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A Case for Horticultural Chemicals

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Mr. Chris Carson, a senior at Cook College, Rutgers University, receives the Jack Ormond Hall of Fame Student Award from Mrs. Betty Ann Scully, daughter of Jack Ormond, at the 1978 Expo banquet. Mr. Carson embarked on a career on the golf course this past April. Congratulations and good luck, Chris!

Rachel Carson's *Silent Spring* has been voted one of the 100 books that most changed history. This book, published in the early 1960s, started the modern controversy over the use of pesticides. The mass media seem to delight in telling the "evils" of pesticides: how they cause cancer, shorten our lives and contaminate food and water supplies. Yet we desperately need pesticides if we want to maintain a bountiful supply of farm products as well as to provide ourselves with more comfortable living.

In spite of rising prices for food (like everything else) the average American family spends only 17 percent of the take-home paycheck for food, the lowest figure for any country in the world. Without pesticides this figure would jump to at least 30 or 40 percent to provide just our own current food needs. There would be no food left over to export and help balance our staggering import of foreign oil, TV sets, cars, and other foreign goods. Without pesticides it has been estimated that the price of farm products would increase over 50 percent. Thanks to pesticides the U.S. no longer has to worry about malaria and numerous other diseases.

There are risks in using certain pesticides, especially persistent insecticides (*e.g.,* DDT, chlordane, dieldrin and heptachlor). Safer, far less persistent insecticides have rapidly replaced these older products. None of the newer pesticides currently being used by farmers and grounds managers are leaving illegal residues in cropland or other soils, cow's milk or beef cattle fat. The total use of pesticides on and off U.S. farms has been steadily increasing since World War II, with the largest increase coming in the past dozen years.

Let me destroy some myths about pesticides:

The cancer myth—Age-adjusted cancer death rates in the U.S. (except from lung cancer, which is directly related to smoking), have been steadily decreasing in recent years. In 1950 the number of cancer cases per 100,000 population was 114. By 1960 this had decreased to 107; it was 104 in 1970 and had fallen to 100 by 1975.

The life expectancy myth—The years of life expectancy at birth have been steadily rising in the U.S. since 1910. Lumping males and females together, we started with a life expectancy of 47 in 1910. By 1930 it had jumped to 60; by 1950 the figure was 69. In 1960 life expectancy was 70, and by 1975 it was almost 74.

The food contamination myth—In recent years there has been a general decline in pesticides, mainly persistent

Comments and Opinions

ALL YOURS

This page is open to you for your comments and opinions. Let's hear from you.

Chemical Controversy

A recent turfgrass editorial attacked fault-finding by the environmental control officials. While I have made my share of dissenting comments, I must classify myself as pro-environmental controls. In spite of the many decisions that are based on anti-chemical mentality, hopefully I and everyone in our profession can still recognize these facts and useful measures that are proposed on behalf of the environment. A commentary by Dr. Mal Shurtleff on page 1 provides food for thought.

R.E.E.

Keep off the Grass!

Rarely should this sign be seen. Turf is grown to be used. Turf wear is discussed in detail in this issue on page 3. Control of wear or traffic is a "toughie," but it offers one of the largest opportunities for more use of turf facilities. Study of traffic control procedures and attentiveness to them are key items, but read the article.

R.E.E.

So Long, Russ!

You will note that Russ Stanton's name is not included in this issue as managing editor. Russ edited articles and set up *Green World* with the printer for five years. After the fall 1978 issue, he has decided to retire. Russ, we will miss your pleasant easy style of writing. You had a knack of saying things so nicely with a few words. Thanks, Russ, for all your help and we wish you the best of health and happiness.

Judy Chi, M.A., has promised to watch over the way we turfgrass people write. We are fortunate to find someone with her ability.

R.E.E.

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insecticides, in our food supply. The daily intake levels of insecticides shown in USDA market basket samples (1965—1974) for 30 U.S. cities are *all* well below the Acceptable Daily Intake Levels established by the World Health Organization. In most cases the daily intake was 1/10 to 1/100 of the acceptable level. And it has been steadily decreasing since these studies started in 1965.

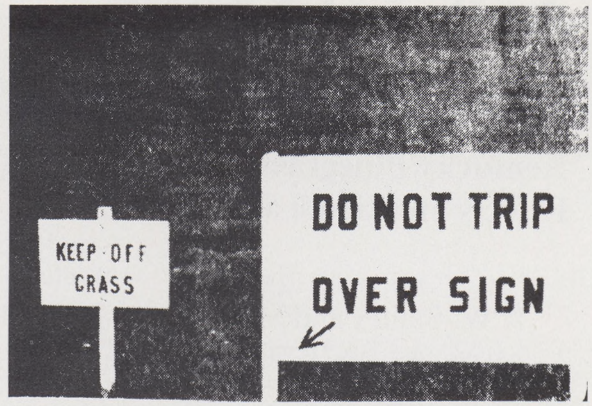
The water contamination myth— Although U.S. figures are hard to come by, a total of 139 water supplies were sampled every five months in Illinois from 1974 to 1976. Pesticide levels were found to be considerably below the allowable limits for all 11 persistent insecticides and the two hormone-type herbicides tested. For example, the allowable limit for chlordane, a very persistent and formerly widely used soil insecticide, is 0.003 part per million (equivalent to about 3 inches in 16,000 miles). Screening levels in the 139 water supplies tested in Illinois showed chlordane at a level of 0.00005 ppm (equivalent to about 5 inches in 1.6 million miles). The other pesticides in the water supplies tested were at comparable levels.

When the first synthetic (and largely persistent) insecticides were developed in the 1940s and early 1950s, the best an analytical chemist could do was to detect a residue of about 1 part per million. With modern chemical methods it is relatively simple to accurately detect residues as low as 1 part per billion or even 1 part per trillion. To put this in perspective, 1 part per trillion equals 1 inch in nearly 1.6 million miles or 1 drop in 20 million gallons.

Our laws now state that any pesticide found to cause benign or malignant tumors in test animals at

(cont. on p. 5)

Correcting Soil Compaction Problems



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Traffic is a major problem on recreational turf. Traffic problems are of three general types: (1) wear to the plant, (2) disruption of the playing surface by rutting or foot-printing, and (3) compaction of the soil. Effects of compaction from vehicular or foot traffic are not always readily apparent. Compaction often acts as a "hidden" injury by making the turf plant more susceptible to other stresses such as wear, disease, drought, heat, cold, etc. Thus, compaction of the soil in the spring may not result in deterioration of the turf until later in the growing season.

Soils which are subjected to compacting forces exhibit increased bulk density, moisture retention, and soil strength, while infiltration, aeration, and resiliency are reduced. Soil temperatures can also be altered; for example, wet soils will be slow to heat up in the spring.

Compaction effects on turfgrass growth are numerous. Important responses include:

(1) Root growth. Depth of rooting decreases but root density in the surface may increase. Also, root structure or morphology can be altered.

(2) Shoot growth. Shoot growth declines due to less tiller, rhizome, stolon and leaf production. Reduced nutrient and water uptake restrict shoot growth.

(3) Physiological responses. Several responses are possible, such as reduced nutrient uptake per unit of root system, altered nutrient ratios within the plant, changes in plant water status, altered carbohydrate and protein metabolism.

(4) Stress tolerance. Compaction may affect the stress tolerance of grasses, particularly high temperature tolerance, scald susceptibility, drought tolerance, and intracellular freezing injury.

(5) Disease incidence. Diseases may be enhanced by high humidity from frequent watering or poor infiltration. Also, plants which are weak will be more susceptible to diseases.

(6) Germination and establishment. Crusting or excessive moisture can restrict turf establishment.

(7) Community ecology. Poor soil physical properties may result in changes in the community composition. Knotweed, *Poa annua,* goosegrass, and clover tend to encroach on compacted soils as desirable species thin out.

The net effect from compaction on turfgrass soils is increased labor, equipment, and expense. Much effort is required to prevent compaction or to alleviate it on effected sites.

ALTERNATIVES FOR ALLEVIATING COMPACTION

Cultural practices for preventing or correcting soil compaction can be grouped into three categories: (a) traffic control, (b) cultivation practices, and (c) soil modification. No single practice is effective but several must be combined for a successful maintenance program.

Traffic Control. The use of constructed pathways of asphalt, wood chips, shreaded bark, etc. is often necessary, especially for concentrated traffic. If paths are to be effective, they must be properly placed with respect to traffic flow. Channeling of traffic can be achieved with the placement of trees, shrubs, or barriers.

On golf course turf, traffic rotation can reduce compaction and allow for turf recovery. Large greens, large tees, and alternative playing surfaces (winter greens) are necessary for proper traffic control. A good cup rotation may involve 8 major cupping sites of 500-700 sq. ft. circles with three minor cupping sites of 150-200 sq. ft. circles per major cupping area. This allows for 24 separate cup placement and, if cups are changed daily, a three-week recovery time occurs between placements.

Tees should be designed wide enough to allow tee marker placement on each half of the tee. When tee markers are placed on the outer edges of tees, players tend to use only the middle teeing surface. Tees should be moved often under heavy use.

Only vehicles with turf-type tires should be used. Vehicles should not follow the same routes but should change mowing and other patterns. Restricting golf carts to the roughs except for right angle entry where the ball lands will substantially reduce fairway compaction problems.

Another facet of traffic control is when to allow foot or vehicle use of an area. If the soil is saturated such as after a heavy rain, the soil will not compact. However, the surface soil structure will be destroyed resulting in crust formation. Also, rutting and footprinting readily occur. When the soil is at field capacity or slightly drier, it is most susceptible to compacting. Traffic levels should be minimized when these conditions occur. Irrigation on a deep, less frequent basis will help, while frequent, light water application keeps the soil near field capacity and prone to compaction. Soils that are moderately dry are least likely to compact. Thus, water management is an important tool for the turf manager in preventing compaction.

Cultivation. Cultivation is limited in turf since you cannot severely disrupt the sod. However, cultivation is a major management tool for improving compacted soils. On areas receiving intensive traffic, a routine cultivation schedule should be followed. Proper cultivation alleviates soil compaction, at least temporarily.

Soil Modification. On areas that receive intensive traffic, soil modification may be required. Partial modification can be achieved by the addition of a foreign material to the existing soil. Sand, calcined clays, peats, and other amendments are used. If partial modification is to be successful, a good topdressing-cultivation program must be followed to prevent layering. Also, the proper amendments must be chosen. Even under ideal conditions, partial modification alters only the surface 2-3 inches of soil and results may not be apparent for several years.

Complete modification refers to the preparation of a root zone mix that may or may not include the existing soil. Examples of well-known complete modification systems are the USGA Green Section green and the P.A.T. system for green construction. Complete modification will be successful only if the components of the rootzone mix are carefully chosen, mixing is complete, and drainage is provided. While initially the cost is high, complete modification can save much money and time on future maintenance and renovation.

Another type of soil modification is with chemical soil conditioners. Examples of chemical conditioners utilized to alleviate compacted soil are: various wetting agents; materials containing algae, fungi or bacteria polysaccarides; bitumenous emulsions, polyacrylmide, polyvinyl alcohol, vinyl acetate maleic acid copolymer (VAMA, Krilium), and others. While some of these materials are effective under specific situations, very little research data are available to support any effectiveness under turfgrass conditions. The traffic on turf areas quickly destroys any aggregation or structure formation that may result from chemical treatment.

Sustaining Members—1979
(as of May 8, 1979)

Andrew Wilson, Inc.
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Seacoast Laboratories
Storr Tractor Co.
The Terre Co.
Twin Rivers Community Trust
Vaughan Jacklin Corp.
Rockland Chemical Co.
Playboy Resort and C. C.

Chemicals (cont. from p. 2)

any dosage is considered to have "an unreasonable adverse environmental effect." The U.S. Environmental Protection Agency has cancelled the uses of a growing number of pesticides on food and feed crops. The cancellations were largely the results of laboratory tests on rats, which showed these pesticides to be *potential* health hazards.

But how much of a hazard? This is the present dilemma. EPA tests require that every candidate pesticide be used at a rate that provides a reaction. Tests often involve dosages several thousand times higher than the exposure a human would be likely to receive during a 30- or even a 50-year period. Many of our most widely used modern pesticides are less toxic when taken orally than are sugar, salt and aspirin. More importantly, these pesticides are *not* stored in the bodies of plants and animals. And even water will kill humans at not much higher volumes than the normal daily intake of two quarts or more. A boy who had a compulsion to drink excessive amounts of water died when he drank two gallons in a day.

Sound judgement on what constitutes a pesticide risk is needed by legislators and the regulatory agencies responsible for carrying out their legal mandates. If not, the pesticide industry in the United States will not survive.

The cost of developing *one* new pesticide was $1.2 million in 1956. By 1964 this figure was $2.5 million. As governmental regulations and requirements for testing multiplied, so did the cost of developing a new pesticide. By 1969 the cost was $4.1 million; two years later this had risen to $9.8 million. In 1975 the cost was $13.2 million. Many company officials gloomily say that today's figure is somewhere between $17 and $20 million with no end in sight.

As the cost of developing a new pesticide rose, so did the odds against a candidate product ever making it to market. In 1956 the odds were 1 in 3,000. In 1964 the odds had risen to 1 in 4,000. In 1969 they were 1 in 6,000; by 1971, 1 in 7,000. In 1975, again largely due to tightening governmental regulations and a demand for more and more testing, the odds were 1 in 15,000 of a new pesticide ever becoming a product. This illustrates why there are only a handful of companies in the U.S. still screening chemicals as potential pesticides. The costs are too great and the odds are getting worse.

The result is a dramatic drop in the number of new pesticides being introduced in the United States. In the 1951—1960 decade 17 new, major pesticides were introduced and this figure rose to 19 in the period between 1961 and 1970. The mountains of governmental red tape, plus a significant decrease in companies screening for new pesticides, dropped this figure to just 3 for the period 1971—1975. Many scientists and citizens are concerned. Where will the new pesticides come from? What will replace present chemicals if they are banned or if resistant populations of pests develop?

Federal and state regulations governing pesticides need to be reasonable and practical. We cannot manage many of our most serious pest problems without the use of chemicals in the foreseeable future.

We know every man, woman and child cannot be protected from every potential or real hazard through the passage of more laws and regulations. For example, some 50,000 peolple die in automobile accidents each year in spite of adding $800 or more in safety features to the family car. Education and understanding are usually the best ways to solve any dilemma if our country is to progress.

EDITOR'S NOTE

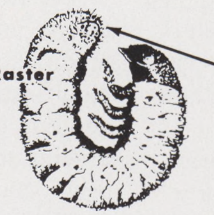
Dr. Robert H. White-Stevens, a Rutgers University professor, appeared on the T.V. documentary of "Silent Spring" with Rachel Carson some years ago. Omission of some of his comments from the presentation made this a disappointing experience for him.

Ironically, Dr. White-Stevens died of an insect bite last fall. One could theorize that this very able man could still be at work if some neighbor was not afraid of pesticides. Agriculture and plant science will miss Dr. White-Steven's deep British accent. This man of giant talent has been lost from the ranks who strive to grow food for everyone.

The North End of a Grub Going South

If a turf grass grub is found, call it a Japanese beetle grub if the raster end has a v-shaped arrangement of bristles.

Grub Showing Location of Raster



Bottom Side of Last Segment Bears the Raster

Japanese Beetle

ABSTRACT

Fungicides in Kentucky Bluegrass Turf: Effects on Thatch and pH

R.W. Smiley and M.M. Craven. Agron. J. 70:1013

The influence of 14 fungicides, one nematicide, and of five mixed fungicide programs, applied over a 3-year period, on thatch decomposition and the resultant pH of underlying soil was investigated on a blended Kentucky bluegrass (*Poa pratensis* L.) sod. The physical depth of noncompressed thatch was measured after samples were removed from plots with a Noer Soil profile Sampler. Cores of 2.54 cm diam were used to determine pH characteristics of the soil profile. Thatch depths among fungicide treatments ranged from 2.8 to 22.0 mm, and the pH (saturated paste in 10 mM $CaCL_2$) of the surface 3 cm ranged from 5.6 to 6.5. Thatch depth and pH of the surface 3 cm of thatch plus soil were inversely related ($r = -0.797$; significant at $p = 0.001$), although differences in pH among treatments were associated with the mineral soil fraction and not with the thatch. Fungicide-induced reductions in pH occurred to depths exceeding 20 cm. Acidification of soil was apparently not the result of organic acids leaching from decomposing thatch, but was correlated ($r = -0.564$; significant at $p = 0.01$) with the contributions of sulfur (up to 491 g S/are/year) from the fungicides. Oxidation of sulfur from decomposing fungicides reduced the soil pH which, in turn, reduced the activity of microorganisms responsible for degradation of thatch. Thatch accumulation was not considered to be due to inhibitory effects of fungicides toward earthworms.

Annual bluegrass will set viable seed in 24 hours after pollination.

Vaughan Holyoke

Keep your "Poa" wet.

William Smart