre inch of effluent water. It's ratio to nitrogen is generally much higher than normal for turfgrass. It will also tend to build up, rather than leech.

Potassium is available at 3 pounds per acre inch and carbon is present at about 16 pounds per acre inch. The carbon level may be significant in building organic matter levels at the soil surface, but not in relation to the amount of carbon usually contained in most soils. The potassium level is adequate if the crop is not removed, but if it is, supplemental potassium may be necessary.

Range in pH is from 6.5 to 8.4. Amounts of zinc and copper do not present a problem, according to irrigation water standards, however, levels of manganese and iron might. Cadmium probably represents the biggest problem with inorganic compounds.

Salinity would not be a problem in areas where rainfall is adequate, but might in the more arid areas of the west. Boron is not generally a problem, but it is recommended that the specific source of recycled water be checked for significant levels.

Some pathenogens and viruses are present, according to the degree of treatment the water has received. Use of the turf will play a role in the amount of these organisms that may be present. Obviously, a sports area will have lower permissible levels than a non-use area.

Arrangements should be made in advance and contracted so that the party receiving the water knows just what is expected. It has happened that the water can't be shut off, even during periods of naturally high moisture levels. This can present a problem and one should be aware from the beginning. **WTT**

CONFERENCE PRESENTS INFORMATION ON WASTEWATER IRRIGATION

Use of effluent wastewater for irrigation is becoming a feasible alternative to paying higher water prices, expected to climb to unreasonable heights. Wastewater can also provide side benefits in the form of nutrients. The only drawback is that not enough information is being disseminated so that a prospective user can determine the economics and feasibility of using the effluent.

Golf course superintendents are especially concerned and have strong organizational support. They have again taken the initiative in holding a "state of knowledge conference on wastewater irrigation of recreational turfgrass".

An audience of over 80 gathered in Arlington Heights, Illinois, to hear officials, architects, superintendents, businessmen, engineers and agronomists brought together by the American Society of Golf Course Architects Foundation (ASGCA), the Golf Course Superintendents Association of America, the National Golf Foundation, and the United States Golf Association Green Section.

According to Richard Nugent, ASGCA, one of the most important aspects of developing a site is the water. For this reason, golf course superintendents in the Chicago area have approached the North Shore Sanitary District and are going to put turf plots there to see what happens to grass under these circumstances.

Nugent (ASGCA) was called in to help with design of the project, workers from Northmoor Country Club, which is nearby, are going to mow and take care of the plots and Dr. Al Turgeon of the University of Illinois is going to monitor them. A check, using potable water, will be run along side the effluent plots.

Organizational initiative is the key to projects such as this and they can be easily duplicated across the country, if properly done. In this case, local contractors and suppliers have also volunteered their help and are donating equipment.

Wastewater falls into three general categories, according to David Gill of the ASGCA. Ranked in order of those most difficult to predict and control, they are: 1) storm wastewater; 2) industrial wastewater; and 3) sanitary wastewater. In the order of difficulty to treat and use, industrial is first, sanitary second, and storm wastewater is the easiest.

A golf course using effluent will receive it at a constant rate, but not all will be used as it is received, Gill says. For this reason, storage volume can be used as a basis for making general estimates of feasibility.

By determining irrigation requirements and comparing them with availability, a system for making feasibility statements can be established.

An empirical formula established by Quackenbush in 1965 can be modified to compute irrigation requirements for lawn grasses. This formula basically states that the evapotranspiration less the

David Gill, ASGCA

amount of precipitation divided by 70 percent irrigation efficiency equals the irrigation requirement.

Based on this formula, Chicago fairways would require about an inch of water per week and greens and tees about one and one-half inches per week. Salt Lake City fairways would require two inches and greens and tees about two and one-half.

Figures should be designed to achieve the best quality turf and get the greatest efficiency from the effluent. The inflow rate depends upon water consumption and storage capacity. In determining the inflow rate, Gill uses the weekly water requirement, the length of the irrigation season and the length of the longest nonirrigation period.

These calculations resulted in the establishment of six zones. They cannot be ranked, but rather described, Gill says, because of many interacting factors. For example, zone number one, including southern California, Arizona, New Mexico and Texas, is not considered an effective zone. There is no storage problem there because irrigation can take place almost every day. Storage would only be needed for emergencies.

Storage would be minimal in semi-tropic areas. The plains and mountain states, on the other hand, would have high storage requirements. Zones 5 and 6, including the middle South, then North and Northeast, would have moderate to moderately high storage requirements.

Basically, what he has tried to do, Gill says, is to give an overview for more detailed local studies. There are many local exceptions to a general overview.

It is apparent that time might come when there is competition for available wastewater to irrigate with. When faced with what to do with theirs, Muskegon County Wastewater Management now uses it to irrigate 5000 acres of corn and harvests three or four hundred thousand bushels of corn every year.

Some of the crop gets 80-100 inches of water

continued on page 50

during the growing season at ¾-inches per day. The 1700 acres of lagoons also make a natural migratory bird haven. The Michigan Department of Natural Resources estimated there was 100,000 ducks on the lagoons at one time this fall.

While wastewater provides necessary water to the plant, it also has other elements in it that must be monitored to avoid a harmful buildup. Dr. Boyd Ellis of Michigan State University explained how industrial wastes affect some chemical properties of the soil. He gathered data from 59 treatment plants in Michigan.

The range in pH was 6.3 to 9.3 with a median of 7.5. Sixty percent of the plants had a pH near the median. The pH will change, according to Dr. Ellis, to that of the wastewater that is being applied.

In one example, in one surface soil, the pH rose from 4.4 to 6.6 in two and one-half years. The wastewater being used had a pH of 7.2-7.4. It may take one year, or ten, he emphasized, but it will happen and could lead to heavy metal deficiencies as they become tied up at higher pH's.

The amount of nitrogen ranged from 11-285 parts per million (ppm). The mean was 35, slightly higher than expected. The mean would be about right for Kentucky bluegrass and not too bad for bent. If you got on the low end, at 11ppm, the turf would only get about two pounds per growing season. On the high end, 285 ppm, it would get 47.8 pounds that might even do it in. You might be able to use it if you only applied it about three times during the season at one inch and then quit.

Phosphorus levels were low, .03-8.1 ppm with a mean of 2.2. It might not be too bad unless you were removing the clippings.

The thing to look out for is the extremes. Chromium, for example, had a mean of 2620 ppm which is not too bad because it precipitates in the soil. One sample had 99,000 ppm. Who knows what that might do.

The chances of drawing random effluent that would meet the average needs would be about one in three if you didn't bother to analyze it.

The cation exchange system is one of equilibrium, Ellis warned. You can't expect it to be a sink for all the bases you put in it. It will reach an equilibrium based on the properties of the water you're applying.

Watch SAR, or exchangeable sodium, values. Ellis recommends that SAR values should be less than five for turfgrasses.

In closing, Ellis offered five points to successful use of effluent. Establish the chemical composition of the wastewater you're going to use, before you use it. Find out if it is going to change (at the treatment facility).

Contract only when you can control how much and when you are going to apply it.

Carefully base your fertilizer program on the nutrient content of the soil and the nutrient content of the wastewater you're going to be using. Test the soil frequently.

Keep very close track of the sodium level in your wastewater and your soils. Don't let it become a problem. *Ron Morris* **WTT**

