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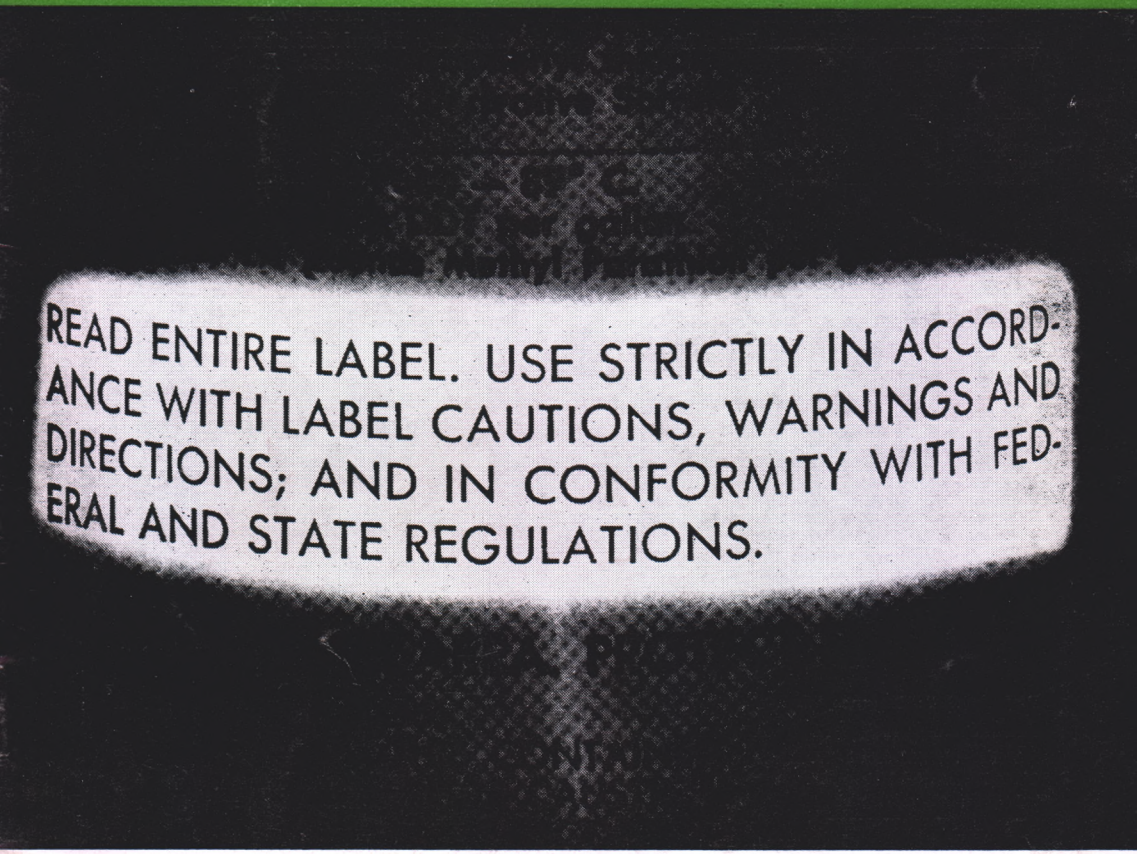
USGA GREEN SECTION RECORD

A Publication on Turf Management
by the United States Golf Association



The most important 21 words in pest control

USGA GREEN SECTION RECORD

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Pesticide Laws and the Golf Course

By **William H. Bengeyfield**, Western Director, USGA GREEN SECTION

In her highly controversial 1962 best seller, "Silent Spring", authoress Rachel Carson vigorously stirred an already simmering pot in the agricultural community. Miss Carson, who died of cancer last spring, was a brilliant and effective writer. Her last book influenced a considerable sector of the American public in opposing and pointing out the perils of pesticides and other chemicals used in modern agriculture. We, in golf course maintenance, are a part of agriculture and we will inevitably be affected by the chain of events developing in this long bubbling controversy. We would do well to be alert to the changing temperatures.

The Crusade

Every crusade of this type, i.e. forced controls through legislation, follows a certain pattern or progression toward its goal. First, there is an emotional appeal to the general public. Newspaper stories and magazine articles on the chemical poisoning of children, pets, wildlife, etc. is high voltage material. It is big news because it is unusual. Deaths caused by accidents in the home or automobile are not quite as "big" because they are not quite unusual (though there are more of them).

A second impetus in the crusade comes from groups that, in addition to believing "it is in the public interest," may have their own interest at heart as well. For example, it would not hurt your business as a commercial applicator if there was legislation requiring everyone using agricultural chemicals to be licensed. The home owner would have to call a local spray man to kill a nest of ants or control the black spot on his roses. Similarly, the golf course superintendent would either have to be licensed (probably for an annual fee) or hire someone else to spray fungicides, insecticides or herbicides for him. It's hard to imagine how one would operate a golf course under these conditions.

To illustrate the degree to which some thinking has reached, one leading and influential commercial applicator has publicly proposed legislating water soluble arsenic materials completely off the market!

The third step of the crusade is gaining legislative action. It is on this plateau that most states stand today. Laws have been proposed on the local, state and federal level that, if passed, would place a tremendous burden on the user of chemicals and might well cause harm not only to agriculture but to public health as well. Virtually all state legislatures are considering some type of increased control over the sale and application of agricultural chemicals. In one extreme case, one state has considered bringing chemical fertilizers under its hand. We in turf management have an interest and must be directly concerned with such laws.

No reasonable person would oppose sound legislation in agricultural chemical control when and if a real need exists. But opposition is required when pressure groups and government agencies take arbitrary and discriminatory action. Parke C. Brinkley, of the National Agricultural Chemical Association, stated the following before the Ribicoff Committee in Washington:

"To deny a grower the use of a compound which he has used safely and effectively and force him to use

another at a higher price would place a cost burden on him and the ultimate consumer. Further, who would say where the line would be drawn to separate 'low' (toxicity) and 'high' (toxicity) materials?"

At the federal level, Congress has resisted pressure groups and has not taken untoward action. It is reviewing the entire problem with cool consideration. The same cannot be said for some states. California is one of them and an example for all to see, study and heed.

Sodium Arsenite Regulated

As early as January 1, 1962 (Miss Carson's book did not appear until October, 1962) the California Department of Agriculture placed sodium arsenite under regulation as an "injurious material." This category is reserved for "any material (the Director of Agriculture) finds and determines to be injurious to persons, animals, or crops other than the pest or vegetation it is intended to destroy." It would seem almost any agricultural chemical is eligible. The sodium arsenite restriction followed a public hearing in Sacramento in May, 1961.

In order to use sodium arsenite in any phase of California agriculture (including the killing of weeds under a proposed asphalt pavement), the user must now obtain permission from his County Agricultural Commissioner. (The Commissioner is appointed to this office, not elected.) He does have certain guide lines he must follow before issuing a permit. Among these is the determination that the property to be sprayed must have "a good and sufficient fence or otherwise made inaccessible to grazing animals, pets and children."

When the California Department of Agriculture made its ruling on sodium arsenite, it either overlooked or ignored the fact that this chemical has been safely used on golf courses in the state and throughout the nation for the past 40 years. As far as the USGA Green Section knows, it has never been responsible for a death when so used. Nevertheless, the Director of Agriculture determined it "injurious" and, therefore, under control. In treating fairway weeds, cost of control went from approximately $1 per acre for sodium arsenite to over $100 an acre when pre-emergence materials are substituted (if the golf course was not fenced). Because of the ruling, several California golf courses have been denied the use of sodium arsenite for weed control.

When the Western Green Section Office learned of the new state regulation, a letter of inquiry was directed to H.E. Spires, Chief, Field Crops and Agricultural Chemicals for the California Department of Agriculture. His reply follows:

"Sodium arsenite was placed under regulation as an injurious material effective January 1, 1962, in view of its history over the years as the causative factor in accidental deaths. Very frequently children were poisoned by exposure to this material, as were grazing animals.

"The problem of complying with the regulations pertaining to injurious materials where applied to golf course fairways was recently brought to our attention for the first time by the Greens Committee of a golf course in San Diego County.

"Under the provisions of the Agricultural Code, permits to use sodium arsenite are issued by the County Agricultural Commissioner. San Diego County Agricultural Commissioner informed us that he learned that the fairways to be treated on this golf course are accessible to children who

play in the area and to horses on adjacent bridle paths. This caused him to be of the opinion that the proposed usage did not conform to the requirements of the regulations and a permit was not in order.

"If a golf course is fenced or the treated area is not accessible to children, pets or grazing animals, the applicant would be eligible for a permit insofar as this provision of the regulation is concerned.

"You have the privilege of petitioning the Director of Agriculture to hold a hearing to amend the regulations; however, it appears that persons contemplating the use of sodium arsenite would prefer to conform to the existing requirements. The conditions of the permit are only those which careful users would observe to prevent accidents and the subsequent liability that would be incurred."

There are a number of points in Mr. Spires letter on which I would like to comment; accidental deaths is one. No one could possibly defend an accidental death, whether it be man or child; yet it is a fact we must all live with from the day we are born. Furthermore, it seems most unlikely that any federal or state government will ever legislate "accidental deaths" out of existence. This would be asking too much.

Becoming overly and emotionally concerned with accidental deaths of children due to agricultural chemicals is easy to do. However, there are more accidental deaths of children due to swallowing aspirin and other medicine chest items than from all agricultural chemicals. Even bee stings have a high accidental death rate among children. It is a fact that the chemical tools of agriculture have a safer accident and fatality record than mechanical tools; yet we do not hear of legislation outlawing or regulating the use of tractors or harvesters. But that day may also come.

When one looks at the national health picture, it is difficult to detect any catastrophic trend that may be attributed to the wide use of pesticides in agriculture. The opposite is true. A child born in 1940 had an average life expectancy of 62.9 years. Those born in 1959 have life expectancy of 69.7 years.

The Privilege To Petition

Mr. Spires advises that we have "the privilege of petitioning the Director of Agriculture to hold a hearing to amend the regulations." Unfortunately, the golf course superintendent or any turfgrass association for that matter lacks the funds for a legal or lobbying staff to follow through the legalistic maze. And more regulations are on the way, for Californians at least. A University weed specialist, writing in "California Turfgrass Culture," (October 1963) commends the sodium arsenite ruling and advises "we should consider substitutes for lead and calcium arsenate in crabgrass control in turf." Apparently, they are next.

"There Ought To Be A Law"

It's typically American. When someone or some group becomes stirred up, their first thought is, "there ought to be a law against that." And the average legislator in any State House seems eager to write a new law, usually with his name attached. Perhaps we have reached the point in agriculture where there are enough laws already and they cover most situations. They may need enforcement but not through growing governmental controls.

Anyone interested in golf course maintenance has a stake in the problem of agricultural chemical controls.

The outcome will directly affect you and your program. As best you can, be alert to pending legislation. Be aware of pressure groups. Resolve to handle all chemicals carefully and condemn those who do not. Through intelligent cooperation with all concerned, a solution—short of rigid and largely unnecessary new laws—will be found.

Development, Labeling, Distribution of Turfgrass Pesticide Chemicals*

By **Dr. J. Everett Bussart,** Chief Entomologist, Velsicol Chemical Corporation, Chicago, Illinois

I wonder what thoughts the title of this paper brings to each of you. To business executives it probably creates visions of new uses for chemical products and the economic implications involved. To salesmen it may raise expectations for new lines of persuasion to complement those that may have lost their freshness. To technologists it could recall memories of endless laboratory and field testing. To theoretical scientists it may give hopes of a new "breakthrough" in the scientific field. To the consumer, it may give a feeling of satisfaction to know a new potent chemical is available. Or, it also may bring confusion as to availability and proper use for this material. At any rate, it is a subject that is much broader than the simple title may imply.

When invited to present this topic, I thought of the extremely broad subject and could hardly visualize discussing this topic in 30 minutes. Then I considered the part Velsicol Chemical Corporation has had in the turfgrass chemical control program. As you know, chlordane and heptachlor have wide acceptance of usage in the various insect control programs. Also, chlordane has gained acceptance as a pre-emergence application for crabgrass control. Just at this time we are evaluating other chemicals for use in the Turfgrass Pesticide Chemical Control Programs such as a fungicide for the control of various diseases of turf and also some selective herbicides. Hence, with products now being used as well as others being evaluated in the Turfgrass Control Programs, I believe you can realize we have faced this topic various times and I speak from experiences in the various steps necessary in placing a new product on the market.

First, let us look at the subject in relation to the broader aspects of the producing and consuming public with which a pesticide is ultimately concerned. Turfgrass pesticides must be used under a variety of soils and climate and management practices that are constantly changing. As a result, the circumstances under which a turfgrass pesticide is used are never the same from state to state or even from one town to another and even within a given area. The control of the pests has to be attempted under these diverse conditions.

Furthermore, living things have great powers to adapt to environmental change and the agricultural environment is changing both naturally and through the efforts of man. Thus,

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when a new pesticide is applied, it is introduced into a situation that is living and changing and may even be changed as result of the application.

Agency Responsibilities

Let us now consider the responsibilities of the various agencies concerned with the development and use of a new turfgrass pesticide. Various Federal Experiment Stations, State Experiment Stations, and other institutions which may or may not be privately owned, contribute to the knowledge of a pesticide through both testing and research. However, I propose to refer to the responsibilities of the chemical industry and of Federal or State Government Offices that are vitally concerned.

Industry's essential objectives are to develop new pesticides and to get them legally on the market with as little delay as possible. Since industry develops new pesticides for sale, it has the primary interest in securing the information required by law for registering such products for sale. This would entail responsibility for securing physical and chemical properties of the pesticide, procuring reliable data on the toxicity to various pests, plants, warm-blooded animals, including the applicator, fish or wildlife as well as to provide the essential information for pharmacological purposes. To carry out these responsibilities, industry must undertake the synthesis of new chemical compounds and the study of their evaluation in tests to determine the performance under field conditions similar to those for which their use will be recommended. Individual companies may vary in whole or in part in discharging these responsibilities but usually they supply samples of the candidate pesticide to Federal or State Experiment Stations for evaluation.

Possibly the easiest way to show the progress or development of a new pesticide is to follow the outline to show the steps in development and marketing of a chemical. Each stage of development, such as biology, chemistry or toxicology, is being evaluated simultaneously. However, for the ease of following the stages of development we will follow each individually up to marketing.

BIOLOGY

From various evaluation studies it is necessary to compile data to determine the pests against which the chemical is effective. Also to establish the correct dosage to apply as well as the proper timing of applications. It is necessary to determine the effects of temperature, light, rain, soil type and fertility on the effectiveness of the candidate material. As indicated in the outline, initial screening tests will give an indication of the possible pests that may be controlled. This is followed by laboratory or small plot tests to establish the dosage needed to give effective control. Finally, large scale or field tests are used to secure information on the control obtained under similar application methods as will be used by the ultimate consumer when the chemical is marketed. The last step before placing a material on the market is to secure label registration from the U.S. Department of Agriculture as well as individual states that have Pesticide Laws. Naturally, all information obtained from the entire outline is necessary in securing the label registration. All the claims we make on a label must be carefully worded since they must be the truth in the language the consumer understands.

CHEMISTRY

The outline for chemistry has been divided into three studies in the devel-

opment of a turfgrass pesticide until marketed. Possibly these divisions could be called Production, Formulation and Analytical.

A. Formulation—A proper formulation is necessary since this often determines the success or failure of a pesticide. Various types of formulations are emulsifiable concentrate, wettable powder, dust or granular. The formulation must be easy to use, designed to get the chemical to the site of action in the most efficient form, and must be economical.

The chemical must be stable in storage for periods of a year or longer and must not be affected by extremes in temperature from below O°F. to above 100°F. The formulation must not separate nor block during this storage period since many formulations have separated or hardened, such as a chunk of concrete six months later.

Containers and container weights must be determined in this development program. This would include the size and type of container, whether glass, stainless steel, plain iron or resin-lined. Those of you that have not had the experience of being unable to get two pounds of material in a five-pound container have not adequately investigated bulk density of the new product.

The chemical properties of the new product must be developed and placed in the technical literature at the time the product is introduced to the market.

B. Production—The first laboratory prepared sample is very small such as one or two grams or less. If this sample shows promise in the preliminary screening evaluation tests, then slightly larger samples must be prepared until the product is ready to be moved into the pilot plant. Process development is necessary to find how the product can be made most economically—first in the pilot plant and finally in the large scale plant. This process development should begin as as soon as a new pesticide shows promise in order to supply quantities of the product for development purposes and operating data for the design of large scale plant.

Engineering is necessary for the design, erection and initial operation of the most economical plant. The Chemical Engineering Department prepares a report at this stage which furnishes rough estimates of costs and return on investment at estimated sales prices and volumes.

Concurrent with the later stages of research and the engineering and erecting of suitable production facilities, a market development must be considered. This market study would determine the possible markets as well as the potential for each market. All of this survey is necessary to provide the Chemical Engineers with enough information as to the possible size of the production plant to produce the necessary quantity of the new pesticide.

C. Analytical—If a pesticide is to be used on food crops it is necessary to develop a chemical analysis method to establish the possible residues on the raw agricultural crop harvested. These residues are not as important when the pesticide is applied to turfgrass, however, a chemical cannot be developed for a specific use but must be included in various control programs to provide sufficient production to insure economical use. If no residues are found, then the product may be registered on a "no-residue" basis under the Federal Insecticide, Fungicide and Rodenticide Act.

When residues are found to occur on food crops, a tolerance must be

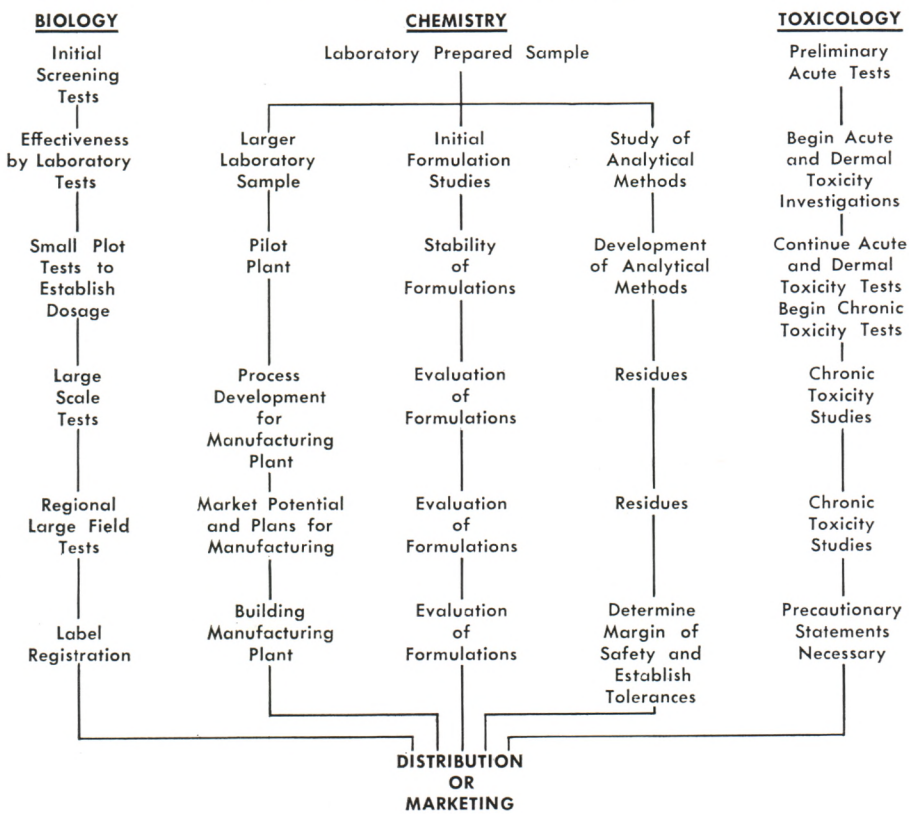
established by a petition to the U.S. Department of Agriculture and the Food and Drug Administration. The USDA decides if the product is useful and renders an opinion as to the correctness of the residue data. The Food and Drug Administration then examines the amount of residues found and if not considered harmful at the levels found will publish the tolerance. The USDA will then register an appropriate label for the pesticide.

TOXICOLOGY

The first preliminary acute tests are made on rats or other laboratory animals to determine the range of toxicity to warm-blooded animals. If the pesticide shows promise then long term animal feeding studies are run concurrently with the large scale biology field studies. The compound is added in various dosage levels to the diets of rats and perhaps other animals. The effects on the animals are carefully noted and compared at various dietary levels.

During the course of the experiments, periodic examinations are made of the blood and general condition of the animals along with organ function tests. Periodically during the feeding tests, small groups of the animals are sacrificed and detailed examinations of their tissues are made. At the termination of the experiments the

DEVELOPMENT, LABELING AND DISTRIBUTION OF TURFGRASS PESTICIDE CHEMICALS



remainder are sacrificed and carefully examined.

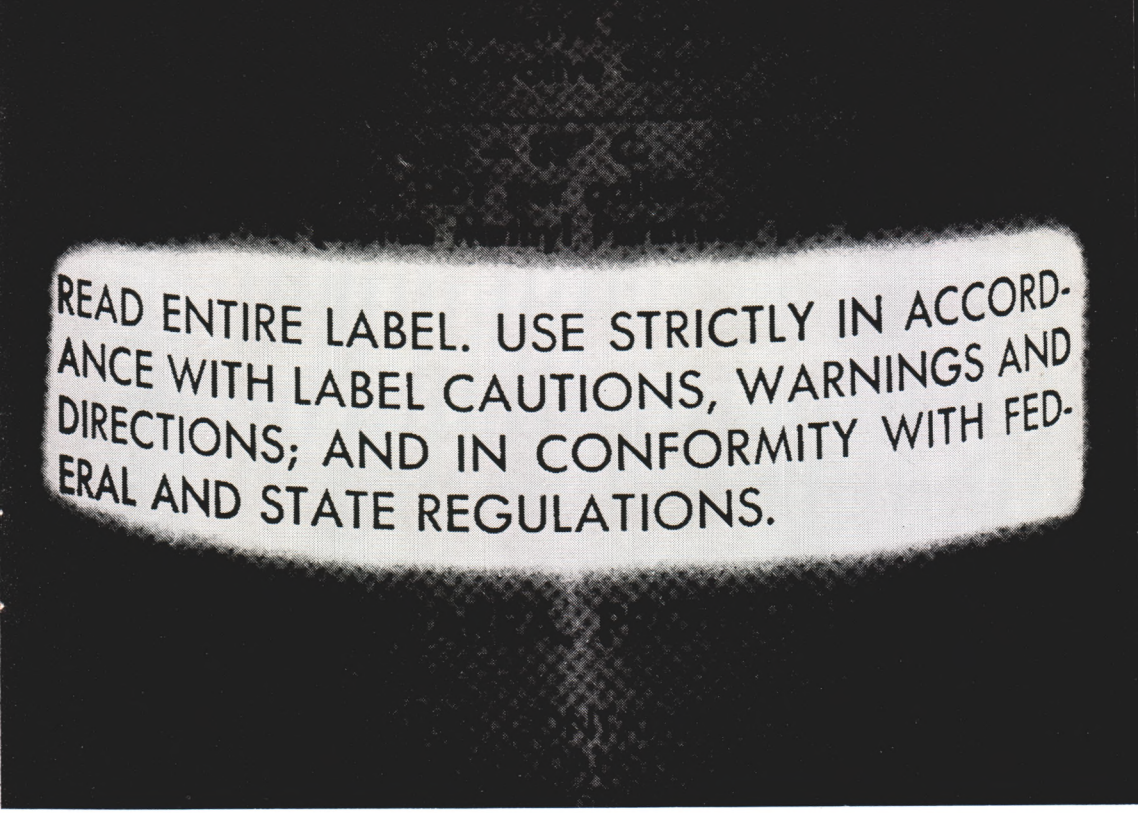
By applying appropriate safety factors to these long-term studies, it is possible to estimate the amount of the residue which will be safe in human food.

After the toxicity studies are completed and the results fully evaluated the necessary precautionary statements that may be necessary on labels for safe use of the pesticide are established.

Finally you may be interested in the possible cost in developing a pesticide through all of these research programs which involves three or more years. The outline gives an estimated cost for the development of a new pesticide. It is difficult to give an accurate estimate of the total costs for development but it is commonly agreed that it will vary from $775,000 to over $3,000,000.

ESTIMATED COSTS FOR DEVELOPMENT OF A NEW PESTICIDE CHEMICAL

		Estimated Cost in Thousands of Dollars
1.	Synthesis 100 - 1500 Compounds	$ 50 - $ 150
2.	Preliminary Screening	
3.	Market Analysis	
4.	Select about 10 Most Promising Compounds	50 - 150
5.	Prepare 50 - 500 Grams Each	
6.	Secondary Screening	
7.	Acute Toxicology	
8.	Phytotoxicity Testing	
9.	Patent Applications	
10.	Select 1-3 Compounds, prepare 25 - 100 Pounds	75 - 300
11.	Analytical Methods Development	
12.	Biological Performance Field Tests	
13.	State Chronic Toxicity Studies	
14.	Flavor and Quality Studies	
15.	Residue Analysis	
16.	Formulation Studies	
17.	Experimental Label Registration	
18.	Pilot Plant Production - 1 Compound	100 - 500
19.	Advanced Field Testing and Comparisons	
20.	Residue Analysis	
21.	Conclude Toxicology Studies	
22.	Process Studies and Plant Design	
23.	Petitions for Tolerances	
24.	Label Registration	
25.	Build Full Scale Manufacturing Facilities	500 - 2,000
26.	Packaging Chemical	
27.	Labeling Chemical	
28.	Sales Literature	
29.	Recommendations	
30.	Market Expansion	
	Total Costs . . . . $775,000—$3,100,000	



The most important 21 words in pest control

You see those 21 words—or words like them – on every pesticide container you buy. They're the whole key to pesticide performance.

It takes thousands of hours of testing to come up with label directions. Laboratory and field tests conducted by professional chemists and agricultural scientists. Tests that have to meet the most stringent standards of government agencies.

But the important thing is what happens when you use the product. Those thousands of hours of tests behind the label directions have but one purpose: to help you get the safest, most effective and economical pest control possible. And following those directions is the only way to make sure you're getting it. That's why it's so important to read and understand the label before using any chemical product.

NATIONAL AGRICULTURAL CHEMICALS ASSOCIATION
1145 Nineteenth, N.W. Washington 6, D.C.

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Pesticides - Boon or Bane?

By **Marvin H. Ferguson,** Mid-Continent Director, National Research Coordinator, USGA Green Section

The use of pesticides has accounted for a great deal of the progress that has been made in golf course management in the last two decades. Chemicals for the control of specific weeds, for the control of insects, for the control of diseases, for growth regulating purposes, and for repelling pests such as rabbits and deer are examples of uses for which we depend upon the products of pesticide research.

Our use of chemical materials on the golf course is paralleled by similar uses in other phases of agriculture. Our dependence upon pesticides has provided a tremendous market and the burgeoning agricultural chemical industry seeks to provide the needs of a consumer who, technologically is becoming increasingly sophisticated.

An example of the speed with which this industry is moving may be seen in the number of listings in The Pesticide Handbook by D. E. H. Frear. In 1958, the Handbook listed 6,129 pesticide products. In 1962, a total of 9,444 products was listed.

Research in all state supported agricultural experiment stations seeks to find more completely specific herbicides. We need materials which have residual effects of varying lengths of time. We need pre-emergence materials and post-emergence materials. A constant search is underway for cheaper, more specific, more effective, safer, and more predictable products.

In the areas of insecticidal and fungicidal research, the investigator likewise seeks effectiveness over a controlled period of time. He seeks low mammalian toxicity and low phytotoxicity. He seeks selectivity.

Above all, the investigator seeks a product that can be handled safely by anyone who may have occasion to use it. The matter of safety to human health, to birds, to fish, and to animals has come to be a matter of considerable interest on the part of the American public.

Much unfavorable, unfortunate, and unfair publicity has been generated by writers who produce sensational "scare type" headlines. Exaggeration of fish kills, bird kills, and sensational accounts of accidental human poisonings have combined to feed the fears of those who may have been impressed by the dangers of pesticide usage.

Testing Procedures

The truth of the matter is that the developers of any kind of pesticide must go through such a rigorous and expensive series of testing procedures that many potentially useful (and perhaps safer and more specific) products are not processed because the developor may doubt that the available market will justify his expenditure. That the procedure is technically involved and expensive is borne out by statements of Dr. J. Everett Bussart in another article in this issue. He estimates the cost of developing and preparing a new product for market to range between $775,000 and $3,100,000.

The producers and users of agricultural chemicals are not alone in the dilemma that seems always to accompany technological progress. Drug manufacturers are haunted by possible harmful side effects of compounds which successfully combat specific ills. The enormous benefits that may accrue from the use of nuclear energy are accompanied by the potentially dangerous presence of increased

radioactivity in the human environment. Even the marvels of modern transportation and automation are not without the detracting spectre of more deaths by accident.

It would appear then, that the duty of responsible spokesmen in this area of science would be to paint a realistic picture for the American public. Most of the people concerned are not scientifically trained. They are ill equipped to evaluate the writings of the responsible reporter in comparison with those of the sensationalist.

Pesticides are necessary in the agriculture of this era. The population of the United States could not be fed without the use of agricultural chemicals. Golf courses would revert to much less pleasant conditions without modern methods of controlling weeds, insects, and diseases.

Pesticides handled properly present very little danger to man, to wildlife, to fish, or to the other factors contributing to man's environment. The key words of the foregoing statement are "handled properly." These words might be applied just as appropriately to automobiles, to fire, to electricity, or to mouthwash. All can be lethal when not "handled properly."

It would appear that all who are involved in the use or commerce of pesticides have an obligation to be aware of the potential dangers inherent in the materials they use. Used carefully in accordance with the instructions of the manufacturer, stored safely, and handled with a knowledge of possible effects upon plants, animals, and man, pesticides can continue to do an increasingly more effective and safe job of controlling the pests that beset us.

COMING EVENTS

July 7
Turfgrass Field Day
Texas A&M University
College Station, Texas

August 12-13
Turfgrass Field Days
Rutgers University
New Brunswick, N. J.

September 9
Turfgrass Field Day
Virginia Polytechnic Institute
Blacksburg, Virginia

September 14-15
Midwest Regional Turf Field Days
Purdue University
Lafayette, Indiana

September 18
Fall Field Day
Illinois Turfgrass Foundation
Urbana, Illinois

Phenoxy Compounds and Turf Injury

By **Lloyd Callahan, Richard Ilnicki, Ralph Engel,** Rutgers, The State University of New Jersey

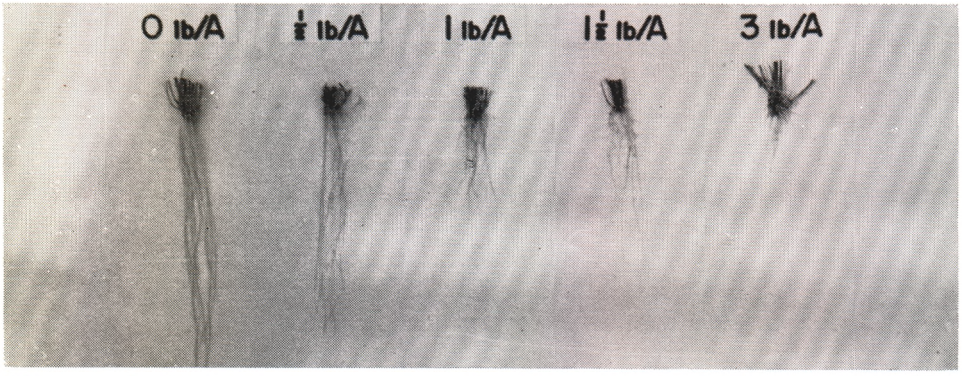
Turf injury from 2,4-D, 2,4,5-T, and silvex herbicides has been suspected and demonstrated on occasions. In a study nearing completion, silvex was injurious to both top and root growth of Colonial and creeping bentgrass. Injury to top growth occurred in most of the treatments and it appeared as discoloration and thinning. Root growth was reduced in total growth and extensiveness by most treatment rates. Other effects from silvex treatments were lower drought tolerance, decreased food reserves in roots, and tissue abnormalities of the roots.

Since silvex and related compounds are very effective herbicides, it is still logical to use these chemicals and assume the risk of injury on many turf areas. If this is done, careful consideration might be given to factors that will reduce the chance of serious injury.

Bentgrass was more tolerant to silvex when grown at cooler temperatures. Early to mid-spring application of silvex after the first flush of new growth was one of the safer periods for treatment. Applications in October, with cooler temperatures, appeared less safe. Late summer to early fall appears very risky if the weather is hot or the grass is weak. The amount of injury from treatments made in the later portion of the growing season was higher than expected. This result might be associated with the grass needs for recovery and rebuilding of food reserves during this period. Applications in late spring with the approaching hot weather are inadvisable especially if supplementary water is not available in dry, hot periods. Hot weather and summer treatments are not recommended if there is need for safety.

Seedling bentgrass was far less tolerant to silvex 2,4-D, and other phenoxy compounds than more mature bentgrass. Other grasses showed the same relationship, but they were less sensitive than bentgrass.

The minimal rate of ½ pound per acre of silvex is much safer to bent-



Silvex, applied to Colonial bentgrass seedlings 10 weeks old, produced serious effects upon the root systems. From left to right, the plants in the photo were treated with 0, 1/2, 1, 1-1/2, and 3 pounds of silvex per acre, respectively.

grass than rates of ¾ to 1 pound per acre or higher. If the weed of concern is easy to kill, the lower rate of ½ pound per acre is the logical choice. Higher rates should not be used without recognition of the greater risk that will be incurred.

Since a significant degree of risk is involved, chemicals such as silvex, 2,4-D, 2,4,5-T, and other phenoxy compounds might be used only on those portions of the turf area where there is a significant quantity of weeds.

ROYCE O. CORNELIUS
NACA News, April 1964

After sifting through the case histories and the conflicting reports of pesticide applications in the past, we reach a conclusion that is inescapable. Pesticides are of great benefit to society, yet they can be dangerous. Similarly, anesthetics, X-rays, and new drugs have been of incalculable value in alleviating suffering and restoring health to mankind. Yet these beneficial materials, unless used with scientific care, are deadly killers. So it is with pesticides, which have been used at times without a proper sense of understanding and responsibility. Certainly we must all work toward improving the understanding and careful use of these materials. While additional safety is desirable, this is not the time to build a pyramid of legislation and regulations on suppositions. Rather, this is the time to expand our already considerable knowledge. We must know more about pesticides rather than use them less.

Much of the criticism of pesticides has been general and sweeping. All users have been tarred with the same brush. This is unfortunate, for hazard differs widely according to use.

TOXICOLOGY*

The 18-Hole Itch

The 51-year-old automobile-repair instructor had a flaming eczemalike eruption on his hands and arms, neck, face and legs. He told the University of Pennsylvania's Dermatologist Walter B. Shelley that he had first had it in 1959, soon after he took up golf. For the next two years it got bad in summer, better in winter. But after the 1962 season began, it stayed bad. He had noticed, the patient said, that it became "explosively worse" after he walked past workers spraying the greens. That was the doctor's clue.

The patient was given a cortisone-type drug and kept off the golf course. Within a week, he was much better. Then Dr. Shelley checked the spray used on the greens. It was a fungicide, and its active ingredient was thiram, a notorious cause of allergies. Since thiram is still used in processing rubber, Dr. Shelley notes in this week's A.M.A. Journal, "the thiram-sensitive individual must avoid such varied rubber products as art-gum erasers, bunion pads, eyelash curlers, condoms, gloves, goggles, dress shields, dental dams, bathing caps, headrests, garters, pessaries, elasticized garments, and mammary prostheses." And now, golf courses.

Dr. Shelley has added an extra hazard to the known perils of the 19th hole. Thiram is close chemical kin to disulfiram (Antabuse), which makes people sick when they drink. A golfer sensitized on the greens may have *a serious reaction* at the bar.

*Time Magazine, May 8, 1964

Editor's Note: Thiram is a widely used golf course fungicide. It has been used regularly on most golf courses for more than twenty years. It has been known to cause a temporary dermatitus, but apparently it is a very rare occurrence for one to be seriously affected by this material.

USGA GREEN SECTION RECORD
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TURF TWISTERS

OVERSEEDING

Question: We have been told that maleic hydrazide is useful in overseeding. Is this true? How is it used?

Answer: Yes, but caution should be observed. MH-30 has shown much promise in retarding bermudagrass when sprayed one week before overseeding for winter play.

Aerate and vertical mow 3 to 4 weeks before seeding date. Allow the grass to recover to the normal putting condition and spray with 1/2 ounce of acid and not over 3/4 ounce in 2 gallons of water per 1,000 square feet. Spray in the morning while it is cool, after mowing. Expect some discoloration of the bermuda. The third day, little or no clippings will be caught in the basket. Irrigate the greens thoroughly so any chemical will be washed into the soil.

One week after spraying, drench the greens with fungicide and seed your mixture into the bermuda. Topdress lightly and keep the seeds moistened until they germinate and begin to grow. Use fungicide regularly to reduce damping off disease activity. One or two years of trial runs on small areas would be advisable until you learn to use the chemical.

MULCHING

Question: This year we plan to mulch our bermuda (Tifgreen) greens during the winter months in order to try to avoid the winterkill we experienced last year. We plan to use cottonseed hulls. Is this a good material? (OKLAHOMA).

Answer: We have had no experience with cottonseed hulls used for this purpose. It is our opinion, however, that such a material may pack too tightly after it becomes wet. You may have more trouble from "suffocation" and disease activity than you would have from winterkill.

May we suggest that you use something like clean oat or wheat straw. Use a blanket of this material 4 to 8 inches thick. Secure it by the use of pegs and criss-crossed strings to prevent its being blown away. Remove it as soon as danger of freezing has passed in the spring.