WEEDS TREES and TURF

MARCH, 1968

Spraymen's Issue

Calibrate Sprayers Often

Turf Enemy No. 1

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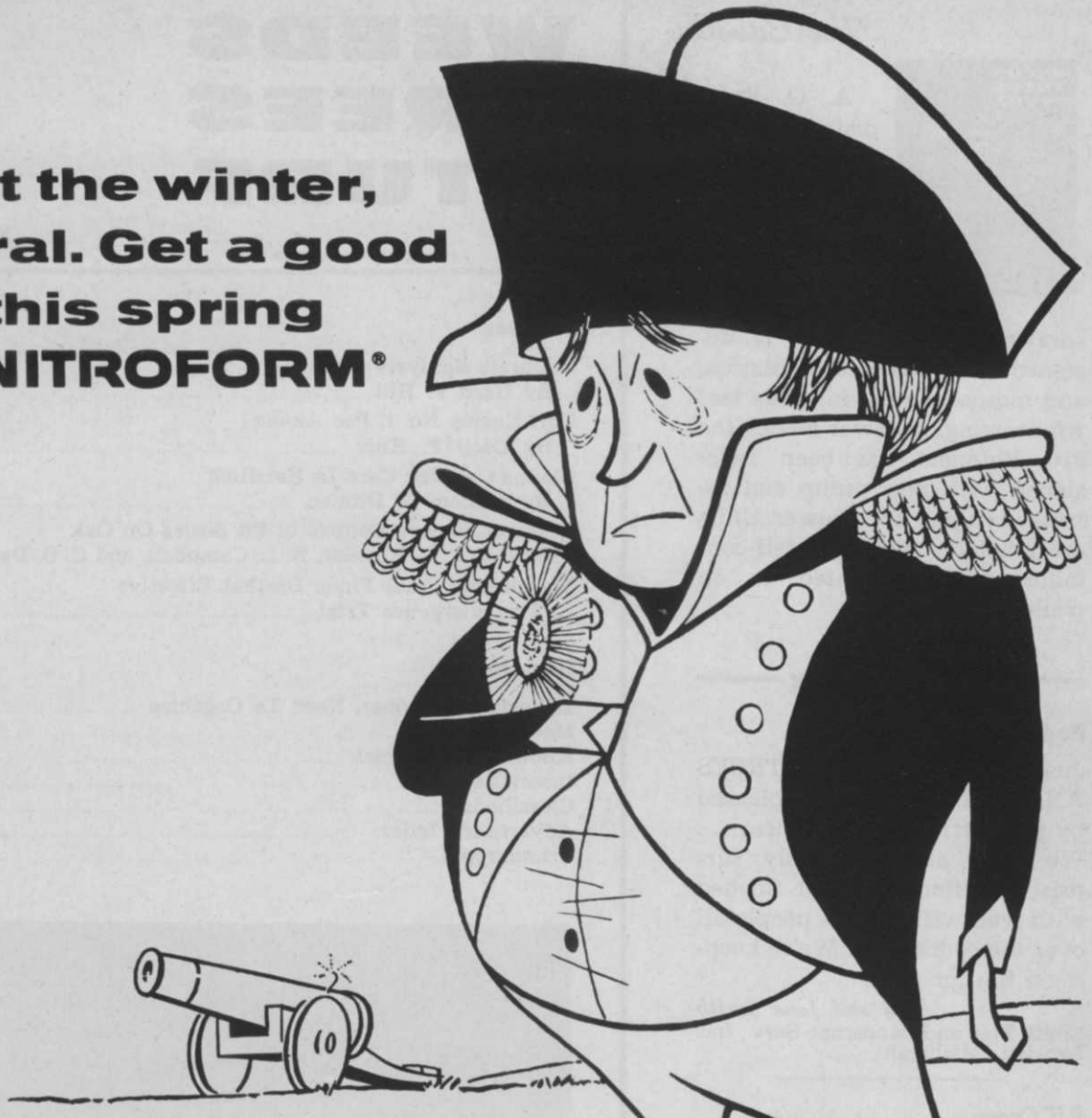

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The Cover

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WEEDS TREES and TURF

FORMERLY WEEDS AND TURF

March 1968
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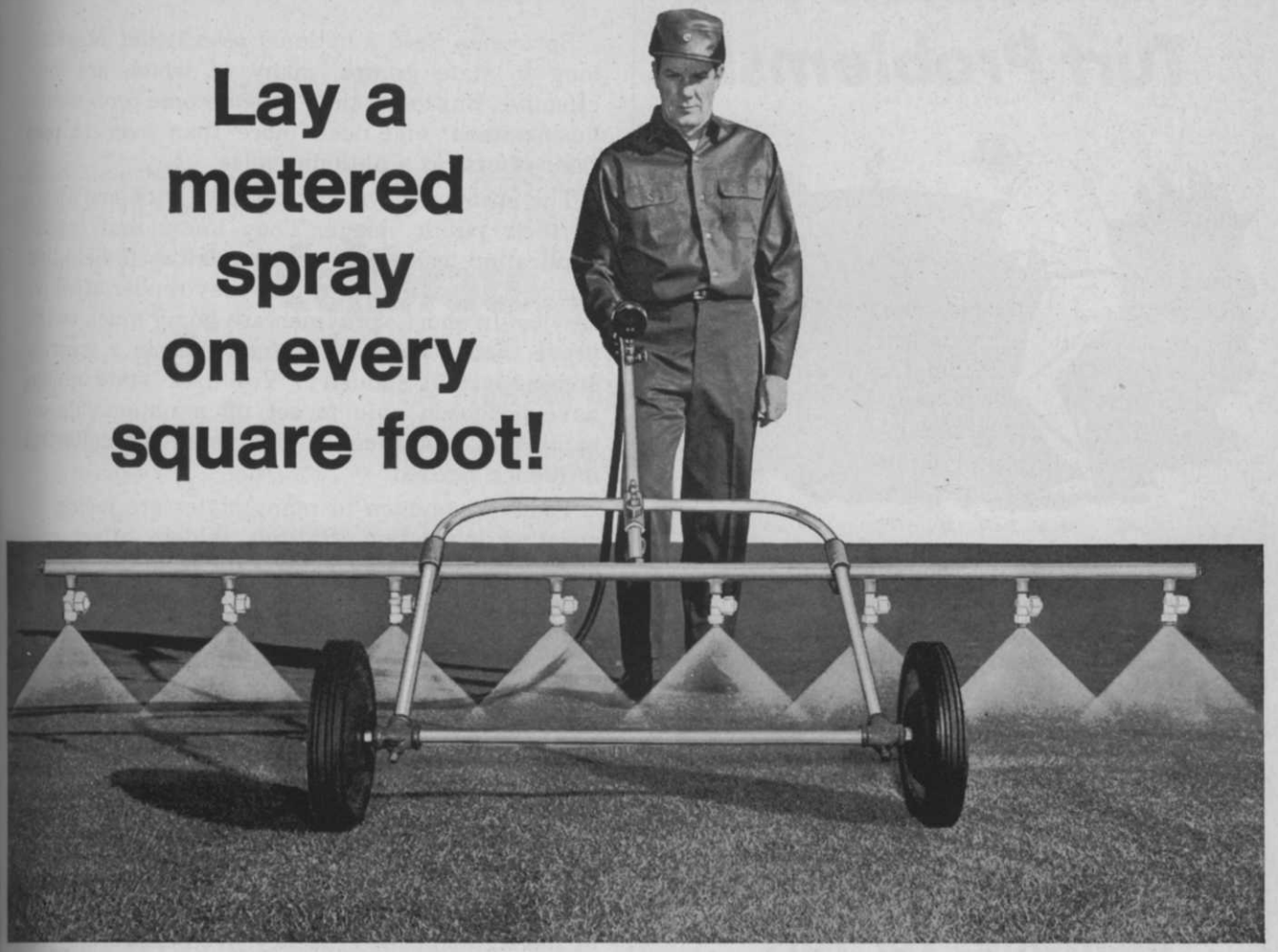

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Spraymen Need to Organize

Spraymen need a national association. Most belong to state groups, many of which are very effective. But today they have become professional businessmen, and need more than ever to pool their efforts as a national voice.

The spraymen we have talked with are aware of their public image. They know that careful application techniques are mandatory to help that image. They are careful that they render effective service. In short, spraymen are doing much to improve their stature as professionals in a growing and important industry. Yet their state groups have not been able to set up a nationwide organization which could give them the collective influence needed.

Today, spraymen in many states are facing restrictive legislation. Rulings seldom affect only one state. Spraymen constantly face new restrictions which affect every spray operator in the nation.

Naturally, certain restrictive rulings are necessary for the common good. But many times these are made without benefit of the combined experience of spray operators. An association voice, particularly on a national basis, could contribute information which would reflect the effect such rulings would have on the professional spraymen.

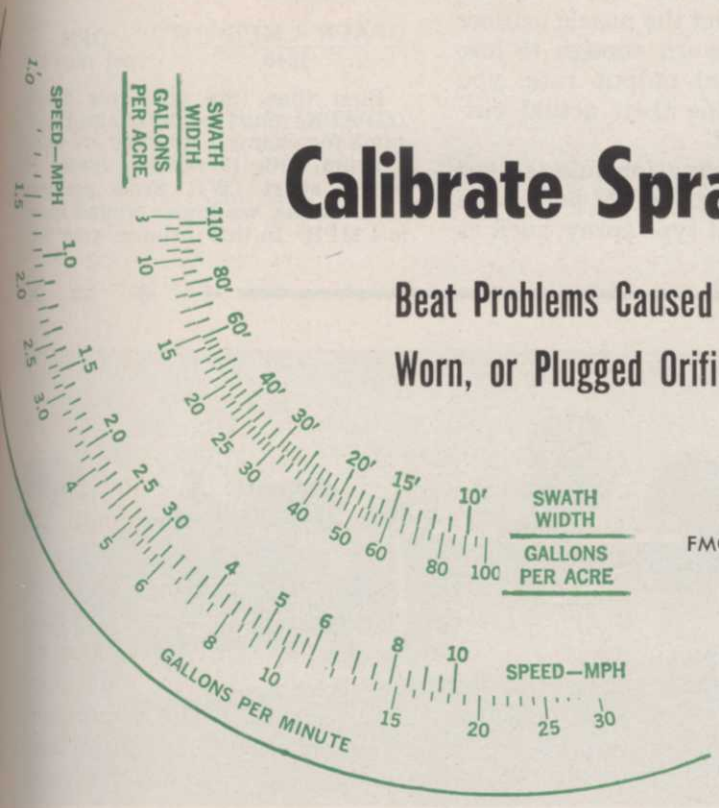
We happen to believe that spraymen can protect their interests and at the same time remain aware of the rights of the citizenry. We believe they can best do this when they are heard in unison; that is, when they speak as a national group.

Most lawmakers are perfectly willing to discuss problems with the individual, particularly when he is a constituent. But we can't believe that the individual will be likely to get action as readily as if he were speaking for a group.

Legislation is but one of the important benefits of national association. Many others can be cited. For example, association programs serve as a central outlet for new information. New research, methods, equipment, business management, and trends across the country become immediately available to the active association member. Help for unusual problems is within easy reach as needed.

We sincerely hope that spraymen, because of the importance of their profession to the nation, will shortly organize nationally.

WEEDS TREES AND TURF is the national monthly magazine of urban/industrial vegetation maintenance, including turf management, weed and brush control, and tree care. Readers include "contract applicators," arborists, nurserymen, sod growers, and supervisory personnel with highway departments, railways, utilities, golf courses, and similar areas where vegetation must be enhanced or controlled.



Calibrate Sprayers Often

Beat Problems Caused By Damaged, Worn, or Plugged Orifices

By HERB P. HILL

FMC Corporation, John Bean Division

San Jose, California

NOTEWORTHY PROGRESS in studies of turf problems by experts at state universities and experiment stations has made good maintenance somewhat easier. Likewise modern chemical technology has developed new chemical sprays which assure good control of both animal and plant pests. Higher costs of modern day chemicals, and critical rates at which they must be applied for best results, make close attention to sprayer calibration important.

Current information, formulas and procedures can help the somewhat perplexing and complicated-appearing task of calibrating sprayers. Correct sprayer and boom calibration are important to the success of a control program.

Consider Four Factors

There are four major factors to consider in the calibration of a turf sprayer:

(1) Nozzle spacing on the boom and boom width;

(2) Ground speed of the sprayer in miles per hour, MPH;

(3) Recommended application rate; in gallons per acre, GPA;

(4) Discharge rate per nozzle in gallons per minute, GPM.

Discharge rate of the nozzle depends on the size of the nozzle orifice and the operating pressure of the pump. Consider all of these factors and how you may utilize them to arrive at the recommended rate of application.

Nozzle Spacing

Nozzle spacing is a known factor, as is the width of the boom. To determine the spray swath, or effective width of your boom, simply measure the distance between nozzles and multiply by the number of nozzles on the boom.

For example, assume you have a boom with 13 nozzles, spaced 20 inches apart. Thus, 13 × 20 = 260 inches, divided by 12″ = 21 ft. 9 in., the effective width of the boom.

Determine Ground Speed

Consider the ground speed of the sprayer and select the speed best suited to the type of terrain. Determination of this speed is made with the tractor and sprayer in motion. When the desired speed is found, drop a marker, a stick or a wrench. Exactly one minute later, drop another marker. Measure the distance between markers to find the number of feet traveled in one minute (60 seconds). With this information, compute the speed of travel, in MPH, with this formula:

$$\frac{\text{Distance in feet}}{\text{Time in seconds} \times 1.47} = \text{MPH}$$

Example: If 360 feet is the distance traveled in one minute, or 60 seconds, the speed of travel is 4 MPH.

$$\frac{360}{60 \times 1.47} = 4 \text{ MPH}$$

In this example, 360 represents the

distance traveled and, according to our formula, is divided by 60, representing the time, in seconds, during which the distance was traveled. This is multiplied by the constant 1.47. Thus; 60 × 1.47 = 88.2 which now becomes our divisor:

$$\frac{360}{88.2} = 4 \text{ MPH}$$

Determination of the speed of travel is the *most important step* in the calibration of a turf sprayer. The method described above is easy to follow. If your vehicle has a speedometer, this step, of course, can be eliminated.

Know Proper Rate

The third factor to decide on is the recommended application rate. This is almost always a known factor and should be the gallons-per-acre (GPA) rate recommended by your turf advisor or experiment station. Such turf specialists should be consulted for recommended application rates for various types of spray materials and control programs. They are best qualified to advise you on these subjects.

Figure Nozzle Output

A fourth factor to consider is the rate of discharge per nozzle in GPM, or the nozzle output. This can be obtained from sprayer manufacturers, manufacturers of nozzle tips, or from spec sheets that accompanied the equipment when it was purchased.

If such data are not available, or you suspect the nozzle orifices (holes) are worn enough to lose their original output rate, you can determine their actual output yourself.

The following formula is used to determine the GPM per nozzle for a blanket type spray, such as is used in overall fairway spraying operations, when the rate of travel in MPH, the *desired* application rate in gallons per acre (GPA), and the nozzle spacing, are known:

$$\frac{\text{GPAPN} \times \text{MPH} \times \text{W}}{5940} = \text{GPM per nozzle}$$

First then, the GPA per nozzle (GPAPN) must be determined. Assume for example, that we are using a boom with 13 nozzles, spaced 14 inches apart (W). From previous calculations, we know ground speed is 4 MPH. In this instance, your turf advisor has recommended 5 gallons per acre (GPA) as the dosage. Next, multiply GPAPN (5) by MPH (4) and then by the nozzle spacing (W) in inches (14). Divide by the constant 5940 and the answer is .047 GPM per nozzle. Here are the calculations:

$$\text{GPM per nozzle} = \frac{\text{GPAPN} \times \text{MPH} \times \text{W}}{5940}$$

$$= \frac{5 \times 4 \times 14}{5940}$$

$$= \frac{280}{5940}$$

$$\text{GPM per nozzle} = .047$$

To apply 5 GPA, using a boom with 13 nozzles spaced 14 inches apart when the ground speed is 4 MPH, each nozzle must discharge .047 GPM.

If the nozzle spacing is 20 inches, which is standard spacing on most booms sold today, use 20 as the value of W.

To determine if your nozzles discharge the correct amount,

With nozzles set to spray at 65 degrees, this boom spray system delivers even coverage with little drifting caused by wind. Boom is 22 inches from the ground.

Eighty degree spray patterns assure adequate overlap by this boom sprayer system. Conical discharge patterns of the spray marks this boom as well maintained.

check the discharge of one nozzle in a calibrated container for one minute, while the sprayer is operating at 40 p.s.i. If the output from the nozzle is supposed to be .067 gallons per minute, 8.5 fluid ounces should have been collected during the one-minute discharge time.

To convert ounces to gallons, use the following formula (128 oz. = 1 gal):

$$\frac{128 \text{ oz.}}{1 \text{ gal.}} = \frac{8.5 \text{ oz.}}{Z}$$

$$128 \times Z = 1 \times 8.5$$

$$Z = .067 \text{ GPMPN}$$

If, for example, more than 8.5 oz. are collected in one minute, substitute the number of ounces you collect for the 8.5 in the above formula to get the nozzle output.

These calculations may not appear to be important, but remember that 3/100ths of a gallon excess output per nozzle, multiplied by the number of nozzles on your boom and the number of minutes of use in the field, will total many gallons of wasted chemical.

Determine GPA from Worn Nozzle

If the nozzle being calibrated turns out to be the proper size, things are fine. However, in case the calibration does not come out as required, don't throw away the nozzles. Here is another formula which reveals what gallons per acre application they will give.

$$\text{GPAPN} = \frac{5940 \times \text{GPMPN}}{\text{MPH} \times \text{W}}$$

For example, multiply the constant 5940 by the actual GPM measured from each nozzle during one minute at 40 p.s.i. This product is divided by MPH × W, and the answer will give you the gallons per acre per nozzle (GPAPN).

Let us say that nozzle discharge was measured to be .067 gal. (8.5 oz.) per minute, that MPH is 4, and the nozzles are spaced 20 inches apart. Putting these values into the formula, we have:

$$\text{GPAPN} = \frac{5940 \times .067}{4 \times 20}$$

$$= \frac{397.98}{80}$$

= 4.9 gallons per acre your nozzle will discharge.

Total GPA is thus found by multiplying the number of nozzles (13) by GPAPN (4.9). The answer is 65 gallons per acre which, in this case, was the recommended rate.

Suppose that the nozzles are

worn, the orifice sizes are enlarged, and the discharge rate is greater but to an unknown degree. This same formula will tell you their exact capacity, as well as the gallons per acre they will apply.

Suppose your one-minute measurement revealed a discharge rate of 12.5 fluid ounces. Convert this to gallons (12.5 fl. oz. ÷ 128 fl. oz. = .097) and you will come up with a figure very close to 0.10 gal. per minute per nozzle. Use this known result in the above formula to obtain the exact gallons per acre you can expect to obtain from worn nozzles. In this example, the calculations look like this:

Abbreviations Used in This Article

GPA = Total gallons per acre
GPAPN = Gallons per acre per nozzle
GPM = Gallons per minute
GPMPN = Gallons per minute per nozzle
MPH = Miles per hour
W = Nozzle spacing in inches
APH = Acres per hour
Y = Boom width in feet
8.25 = Constant for APH
5940 = Constant for GPMPN

$$\frac{5940 \times .10}{4 \times 20} = \text{7.4 gallons per acre per nozzle}$$

Multiplying this result by your 13 nozzles, 13 × 7.4 = 96.2 GPA, the output these 13 nozzles produce. This higher rate per acre results directly from the worn orifices in the old nozzles. If the rate per acre is satisfactory for your program there is no reason why they cannot still be used. But, if the rate is too high, discard the nozzle tips, and buy new ones of correct size. Depending on the abrasives in your water supply, nozzle wear is not uncommon, even within a short time.

It is possible to reduce the GPA rate even with worn nozzles by increasing the ground speed. However, for most courses a speed much more than 4 MPH is not too practical.

What Nozzle Numbers Mean

When you see a nozzle tip which reads 650067 or 65015 or 73039 or 800067 or 8002, have you ever wondered just what these numbers mean to you? Actually nozzle numbering systems are easy to understand once they have been explained.

First thing to remember is that the first two numbers *always* indicate the angle of spray discharge. Thus any nozzle beginning with 65, such as 650067, has a 65 degree spray angle; any nozzle beginning with 80, such as 8002, has an 80 degree spray pattern. The reason for these different angles is to provide a 25% overlap in spray pattern for even coverage when the nozzles are used at various heights from the ground.

For example, when spraying height is 17 to 19 inches from the ground, the wider angle, 80 degree nozzles are recommended. When spraying heights are 19 to 21 inches, an intermediate nozzle, 73 degree series, is recommended. When spraying heights are from 21 to 23 inches, the 65 degree series is recommended. This last series is most widely used today.

Risk of drift is greater at wider angles. Narrower, 65 degree nozzles, provide a coarser droplet size and reduce the risk of drift.

What do the rest of the numbers mean? They indicate the GPM of that particular nozzle at 40 PSI (which is the standard from which all other calculations are made).

Take, as an example, nozzle tip No. 650067, which happens to be the same nozzle used in our previous examples. To know the GPM of this nozzle at 40 PSI, simply count three decimal points from the left and place a decimal point. We find we have the decimal .067, which is the GPM of this nozzle at 40 PSI.

If you had a nozzle numbered 65015, you would count over three places from the left and place the decimal point between the zero and the 1. You would then have the decimal .15, which represents the GPM at 40 PSI of this nozzle. If you had a nozzle carrying the number 73039, you'd place the decimal point three places from the left between zero and three; the nozzle would have an output of .39 GPM at 40 PSI. Now let us say you have some nozzles marked 800067. Counting three places from the left, you'd place the decimal point between zero and zero. The remaining decimal is .067 GPM at 40 PSI; the same as nozzle No. 650067 used in an earlier example, but in the 80 degree series. Thus the GPM capacities of various spray angles, can be duplicated.

Set Pump Pressure

Up to this point we have not discussed pump pressures. To maintain the gallonage requirements per nozzle, pounds of pressure per square inch must be known. When a nozzle chart is not available, this can pose a problem because it is necessary to maintain exacting pressures in order to obtain an accurate rate of discharge from a nozzle.

The formula to obtain the GPA per nozzle has been shown. From our example, we determined that .067 GPM per nozzle was required. To determine the proper pressure setting at the relief valve, or regulator, the following steps should be taken:

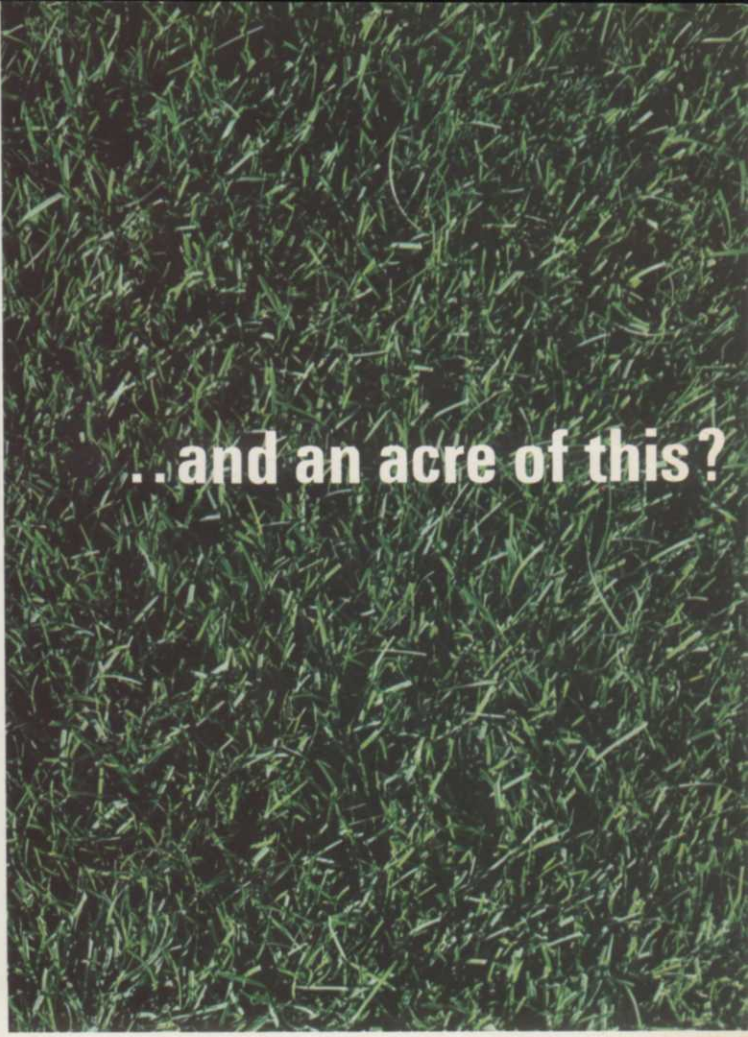
(1) Install all nozzles in the boom.
(2) Start the sprayer and run at factory-governed speed if engine driven; if power-take-off (PTO) operated, set tractor throttle at predetermined position for the proper ground speed we have selected and the proper PTO speed. This should be the equivalent of 560 RPM on the PTO shaft.
(3) Set the sprayer relief valve or regulator at an approximate setting of from 40 PSI to 60 PSI.
(4) Start spraying, open the boom valves to full capacity. Catch the discharge from two or more nozzles in separate containers for exactly one minute.
(5) Measure the material discharged and compare it with the quantity needed. As we have previously determined, this quantity should be .067 gal., or 8.5 fluid ounces per nozzle. If the quantity discharged is too little, increase the pump pressure slightly and recheck; if the quantity is too great, lower the pressure slightly and recheck.

Several settings may be required the first time this pressure calibration is made, but with a little experience, much less time may be required for later calibrations if they become necessary.

Formula for Acres per Hour

Still another formula we have not discussed is quite useful to

(Continued on page 44)



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Turf Enemy No. -1-

Young, immature Poa Annua plant is typical of those found in turf areas. This particular plant was pulled from a green at Beverly Country Club, Chicago, Ill.

Poa Annua

By Cecil F. Kerr

Turf Manager, Rhodia, Inc., Chipman Division

Why is *Poa Annua* such an unsavory weed? It grows vigorously (part of the time); it reseeds itself (much of the time); it is fine textured (even at putting green height of cut); and it survives in some bad areas (when conditions are favorable). A professor said, "Review is good for the soul." Let's then, before we go further into any discussion, review what *Poa Annua* is:

Scientific *Poa Annua* name: Annual bluegrass, misnomer for common name. This is a short growing tillering plant which grows well in cool weather, which tolerates low or high fertility and whose seed germinates quickly whether fresh or old seed. Also, rapid growth makes it very competitive. Then why did Dr. Daniel, Turf Specialist at Purdue University in a 1966 Midwest Turf Newsletter say, "I'm tired of *Poa Annua*"?

Many turf managers do a good job of maintaining *Poa Annua* and hope to keep it as turf. They may water frequently to avoid wilt; fertilize often and lightly to avoid stress; and avoid mowing when stress could occur.

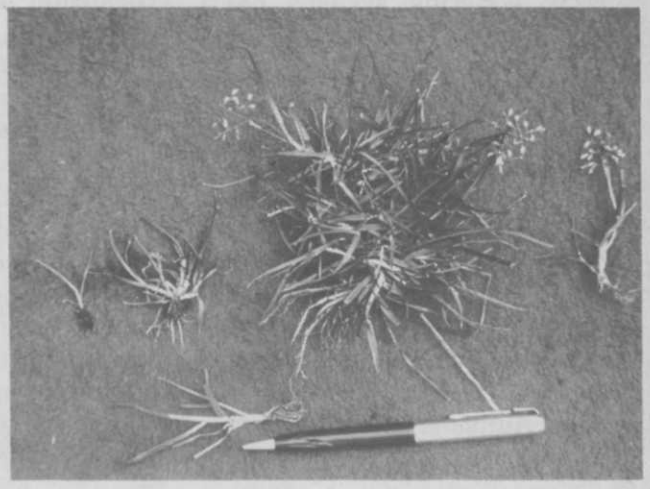
Why Poa Annua Fails:

In the north where cool season grasses predominate, turf managers fear the loss of *Poa* throughout the summer. The fear, however, in the southern warm season grass area is loss of *Poa Annua* during the early transition period from *Poa* to green bermudagrass. During this critical period the area is spotted and poor golfing conditions prevail.

(a) *Poa Annua* is easily smothered by ice and snow. Superintendents in the south experience ice damage almost as often as they do in the northern climate.

(b) During the summer, turf managers are confronted with hot humid days and nights. Disease rapidly infests *Poa Annua* —our turf enemy is dead! It can happen literally over night.

(c) Hot, dry winds will cause our enemy to fail. Dr. Daniel of



Pencil gives an idea of size of Poa Annua plant, seedhead and parts.

Indianapolis Country Club Golf Course Superintendent Terry Pfotenhauer checks one of his **Poa Annua** free fairways, Indiana.

Bare areas may exist when **Poa Annua** is removed, shown here by Norman Kramer, Point-of-Wood Country Club, Benton Harbor, Mich.

Purdue University states, "The shallow-rooted *Poa Annua* is comparatively weak and its transpiration rate is high. Also, it has little drouth protection mechanism — rolling, folding hairs are missing and the result is 'failure grass,' measured in hours, not days." The author has watched a fairway wilt one afternoon in Cleveland during the month of September. The superintendent thought his problems were over, but *Poa Annua* was still going out from dry wind.

(d) Wear destroys our enemy. *Poa Annua* has a contiuous fight to exist with the increased number of golfers and golf carts.

(e) Excessive watering following the establishment of new fairway watering systems has caused many fairways to be over 90% *Poa Annua.*

James L. Homes, USGA Green Section, Agronomist, stated in his 1967 report at the Illinois Turf Grass Conference, "Golf course superintendents in this area can not trust *Poa Annua* any given year." He further states, "Of real significance is the encroachment following irrigation, and a reduced height of cut. *Poa Annua* is extremely difficult and expensive to control. Arsenicals are effective when used properly." This leads to the point of our further discussion— when used properly. We have to understand *Poa Annua* and the chemical used to restrict this enemy.

Background:

We have all been aware of increased crabgrass and *Poa Annua* in recent years. The installation of watering systems, decreased useage of arsenicals as insecticides, and increased useage of chlorinated hydrocarbons have caused this enemy to be a golf course menace.

We have reported in the past that Purdue University initiated *Poa Annua* control research with lead arsenate as early as 1951. Tri-calcium arsenate was first tested in 1954. Purdue tested four arsenical formulations in 1958. Ten out of seventeen of these tests averaged 98% crabgrass reduction.

Dr. Ralph E. Engel, Dr. Richard D. Ilnicki, and Alan Morrison of Rutgers University have reported recent arsenical research on preemergence chemical effects on annual bluegrass. Eight materials were included in the test. Treatments with calcium arsenate on bentgrass gave the only effective control of annual bluegrass after 16 months. The estimated control ranged from 64 to 94% for their three test locations. This report further states that a split application of 5 pounds of actual calcium arsenate or more 1,000 square feet should not be applied except in cool growing periods when more cool growing weather is certain to follow. Also, it seems desirable that all retreatments be no higher than three to five pounds.

Formulations:

This study discussed turf quality. Turf quality was measured by the amount of playable area present after *Poa Annua* was removed in areas where the *Poa Annua* is the predominant species. The removal of all the *Poa Annua* at once will result in a poor playing surface. Calcium arsenate did not injure bentgrass. Abundant stands of *Poa Annua* will be removed with one treatment if too heavy rates are applied. It is, however, advisable to apply higher rates of tricalcium arsenate on soils that contain high rates of phosphates; otherwise it may take so many years to reach *Poa* toxicity that the turf manager may become discouraged with the program.

There are many powdered tri-calcium arsenate formulations on the market that vary in availability of free arsenite. Many agricultural formulations manufactured as a cotton insecticide can be as toxic as sodium arsenite. In 1960 48% tri-calcium arsenate was granulated on a vermiculite base which afforded more uniform application and a more gradual release. Research has continued to improve this formulation. Most superintendents prefer the safety and ease of application of the granular formulation.

Arsenic Toxicity:

Purdue University has reported on the relationship of arsenic toxicity to phosphorus ion uptake in the roots. It is important to use little or low phosphate fertilizer while weakening *Poa Annua*. It is also important to maintain arsenic toxicity with light annual applications after arsenic is present in toxic levels in the rootzone.

Arsenic toxicity will control smooth and hairy crabgrass, foxtails, common and mouse-eared chickweed and *Poa Annua* species.

The major fine turf grasses (bluegrass, bentgrass, bermuda and zoysia) are tolerant to arsenical levels which control weedy grasses.

During the early history of *Poa Annua* programs, golf course superintendents applied full, even excessive rates of arsenicals eliminating all the existing *Poa Annua*. It was difficult to reseed these areas because of excessive dosages and inadequate watering systems.

Injury often occurred in the low pockets. It occurred in areas that did not drain rapidly. Representatives of many organizations such as the Milwaukee Sewerage Commission and the USGA Green Section observed that heavy rates were unpredictable as were applications to poorly drained areas. Therefore, improving drainage with trenching and vertical slitting should be part of the improvement program. Light split spring and fall applications of tri-calcium arsenate are essential. They observed that desirable seed readily germinated after light applications were applied. They also observed that adequate watering systems and proper aeration were necessary for a successful program.

Through continued university and industrial testing, golf course superintendents, practical experience, and guidance from Milwaukee Sewerage Commission, and the USGA Green Section, the arsenical program became more practical.

A paper, "*Poa Annua* Restriction," related several earlier case histories of problems and progress from arsenical users. This paper will review recent progress made by golf course superintendents using tri-calcium arsenate.

Recent Case History Changes:

Len Hazlett, superintendent, The Country Club, Cleveland, O., started test work in the spring of 1959. His fairways were approximately 80% *Poa Annua*. Len applied 24 and 36 pounds in one application of 48% tri-calcium arsenate granular per 1000 square feet, in duplicated plots. These plots were completely covered with bent the following spring. Hazlett was still reluctant to initiate a broad scale program, so tested several gradual application plots and was quite satisfied with the results. Since then he has tried to manage for best bent growth and has seeded some bent into his fairways each year. Meanwhile he has added much drain tile and now plans to do some surface contouring. Hazlett has established good communications with his membership. They are, after extensive testing, starting a gradual *Poa Annua* control program on all turf areas.

James W. Brandt of Danville Country Club, Danville, Ill., did some of the earliest testing of tri-calcium arsenate in 1958. He applied four separate plots of 2 parallel 10 foot strips across the fairways. Seeing the dramatic control of crabgrass, all fairways were treated in March, 1959, with 435 pounds of 85% tri-calcium arsenate per acre. In 1961, 1964 and since, an annual application of 80 pounds per acre per year has controlled chickweed, *Poa Annua* and crabgrass.

Recently this course has installed watered fairways. Crabgrass was the only original problem. *Poa Annua* could become a problem. Brandt plans on applying 1 to 2 pounds per 1000 square feet of 48% tri-calcium arsenate granular twice during the season, applications being made in May and September.

The turf at Kensington Metropolitan Park Golf Course, Milford, Mich., consisted of 50% bent, 45% *Poa Annua* and 5% bluegrass. Jim Smith ran five test strips across number 14 fairway. Each was 30 feet wide with a 10 foot untreated check between. On strip A, 8 pounds of 48% tri-calcium arsenate per 1000 sq. ft. was applied in the fall of 1966, spring of 1967 and fall of 1967.

This program stunted *Poa* visibly yet didn't leave objectionable dead spots or voids. Bentgrass appeared undamaged and was beginning to compete with *Poa* for room. Meanwhile the *Poa* was generally yellow-green and stunted. Sufficient bent germinated from overseeding to help compete with the weakened *Poa Annua*, but some retarding was evident.

On strip B, 12 pounds was applied at the same intervals. On strip C, 16 pounds was applied only fall and spring. This test left many small voids. The overseeded bent was retarded. On strip D, 16 pounds was applied in the fall of 1966 followed by two 8 pound applications. On

strip E, two 8 pound split applications were applied in the fall of 1966 and followed by two 8 pound split applications the spring of 1967. These applications were made 13 days apart. It appeared that a split application produced more yellowing on the *Poa Annua*.

In all the tests conducted, no injury was observed on the existing bent and the bent spread. In the areas where less than 8 pounds was applied at one time; objectionable dead spots were not evident and overseeding survived.

In the fall of 1967 Smith started an overall program of 4 pounds per 1000 sq. ft. on all fairways with plans for repeat applications in the spring and fall of 1968.

Earl Dowell, superintendent of Lafayette Country Club, gradually developed a successful *Poa Annua* restriction program on a new 18 hole course at Battleground, Indiana. Dowell is going to prevent *Poa* from becoming a problem by gradually building arsenical toxicity. Both spring and fall, Earl is applying 4 pounds of 48% tri-calcium arsenate granular, and expects to achieve toxicity in two years.

The Country Club of Indianapolis has one of ten better *Poa Annua* programs. The original program was started in 1961, by Don Clemans, then Terry Pfotenhauer continued in 1964, 1965, and 1966. Nine pounds of 48% tri-calcium arsenate granular per 1000 sq. ft. were applied half each about March first and August first. In 1967, 5 pounds was used. The total application for these 4 years was 32 pounds of 48% tri-calcium arsenate granular to all fairways and tees with the exception of #17, which was not treated due to the fact that it was 99% *Poa Annua*. This is his next project. Meanwhile, lead arsenate is being applied to the green for *Poa Annua* prevention.

At Louisville Country Club, Ray Phillips started an arsenical program on bent fairways. He applied 200 pounds per acre of 48% tri-calcium arsenate granular in October 1966 plus another 200 pounds in March of 1967. These applications were made with an E-Z Flo spreader. A brief thinning of *Poa* was noted in May, but there was no discoloration to the bent. There was excellent control of soft crabgrass throughout the season, but small infestations of silver crabgrass existed in localized areas.

Louis E. Miller, now superintendent, continued the program by applying the third 200 pounds on October 22, 1967, and plans on applying 200 pounds of 48% tri-calcium arsenate granular each spring and fall until control is achieved. The control of soft crabgrass has been excellent and 10% *Poa Annua* is the current estimate.

Edward Riley, Manufacturers Golf and Country Club, Oreland, Pa., started testing tri-calcium arsenate in 1960 and 1961. Silver crabgrass control was most encouraging so the spring of 1962 he treated most of his 18 hole golf course with 10 pounds of 48% tri-calcium arsenate granular per 1000 sq. ft. The fairways were comprised of silver crabgrass, *Poa Annua* and very little bent grass. This treatment controlled the silver crabgrass and reduced the *Poa Annua*. Riley continued to treat the fairways every other year with 10 pounds of 48% tri-calcium arsenate. In some fairways where *Poa* was not prevalent, applications of 5 pounds per 1000 sq. ft. were applied. This year Riley plans to treat all fairways at 2½ to 3 pounds. Riley has not reseeded to any extent since 1959; yet today the fairways are over 90% bentgrass!

Norman Kramer, superintendent of Point O'Woods Country Club, Benton Harbor, Mich., applied 10 pounds of 85% tri-calcium arsenate to his greens in the spring of 1960. Norm states, "We followed this program every year since 1960, and I feel it has done a fine job of keeping *Poa Annua* out of the greens plus we have had no crabgrass, chickweed or earthworms on the greens."

Kramer started a complete program on all fairways in 1964. He applied 5 pounds of 85% tri-calcium arsenate powder with a broadcast type spreader in August, which gave a poor spread of powder.

Since 1965, he has applied 85% tri-calcium arsenate each year with a single fan jet nozzle mounted on the back of his sprayer. This nozzle handles one pound of powder per gallon of water well.

From his experience Kramer concludes:

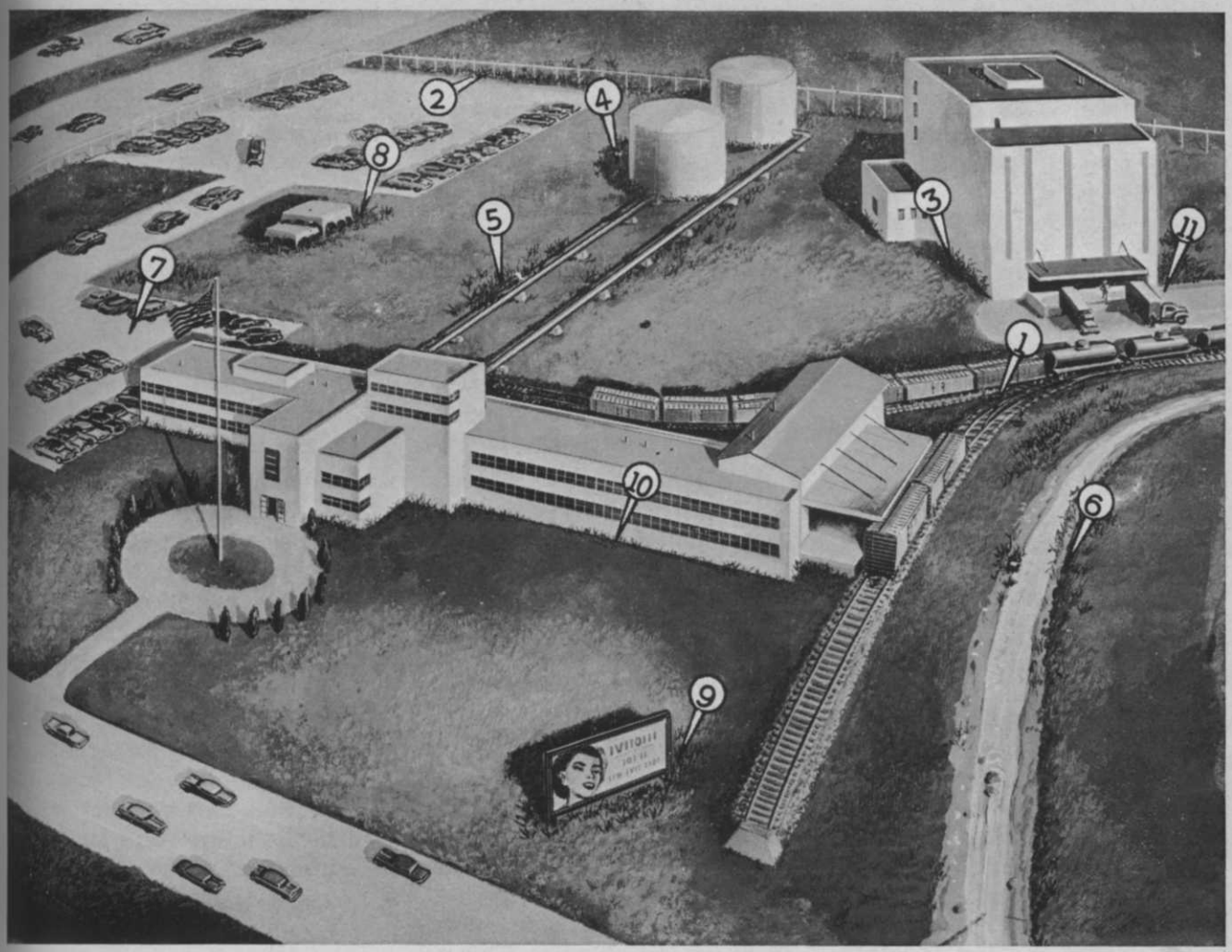
1. Make certain soil moisture is near field capacity.
2. Spray tri-calcium arsenate on with fan jet nozzle.
3. Use as little phosphate fertilizer as possible.
4. Overseeding can be done after applying tri-calcium arsenate.
5. Early spring and early August seemed to be the best time of application.

Our crabgrass, chickweed and earthworm problems on the fairways are completely controlled. Do not mow for at least two days after spraying tri-calcium arsenate.

Ted Woehrle, superintendent of Beverly Country Club, Chicago, Ill., attempted to establish a good cover of bluegrass. The pH was 6.5 and P_2O_5 level was high (400 to 600 available per acre). He seeded a mixture of 25 pounds bluegrass per acre with an alfalfa seed drill. He had not been applying phosphates for several years in an attempt to lower the phosphate level.

Ted sprayed two applications of 4 pounds of 85% tri-calcium arsenate per 1000 sq. ft. two

(Continued on page 43)



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Real or Imaginary

Claims Call For Care In Handling

By WILLIAM D. DITMAN

Rights-of-Way Maintenance Supervisor, Appalachian Power Co., Roanoke, Virginia

CLAIMS may well be a necessary evil of industry, but they exist and will continue to plague even the most public relations-conscious company. Company policy, however well attuned to the technical and safety aspects of operating, cannot always avoid either the valid or the imaginary claim.

Proper handling of claims is a most important aspect of the pesticide business in our company, as it is in practically every similar organization. We give every claim prompt and careful consideration. We feel it is not only in the public interest to do so, but also is required public relations policy for us.

This does not mean we pay a damage claim every time we get a call. However, it does mean that we set in motion a previously determined procedure for settlement which we believe to be fair to all parties; that is, to the company and to the claimant.

With the tremendous increase in the use of pesticides, there will be a corresponding increase in the number of claims, real and imaginary, that will be given to the applicator. Those engaged professionally in the pesticide business must evaluate this phase of their activities — handling claims—to insure that conditions are not established which could create an undesirable public reaction that would result in restrictive legislation affecting the business of the applicator and the best interests of the public at large.

All too frequently, claims have been handled with the philosophy that if you ignore them they will go away. Sometimes they do, but frequently they result in bitter emotional conflicts that not only tarnish the name of the applicator but also the image of the profession. The other extreme is to settle all claims, real or imaginary, at any price, in the mistaken belief that a policy of "instant money" is good public relations and that it is cheaper to pay than it is to make a thorough investigation. This policy is as disastrous as the first. It does not take the public long to recognize that there is a "patsy" available to compensate them for all types of problems in or near the vicinity of the work. Settlement without proper investigation also creates in the mind of the public an impression that there may be problems which are not apparent.

Handle Each Claim As Soon As Possible

In my opinion there is a technique of handling claims, real and imagined, that is in keeping with the image which the professionals would like to establish. First, handling the problems of the public is a very difficult job and should be the responsibility of properly trained and highly motivated personnel interested in exercising responsible business citizenship.

Second, the complaint must be handled in a timely manner with the investigator arriving on the scene as soon as possible. It must be kept in mind that time destroys the evidence of what really happened. Responsive action also impresses the inquiring party with the fact that you are truly concerned about his problem. Lost time also results in hardened attitudes, and each hour that passes makes it more difficult to arrive at an amiable settlement.

Third, the most important ingredient is the attitude of the agent assigned the task. It is imperative that he make a fair and thorough investigation of the incident with the attitude that he will find the basis of the problem. It has been the experience of one company that over 50 per cent of the complaints have no connection with its activities. These include quacks, damage from other sources, and people just looking for conversation and information. All must receive prompt, courteous, and reasonable attention. There is no room for abrupt attitudes.

Every company must accept the fact that claims are a real, if negative, part of the business, and one must react in a positive manner. There must be a stated policy and plan for handling complaints. This is really very simple. The policy:

I. All claims will receive a thorough, fair investigation.

II. Adequate compensation will be given for damage resulting from the operation.

III. Claims received but resulting from a condition not related to the operation must be settled by clearly establishing the real problem.

Cause At Times Is Difficult to Spot

Frequently, the real cause of the problem is not readily identifiable. In these situations the applicator and prime user must take action to discover the nature of the problem. Outside help from knowledgeable personnel such as plant pathologists, plant physiologists, horticulturists, agronomists, and veterinarians should be sought. Claims concerning plant damage can normally be resolved in conjunction with the state agriculture extension service and the state agriculture school.

A prerequisite for properly handling claims is the acquisition of sufficient information and data on similar situations. Complaints involving plant damage are relatively simple to handle, as there is a wealth of data available at all the state agricultural colleges and the symptoms are easy to spot. If the investigation is timely, there is no reason why these cannot be settled most of the time.

There is one area where an investigator can be in trouble because of a lack of valid information, and that is when the damage claim involves animals. These are the most difficult and sensitive problems that the claim agent has to handle. We have hired a consulting veterinarian to represent us and to investigate all animal complaints. We believe it is imperative that a trained man handle these complains, as it is impossible for a layman to arrive at the true cause of the problem. This policy is also good for our public relations as frequently the vet is able to ascertain the real problem and advise the farmer so that he can take remedial action and prevent further losses.

Frequently, the vet must become a detective and try to determine from his investigation of the herd and the farm area the cause of the problem. There is a limit at the present time as to how far he can go because there is a lack of information available which will help him in making his investigation. There is no single source of information that he can turn to for help. There is a real need for regional animal poison control centers that would have all information pertaining to all pesticides, poisonous plants, pathogens, and other causes of animal deaths. The resources of this center should be readily available to the vet. Information should be funneled into these centers from the chemical companies, other centers, and the field vets. In this way, all knowledge of pesticides would be available to claims agents.

Finally, an exact record of every complaint—real or imagined—must be maintained. This record should be established as soon as an incident is noted and every contact or change in the situation noted. In the event of legal action or investigation by outside sources, it will be of extreme value to have this information.

Handling of complaints is one of the most important tasks associated with our business. The manner in which we perform this task will be reflected in the public attitude toward our companies, the public attitude toward our profession, and the government's attitude toward our activities. We must make certain that we have done everything in our power to create the type of professional image for which all of us are striving.

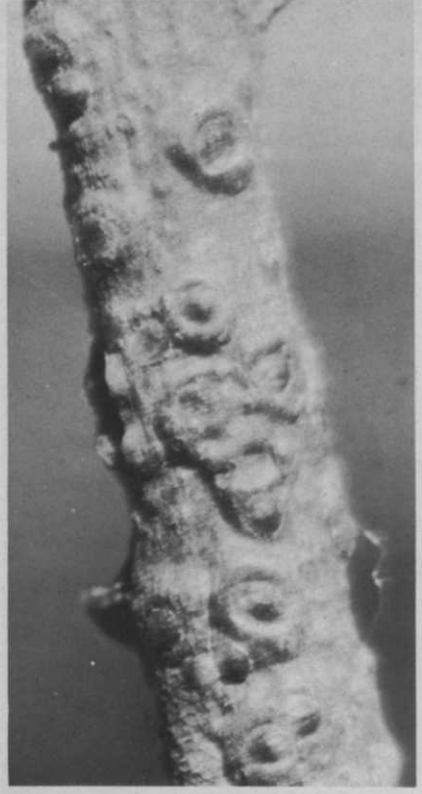

Figure 1. Pit scales on twig of Valley oak.

Research Report

Control of Pit Scales On Oak

By C. S. KOEHLER
University of California, Berkeley

R. L. CAMPBELL
Ohio Agricultural Research and Development Center, Wooster

C. S. DAVIS
University of California, Berkeley

SEVERAL species of *Asterolecanium* pit scales attack many species of oak trees both in the eastern and western United States. These scales suck juices from the twigs and cause a dieback of that growth; this damage first becomes apparent in mid and late summer. The presence of dead twigs, the premature appearance of brown foliage, together with the persistence of dead leaves on the killed twigs during the winter, cause infested trees to assume an unsightly appearance. Young trees may be killed by pit scales when heavy attacks occur year after year.

The pitting effect is most noticeable on the bark of young twigs. Each pit is doughnut-shaped, and the insect is found in the central depression. The scale is brown or dull green in color, flattened and circular, and measures between 1/16 to ⅛-inch in diameter when mature, depending on the particular species involved. Where large numbers occur, the twig surface takes on a roughened, dimpled appearance (Figure 1).

Life Cycle

Studies on the biology of *Asterolecanium minus* Lindinger, the dominant species on Valley oak *(Quercus lobata* Née) in California, were conducted during 1962-3. The adult scales, all of which are females, produce living crawlers from April until October. These young are typically produced in two rather distinct "broods," the first of which reaches maximum proportions in May, and the second in July (Figure 2). The crawlers move about for several hours before settling on a twig, where they remain for the rest of their lives. Crawlers, except those produced very late in the season, reach maturity by the fall of the year, and the cycle begins again the following spring. There is never more than a single generation each year.

Young, current season growth is the place of settling preferred by the immature scales, but they can be found, in greatly decreased numbers, on wood up to seven years old. The lower limbs of the tree are invariably more heavily infested than the upper branches, and sprout growth always supports higher numbers than normal twig growth.

Spray Chemicals Are Evaluated

Several pit scale control trials were conducted in coastal central California during 1962-3. Each treatment was applied as a spray to the point of run-off. Applications were made in the

Table 1. Evaluation of sprays applied May 10 for control of Asterolecanium scales on valley oak. Woodside, Calif. 1962.

Material	Active toxicant in lbs./100 gals.	Gallons oil[1] per 100 gals.	Avg. no. scales per sq. cm. twig surface[2]
Carbaryl	1.0	1.0	0.3 a
Dimethoate	1.0	1.0	0.5 ab
Diazinon	0.75	1.0	0.8 ab
Malathion	1.0	1.0	1.4 abc
Diazinon	0.75	—	1.7 bc
Ethion	0.32	1.9	2.7 c
Untreated	—	—	5.8 d

[1] Supreme oil, with the exception of ethion-oil, which was a commercial mixture of ethion and light-summer oil.
[2] Means followed by the same letter are not significantly different at the 5% level.

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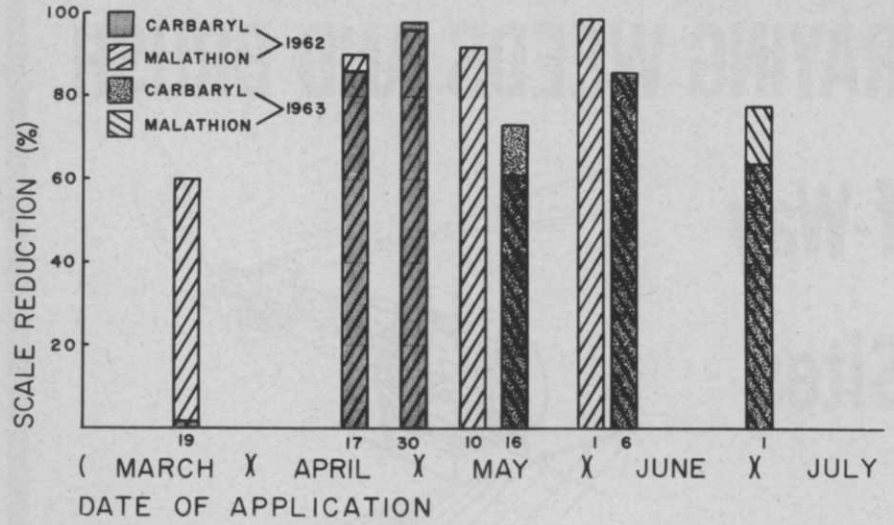

Figure 2. Number of pit scale crawlers trapped per day on 17 sticky bands placed on oak twigs.

spring and the effectiveness of the various treatments was determined by counting the number of living scales on ten current season twigs taken from each plot the following winter.

Table 1 shows that sprays of carbaryl (Sevin), dimethoate (Cygon), diazinon, and malathion, all with oil, resulted in effective control of pit scales when applied on May 10, 1962. Diazinon without oil, and ethion-oil, gave significantly poorer control than carbaryl plus oil. All insecticide treatments, however, were significantly different from the untreated check. An application of oil, or of an oil-carbaryl mixture, in the dormant period (Table 2), resulted in less effective control than certain oil-insecticide combinations applied during the period of early crawler emergence (Table 1). Four different oils evaluated did not differ significantly from one another in their ability to control pit scales, although all resulted in scale counts which were significantly lower than the untreated check.

A further trial was conducted to establish the optimum time for the application of sprays for control of *Asterolecanium minus*. Treatments of carbaryl, and malathion plus oil, were made periodically to different groups of Valley oak trees beginning in mid-March. The effectiveness of the treatments was determined as described earlier.

Applications of oil-insecticide mixtures made in late April through early June appeared to give more consistently effective control of pit scales than applications made earlier or later (Figure 3). Although carbaryl and malathion were the only insecticides used in this timing of application study, there is no reason to expect that the other materials which showed usefulness when applied on May 10 (Table 1), would not be effective if applied during this same late April to early June period.

Table 2. Effect of sprays applied March 5, in the late dormant period, on Asterolecanium scales. Woodside, Calif. 1963.

Material,[1] and mfr.	Viscosity SUS/100° F	U.R. %	Avg. no. scales per sq. cm. twig surface[2]
WSX-5494 (Humble)	57.6	96.1	1.7 a
Supreme oil (Chevron)	142	95	1.8 a
Canadian heavy dormant emul (Shell)	205	75	2.2 a
WSX-5494 (Humble) + carbaryl[3]	57.6	96.1	2.4 a
Dormant quik-mix (Niagara)	110	75	2.6 a
Untreated	—	—	6.5 b

[1] All oils used at a rate of 3 gals./100 gals. water.
[2] Means followed by the same letter are not significantly different at the 5% level.
[3] Used at a rate of 1.0 lb. active toxicant/100 gals. water.

Dormant and Growing Season Control Compared

Applications made for the control of pit scales during the dormant season would have several distinct advantages over treatments made to foliated trees. Firstly, spray coverage is much improved without the interference of leaves. Secondly, the possibility of foliage injury is always present whenever foliated oaks are treated with a spray chemical. In conjunction with these studies a certain few trees were found to display foliage injury regardless of the chemical used. Adjacent trees treated with the same insecticides were total-

(Continued on page 44)

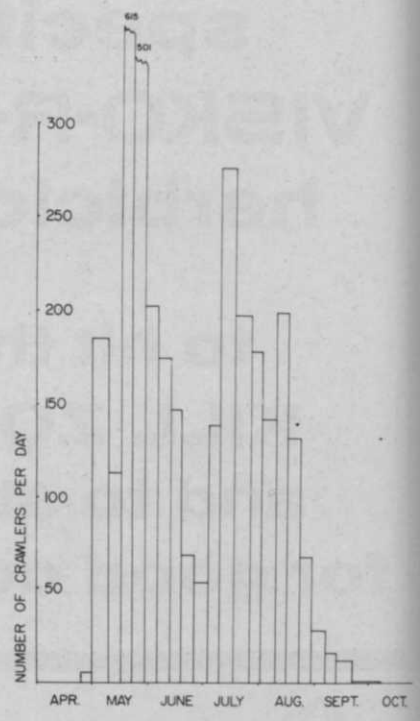

Figure 3. Effect of date of application of carbaryl and malathion, plus 1 gal. supreme oil/100 gal. water, on control of Asterolecanium pit scales in 1962-63. Carbaryl was not applied on May 10 or June 1, 1962.

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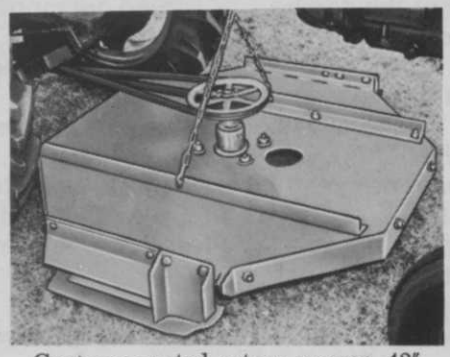

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The gavel is passed. Dr. Richard Behrens, outgoing WSSA president, University of Minnesota, St. Paul, Minn., left, turns over duties to newly elected president, Dr. Boysie E. Day, University of California, Riverside, Calif.

Scientists discuss experience with surfactants, Dr. J. Robert Barry, Louisiana State University, Chase, La., left, and Dr. George E. Barrier, DuPont Co., Wilmington, Del.

Weed Science Society of America Meets at New Orleans, Feb. 5-8

Herbicides are still in the public eye. With more being used every year, citizen groups continue to debate the right of the industry to push chemical control. Thus, it becomes mandatory that weed scientists inform the citizenry as to the toxicity and residual effect of all types of application.

This need for public judgements on herbicide use to be made with all facts in hand was cited by Richard Behrens, weed scientist at the University of Minnesota, St. Paul, Minn., and president of the Weed Science Society of America. Behrens, speaking at the 8th annual Weed Science Society of America session at New Orleans, La., Feb. 5-8, said that herbicide use had increased 25% yearly in each of the past 4 years. He pointed out that a liaison committee of WSSA is now working closely with groups concerned with pesticide use. Behrens stressed that weed scientists have a responsibility to develop herbicides which involve minimum risks to man and his environment. He pointed out that much of the erroneous information about toxicity and residue problems stem from failure to provide the public with available facts. Benefits to mankind far in excess of risks must be assured if the industry is to move ahead, Behrens said.

More Weeds Becoming Resistant to 2,4-D

Field bindweed has become another pest weed which is

WSSA officer slate for the coming year, left to right: Drs. Glenn C. Klingman, Eli Lilly & Co., secretary; Boysie E. Day, University of California, Riverside, president; L. L. Danielson, USDA secretary elect; Fred W. Slife, University of Illinois, treasurer-business manager; and Earl G. Rodgers, University of Florida, editor.

showing resistance to control chemicals. Some bindweed strains can now absorb 2,4-D and survive. Dr. Thomas J. Mizik, Washington State University researcher, Pullman, Wash., reported that the lower the hormone supply, the higher a plant's resistance to hormone-type chemicals such as 2,4-D.

New information on Johnsongrass which is a perennial weed pest in many areas was presented by Jerry Caulder, University of Missouri, Columbia, Mo. Because Johnsongrass does not grow well in shade, tests were made using shade as a means of eradicating the plant. The theory was that perhaps seeds might germinate and seedlings die if a shady nurse crop was provided. However, Caulder said the theory proved to be a failure. Rather, it merely slowed development of Johnsongrass and postponed the problem, rather than solving it.

Spraymen still have problems of spray loss by drift and evaporation. With more low volume applications and higher toxicity in chemicals, losses are even more critical. At the WSSA session, two University of Missouri engineers, L. E. Bode and M. R. Gebhardt, reported on such losses when using fan-type spray nozzles.

They measured the amount of spray lost between the nozzle orifice and the target area. Losses with low volumes of herbicides ranged from ½ to 5 gallons per acre. Generally, more than ¼ of the spray was lost when discharge rates were under 2 gallons per acre. But when 10 gallons or more per acre were used, loss dropped to less than 10%.

An increase in spray pressure, Bode and Gebhardt said, caused an increase in losses for nozzles discharging more than one-tenth gallon per minute; but for nozzles discharging less than one-tenth gallon per minute, an increase in pressure caused a decrease in spray loss. Spray distribution patterns for all the nozzles tested were similar. The most uniform patterns occurred when operating at higher pressures.

Atrazine With Oils Is More Effective

Atrazine mixed with emulsifiable oils for postemergence control of annual grassy and broadleaf weeds is more effective. An Ohio research study, reported by Dr. Glover B. Triplett, Jr., Wooster, O., showed that once absorbed by a plant, atrazine moves outward from the stem to the tips of the leaves. When atrazine is mixed with oil, the activity at the leaf tip is up to 5 times as great as when atrazine-water combinations are used.

Atrazine with 0.1% to 1.0% oil produced about twice as much activity as the atrazine-water combination. With the 10% oil mix, the atrazine proved to be 5 times more effective.

Residue is a problem when

Regulatory agency personnel who served as program and technical consultants during a discussion of licensing problems which affect spraymen are, left to right: Dr. Ellsworth Carlson, Lincoln, Neb.; Freeman E. Biery, Topeka, Kan.; Albert E. Thomas, Oklahoma City, Okla.; Robert F. Odem, Baton Rouge, La.; and Edward H. Hansen, USDA, Washington, D. C.

pesticides are used in surface waters. Research by William K. Averitt, University of Southwestern Louisiana, Lafayette, La., showed a high concentration for 3 days following spraying. But, he said, there is a drastic decrease on the 4th day, and a gradual decrease thereafter.

Averitt said that when methyl amine salt of 2,4-D was applied to control water hyacinth, residue was higher the 2nd day after application than the first. A sharp drop occurred on the 3rd day, and a severe drop on the 4th day. No 2,4-D could be detected after 102 days. Use of Kuron and Esteron 99 showed results similar to 2,4-D.

Laser beams and sonic energy are being studied by army engineers as a means of controlling weeds in waterways. Laser or light energy beams and sound energy have been used to destroy underwater weed growth. Sound energy has been used to temporarily and harmlessly repel fish from an area while it is being treated for weed control.

These novel approaches to aquatic weed control were presented by Dr. Ralph A. Scott, Jr., Washington, D.C. Studies are continuing, he said, on such aquatic plant pests as water hyacinth, watermilfoil, and alligatorweed. These weeds, he said, threaten to choke many of the nation's essential navigation channels. Dr. Scott also pointed to biological agents such as Argentine flea beetle which has produced excellent results in control of alligatorweed. In the long run, he stated, such agents may prove to be our most effective weapons against weed infestation.

Field tests with acrolein and copper sulfate as the control agents have proved effective in suppressing rooted forms of aquatic weeds. Bureau of Reclamation researchers report that acrolein used over a 5-year period in the Pacific Northwest showed that the liquid herbicide controlled pondweed, elodea, water buttercup, and filamentous green algae.

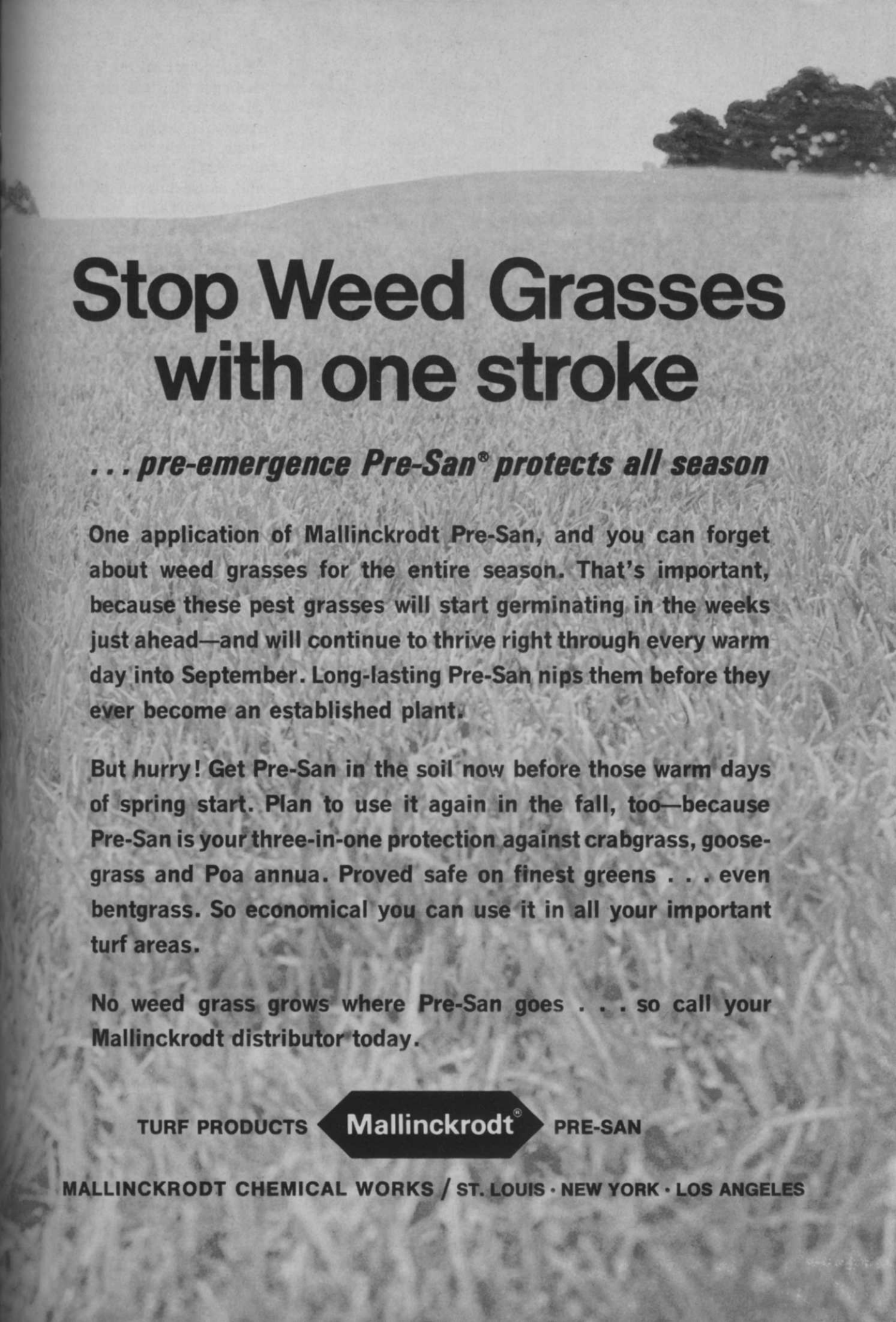
W. Dean Boyle and Thomas R. Bartley, at the Bureau's Denver, Colo., Center, said that pondweed suppression was excellent along a 15- to 20-mile reach, when acrolein was added at channels at a concentration of 0.10 ppm over a 48-hour period on a 2- to 4-week schedule. Flows ranged from 700 to 2000 cubic feet per second during the treatment schedule. Where streams carry less than 700 cubic feet per second of flow, this treatment is not sufficient. Concentrations of 0.6 to 15 ppm of acrolein are needed in the smaller streams. Another finding was that acrolein failed to control horned pondweed in these field tests.

Copper sulfate, dispensed by a screw-type volumetric feeder with a timing device, effectively controlled leafy pondweed and sago pondweed on a 9-mile reach on unlined channel or irrigation canal near Loveland, Colo., the researchers stated. Tests began in June, 1966, and the first leafy pondweed injury downstream was apparent 34 days later. Tests a year later, in 1967, were more readily apparent, likely due to the effects of residual copper in the ditch bottom soil and cooler water temperatures in early season, according to Boyle and Bartley.

Dr. T. F. Hall, Jr., botanist with the Tennessee Valley Authority, Muscle Shoals, reported that picloram (Tordon) is a promising chemical control for a stubborn aquatic weed, *Cephalanthus occidentalis* L. — or buttonball, as it is commonly known. This aquatic weed has posed problems on TVA lakes and elsewhere for years.

In TVA's tests with picloram, the phase of buttonball resprouting apparently had no bearing on the effectiveness of the chemical, but time of applications was important. Excellent control was obtained from a mixture of picloram and 2,4-D applied at the rate of ½ pound picloram and 2 pounds of 2,4-D per acre. This mixture was diluted with parts of water and applied to first-year buttonball coppice in three reservoirs in mid-August and mid-September, 1966. Thus, the results indicate a potential for controlling buttonball with pic-

(Continued on page 33)



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Southern Weed Conference officers elected at the Miami Beach session are: front row, left to right, Paul Santlemann, Oklahoma State University, secretary-treasurer elect; Leonard Lett, Colloidal Products Corp., president for 1969; Doug Worsham, North Carolina State University, editor elect; Henry Andrews, University of Tennessee, executive board; and back row, left to right, Robert Mann, Tennessee Valley Authority, president for 1968; Hanley Funderburk, Auburn University, secretary-treasurer; William Lewis, North Carolina State University, executive board; William Westmoreland, Geigy Chemical Corp., executive board; and Phil Upchurch, Monsanto Chemical Co., editor.

Southern Weed Conference At Miami Beach January 16-18

Weed control innovations in both chemicals and equipment were presented at the Southern Weed Control Conference at Miami Beach, Fla., in mid-January. Public relations chairman, Henry Andrews, University of Tennessee agronomist, reports that 117 papers were presented.

Droplet size of spray chemicals is getting more attention among scientists as the demand to control drift has become a public concern. R. W. Tate, research director for Delavan Manufacturing Company, West Des Moines, Ia., discussed the many factors affecting nozzle design today. He cited the need for manufacturers to adopt a standard code for marking orifice capacity and pattern. Each nozzle company, he said, now has its own system. Tate suggested that Weed Society scientists set up an impartial standards committee to discuss the problem. Their goal would be to recommend a unified system for rating and marking nozzles. The Delavan firm, Tate said, would certainly support such an endeavor.

Tate stressed proper care of equipment. Nozzles need to be cleaned carefully. Plugged or damaged orifices can produce a distorted spray. Tate urged spraymen to be alert for nozzle wear. Nozzle wear, he said, can drastically increase flow rate and cause uneven patterns. Because wettable powders and other abrasive formulations create excessive wear on orifices, Tate suggested buying hardened stainless steel nozzles. Though they may cost 3 times as much money, Tate said that Delavan's tests showed that the useful life of hardened stainless steel nozzles may be 10 times as long as brass or aluminum.

Sprayers also need to be calibrated often. Tate recommended that procedures developed by universities be followed. His one precaution was to check all nozzles rather than a single unit. In multiple-nozzle systems, any one might be the wrong size, worn, or possibly plugged.

Common Sense Needed For Safe Herbicide Use

Safe use of herbicides does not involve mystic. All that is required are some basic facts, common sense, and a will to be safe. This is the belief of Robert A. Mann, Tennessee Valley Authority, Chattanooga, Tenn. He told members of the Southern Weed Conference that the industry needs to exchange all types of information on herbicide use and its effect on both plants and animals, as well as its residual effects in all types of circumstances.

Mann called for education of the public on the safe use of herbicides and their benefical effect on the population. He said careful labeling of all herbicides appears to be the most important single measure for promoting safe use. Next, such materials must be safely stored, in areas inaccessible to children. Education is necessary to achieve this, he said.

Mann pointed out that it is important to distinguish between toxicity and hazards. Toxicity, he defined as the capacity of a substance to produce injury. Hazard is the probability that the injury will result from a specific use of a toxic substance. Thus, it is necessary to know both the toxicity and use or exposure conditions to estimate possible hazard. Just because a material is toxic does not mean that it cannot be used with safety.

Herbicides might be classified, Mann said, as extremely toxic, highly toxic, slightly toxic, practically nontoxic, and harmless. In using these 6 ratings of toxicity, most herbicides now being used would fall in the 3rd and 4th categories, Mann believes. This type information is important to the ultimate user and the general public.

Trained supervision, according to Mann, is the key in safe herbicide use. Most important in this area is education, training, and supervision of persons working with or handling chemicals. Most users, he said, depend on common sense, awareness that herbicides are toxic, and on simple but regular personal hygiene habits.

Plants To Be Eradicated Dictate Special Equipment

Plant species dictate the type equipment and the chemical needed for their control. Important here, according to Chester L. Foy, plant pathologist at Virginia Polytechnic Institute, Blacksburg, Va., is the when, where, and how plants grow.

Foy pointed out that certain crops require that there be no contact between the crop plant and the weed killing herbicide. There is also a big difference, he said, in plant retention, penetration, and translocation of chemical to plant. For example, location of plants to be killed, differences in growth habit and plant makeup determine equipment needed and the type herbicide which will be the most effective.

As examples, Foy cited the need to control spray drift of brush killers by using thickeners and antidrift agents. For this purpose, special orifices and centrifugal type applicators on aerial equipment are needed to confine the treatment pattern. Aquatic weed problems, he said, call for air boats, pontoons for walking on water, and similar equipment to place granules, to spray inaccessible immersed weed stands, or to inject or meter herbicides into water. Large tree tops cannot be sprayed with standard sprayers. For these, the cherry picker or similar devices, usually with off-set nozzles, are needed.

Other examples were presented by Foy to point up the engineering achievements which have made possible the growth of the vegetation care industry.

Conference for the coming year will be held Jan. 21-23, 1969. at the Statler Hilton Hotel, Dallas, Texas.

Renovation Is Severe Method For Improving Turf

Renovation of turfgrass requires both time and money. And because of these factors, it probably should be the last step undertaken for improvement of existing turf.

This was the view expressed by Dr. Robert W. Miller to turfmen attending the 39th annual short course for vegetation care management personnel at Columbus, Ohio. Miller, OSU agronomist, also serves as executive-secretary of the Ohio Turf Foundation.

Reasons for renovating are many. The original job may have been handled improperly and the sod may be in a poor condition. Bluegrass turf may be threatened by annual grasses. Bentgrass may be mixed with bluegrass. Because these problems are difficult to handle and the mixed stands of grass may not permit selective removal, renovation may be the only solution.

If nimblewill, tall fescue, quackgrass, or Johnsongrass are present in a lawn, it may be best to dig out the individual areas and reseed or resod rather than renovating the entire lawn. Miller also said herbicides may be excellent for spot treatments. However, in the case of quackgrass and similar weed grasses, up to 3 treatments may be needed.

If renovation is to be the solution, the kill of existing turfgrass should start in early June for the mid-west area, according to Miller. Then the area can be ready for fall seeding in September. However, this ties up the lawn and it becomes a problem area for most of the summer and fall, or until the new seeding is established.

Because renovation does create problems, Miller believes lawn problem areas need to be carefully analyzed. Many times, he said, the turf only needs an aerification. In other cases, thatching or fertilizing along with deep watering may improve the stand and produce the desired lawn.

A good disease control program is mandatory in maintaining turf. The old adage that "a pound of prevention is worth a pound of cure" applies to turfgrass management, Miller believes. He emphasized that renovation is a drastic step and demands extreme measures to produce a desirable turf.

The Ohio short course is annually sponsored by the University, Ohio Nurserymen's Association, the Ohio chapter of the International Shade Tree Conference, and the Ohio Turf Grass Council.

Use Thickeners

For Improved Spray Drift Control

By EVAN SWARTZ

Director, Noxious Weed Department
Shawnee County, Kansas

WEED and brush control has long been a problem for the people in Kansas. The first chemical used on weeds in Kansas was salt-applied at one pound per square foot. This removed all vegetation, but topsoil was blown away or eroded.

With the discovery of 2,4-D and 2,4-5T, a new era of weed control started. When properly applied, these chemicals killed broad leafed weeds but did not harm the grasses. We could spray our roadsides and kill the weeds and brush and not our grass.

But for the past few years, drift of these 2,4-D sprays has been a problem. You can spot damage on many susceptible plants. For this reason, when I saw a representative of Hercules Incorporated demonstrate an invert sprayer at our State Weed Meeting, I was very interested. Arrangements were made for a demonstration on our roads under typical windy conditions.

Subsequently, on May 11, 1967, three different types of herbicide sprays and techniques were demonstrated in Shawnee County.

(a) One was Visko-Rhap invert herbicide emulsion using a sprayer manufactured by Minnesota Wanner Company . . . the water and herbicide are forced into a thick viscous emulsion that forms droplets too heavy to drift under normal spraying conditions.

(b) A standard thickening agent was added to the herbicide used in the Shawnee County sprayer . . . to reduce drift.

(c) Water alone was employed in the Kansas Noxious Weeds Division sprayer—to demonstrate the difference in drift between conventional sprays and those with a thickening agent added.

These three spray systems were demonstrated just east of U.S. 75 on a Shawnee County road leading to Richland. The sprays used appeared to have an effective kill of elm, wildrose, cottonwood, and weeds, but the grass was not killed.

Test for drift of the spray was made using tomatoes in the right-of-way fence line and at 2 feet, 4 feet, and 6 feet beyond the fence line on the downwind side with 30 mph wind gusts. The area from the pavement edge to near the fence line was first sprayed with invert emulsion. None of the 4 plants used in this test have shown any signs of wilting or stunted growth. All 4 plants with 80 days of growth after spraying are healthy and produced small green tomatoes.

The second spraying of the section was made with a thickened herbicide solution. Tomato plants were placed at two-foot intervals beyond the fence at increments of 0, 2, 4, 6, 8, and 10 feet. Within 24 hours the plant under the fence and the plant 2 feet beyond the fence were wilting badly. Plants at 4 feet and 6 feet were in the first stages of wilt within 24 hours and the plants at 8 and 10 feet showed no signs of wilting. After 5 days, the plants at 6 feet began recovering, while the 0, 2, and 4 foot plants were badly wilted with yellow leaves. After 8 days, the plants were removed from the laboratory and planted outdoors. At this time, the 0, 2, 4, and 6 foot plants showed signs of wilting, although the 2 foot and 6 foot plants seemed to be recovering. Seven days later, or 16 days after spraying the plant under the fence died. At the end of 80 days after spraying, the plant under the fence was dead, the 2 foot and 4 foot plants were stunted and will die without producing tomatoes, and the 6, 8, and 10 foot plants are healthy and have produced small green tomatoes.

Spraying with water, without use of thickener or invert emulsion was demonstrated. Spray fog could be observed drifting with the wind for a distance of 30 feet or more, beyond the fence line.

Soon after our roadside demonstration, with the help of Hercules personnel, we converted our hydraulic boom-controlled roadside sprayer. This was a simple operation. We added the mechanical mixer and used a 55-gallon, 2,4-D barrel.

Our sprayer is equipped so we can spray conventional thickener, or invert. However, after the first day of invert spraying, we were satisfied with the drift control and finished our roadside spraying (300 miles on both sides) with invert material.

With good drift control, our crew sprayed on days we wouldn't have thought about spraying with conventional 2,4-D formulation. This enables us to do more roadside spraying during the period that weeds are small and easily killed. The invert material resists wash-off.

Eron foam generator will handle controlled volume of foamy herbicide in 12 mph wind according to the developer, Robert Eron. Unit can be used to spray minute amounts of foam on a single plant, or to deliver large quantities.

Florida Weed Specialist Develops Foam Generator

Robert Eron, pest control operator and weed control specialist, St. Petersburg, Fla., is working on a new method for foamy herbicides.

Eron describes his system as a positive-pressure foam generator. The idea, he says, is to carefully target herbicides on pest type vegetation. Eron's unit is still in the developmental stage. He is now using it in his own business in Florida and has made patent application. Eron reports the foam generator has been used to treat cattails, hyacinths and similar weeds. The foamy herbicide produced by his generator clings to leaves and stems. Especially important to the weed control operator, he said, is the fact that the new unit foams herbicides onto plants so that the chemical clings to leaves and stems rather than running or blowing off. At the same time, the foam produces the desired extended wetting period.

Biggest problem in development of the new system, Eron says, has been in developing a formula for each type control which would foam properly. None is on the market at the present time.

Eron's hope is to further develop the system, complete patent clearance, and then fabricate the unit for sale.

WSSA Meeting

(from page 28)

loram at a cost which compares favorably with the cost of mechanical mowing.

Officers for WSSA are elected by mail balloting prior to the formal meeting. New officers for 1968 are: Dr. Boysie E. Day, chairman of the Department of Horticultural Science, University of California, Riverside, Calif., president; Dr. Glenn C. Klingman, director of plant science research, Eli Lilly and Co., Indianapolis, Ind., secretary; Dr. Fred W. Slife, agronomist, University of Illinois, Urbana, Ill., treasurer and business manager; Dr. Earl G. Rodgers, department of Agronomy, University of Florida, Gainesville, Fla., editor of the Society's technical journal, Weed Science, reelected as editor; and Dr. Loran L. Danielson, ARS, USDA, Beltsville, Md., secretary-elect.

Dr. R. E. Doersch, chairman of the WSSA awards committee presented the award for the outstanding paper at the 8th annual meeting to Dr. R. Prasad, Dr. C. L. Foy, Virginia Polytechnic Institue, Blacksburg, Va., and Dr. A. S. Crafts, University of California, Davis, Calif., for their paper "Effects of Relative Humidity on Absorption and Translocation of Foliarly Applied Dalapon."

Doersch also presented Dr. G. F. Warren, Purdue University, a plaque and an honorary membership in WSSA. Final registration was 744. More than 200 scientific papers were presented, plus 50 in a special Latin American section. Latin American papers were translated simultaneously during the event.

New Spray Adjuvants Now On the Market

Stull Chemical Company has developed 3 spray application adjuvants for weed, brush, and grass control with presently used herbicides.

Bivert AMX, Bivert DPN and Bivert MSMA have been developed to go hand-in-hand with Stull's Bifluid application system for invert emulsion sprays.

Bivert-AMX is a specially formulated spray adjuvant for use with Ammonium Sulfamate (Dupont "Ammage X" Weed and Brush killer). Bivert-DPN for use with Dalapon (Dow "Radapon" or "Dowpon") provides another weed killer usable in the invert system. The third, Bivert MSMA for use with Monosodiun Methanearsonate through invert spraying, makes it more effective on grasses, weeds, and some brush species.

Power sprayers now using these herbicides may be quickly converted to apply water-in-oil emulsions. This requires a simple, inexpensive device called a Stull Bi-Vac Inverter, which is connected to the regular pump suction, and an additional tank

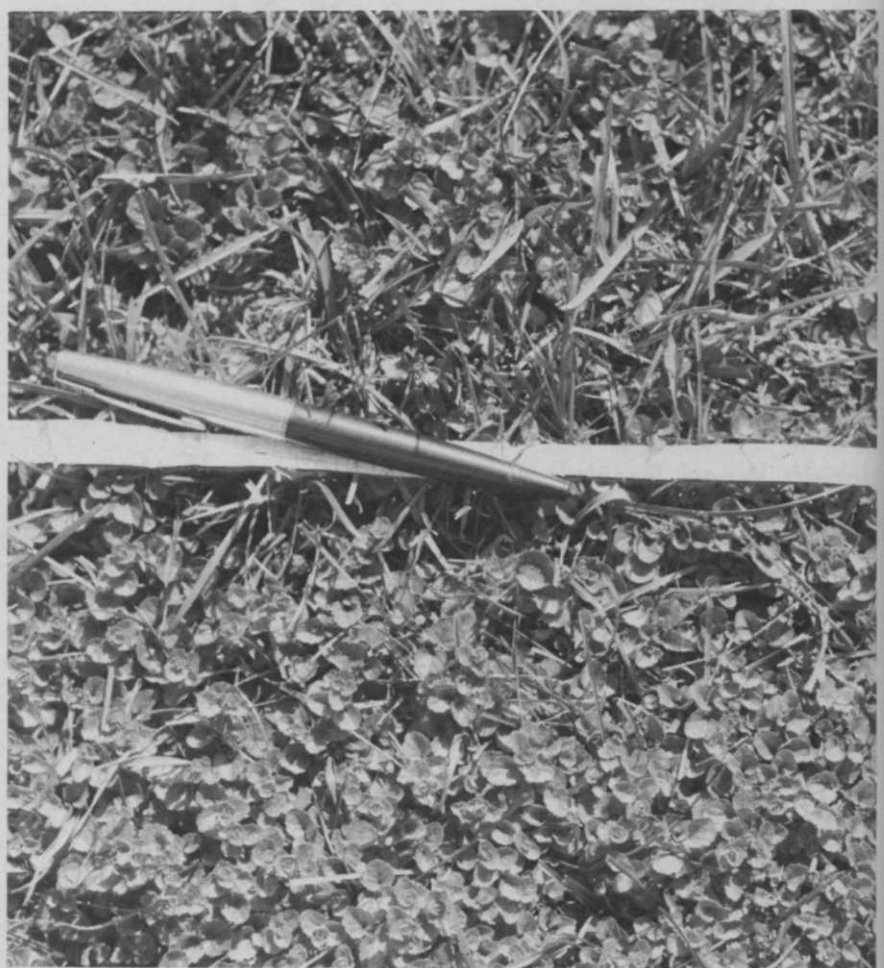
(Continued on page 44)

Washington State Finds Dacthal Effective in Postemergence Trail

Turf maintenance personnel have long battled the troublesome, persistent weed, Creeping Speedwell *(Veronica filiformis* Sm.). Now help may be on the way in the control of this broadleaved weed, which infests turfgrasses in many areas of the Northern United States and Canada. Veronica is an annual weed—sometimes perennial — a prolific spreader that's hard to control in turf without damaging desirable grasses. But tests during 1967 using Dacthal herbicide produced encouraging results in the control of this weed pest. Dacthal is a patented herbicide, developed by the Agricultural Chemical Division of Diamond Shamrock Corporation, Cleveland, Ohio.

In most of the tests, the Dacthal required at least one month to show visible effects, but then produced 99% control or better.

Most of the research was coordinated by T. J. Neidlinger, technical service representative of Diamond Shamrock, in cooperation with the Western Washington Research and Extension Center, a branch experiment station of Washington State University, at Puyallup, Washington. Tests were supervised by Dr. Roy L. Goss, associate agronomist and extension turf specialist.



Control of Veronica filiformis Sm. by Dacthal is evident in this photograph of the edge of a test area. Check area at bottom is heavily populated with Veronica, which has choked out almost all turfgrass. Application of Dacthal on section at top has started to control the weed effectively, with turfgrass actively growing back.

T. J. Neidlinger, Diamond Shamrock Corp., Cleveland, O., delivered a paper on this study at the recent Weed Science Society of America Conference at New Orleans, La.

Early in January a greenhouse screening trial was conducted to test various chemicals on actively growing Veronica. Dacthal was applied at the rate of 12 and 24 pounds active ingredient per acre, to four 25-square-foot plots. By April visual evaluations showed 95% effective control for the 12-pound rate, with the 24-pound rate giving 100% control.

With this data in hand, Dacthal was tested at two golf courses in the Pacific Northwest and one in northeastern Ohio. Three thousand square feet of fairway turf were treated with the 12-pound-per-acre concentration on a golf course near Seattle early in June. In addition to actively growing Veronica, the plot contained Highland bentgrass, fine-leaved fescues, Kentucky bluegrass and annual bluegrass. Dur-

ing the test, the plot received about one inch of water a week and was mowed regularly.

By the end of June, the Dacthal had provided 99% control. Areas devoid of Veronica were apparent where large clumps had been growing. Continued observation showed no redevelopment of the weed.

In a similar test at a golf course in Northern Idaho, 150 square feet of fairway turf were treated with only 6 pounds per acre of active Dacthal. The ground was 95% healthy, actively growing Veronica, 4% plantain, and 1% dandelion. By October, visual observation showed 99% control of the Veronica.

At the Ohio golf course, Dacthal was applied at 9, 12, and 15 pounds active ingredient per acre to plots in the rough that were heavily populated and dominated by Veronica. Some Kentucky bluegrass and fine-leaved fescues were also present. The applications were made on August 1st.

Results of Evaluations Made on September 24

RATE (active)	PERCENT CONTROL
9 pounds per acre	40
12 pounds per acre	50
15 pounds per acre	65

Although the results of this test were not as significant as previous results, the plots may have been mowed soon after application, thus removing much Dacthal before it could be washed by irrigation water into the soil.

Tests were also conducted on Veronica-infested lawns in the State of Washington. In Yakima, a home lawn was treated with 12 pounds per acre of Dacthal on one 160-square-foot plot. A similar adjacent plot received one-pound-acid equivalent each of a 2,4-D/2,4,5-T combination. On September 15th, about two months after application, the

Visual Evaluation Results on September 6

Chemicals	Rate	Percent Control				Average
		R1	R2	R3	R4	
Dacthal (W.P.)	9	90	90	80	90	87.5
Dacthal (W.P.)	12	100	95	90	90	93.8
Dacthal (W.P.)	15	90	90	90	90	90.0
Dacthal (Granule)	12	50	60	50	40	50.0

2,4-D/2,4,5-T showed only 5% control with the Dacthal giving 85%.

A similar test was made on the state capital lawn at Olympia, Washington. On July 14th, 9, 12, and 15 pounds per acre of Dacthal were applied as a wettable powder, 12 pounds active Dacthal as a 5% granule, and several rates of picloram, picloram +2,4-D, DSMA, and MSMA. All treatments were replicated four times on 100-square-foot plots. On September 6th visual evaluations showed the following:

None of the other chemicals gave adequate control. The best of these showed an average of only 42.5% effectiveness, which really only suppressed the Veronica, rather than killing it.

According to Neidlinger, Diamond Shamrock plans further tests in 1968 to determine exactly how Dacthal affects the Veronica plant physiologically. Field tests will also be made to establish the proper rate and time of application for optimum control under a variety of conditions.

Although Veronica is not presently on the Dacthal label, it is hoped this data will be sufficient to add Veronica to the label in the near future.

Chemicals Control Weeds In Bermudagrass Stands

Herbicides can give control of weeds in new bermudagrass stands. Dr. Elwyn Deal, agronomist, University of Maryland, College Park, Md., reports no evident damage to the new grass.

Winter survival the first year after sprigging (planting small sections of the plant) proved excellent. Grass was sprayed with DMPA (Zytron). Where DCPA (Dacthal) was used, Deal reports winter survival was almost as good, but weed control was slightly poorer.

Deal said that Simazine, in the Maryland tests, severely injured sprigs, and almost all grass died out during the winter. However, this chemical did give excellent weed control. Another chemical, bensulide (Betasan or Pre-San) caused no visible damage to the plants during the first few weeks, but stolon (runner) development suffered even during the second season.

Plots fumigated with methyl-bromide, before sprigging showed good weed control and the bermudagrass survived well through the winter. Trifluralin (Treflan) worked lightly into the soil with a rototiller after planting gave good weed control but caused some stunting and retarded grass root growth.

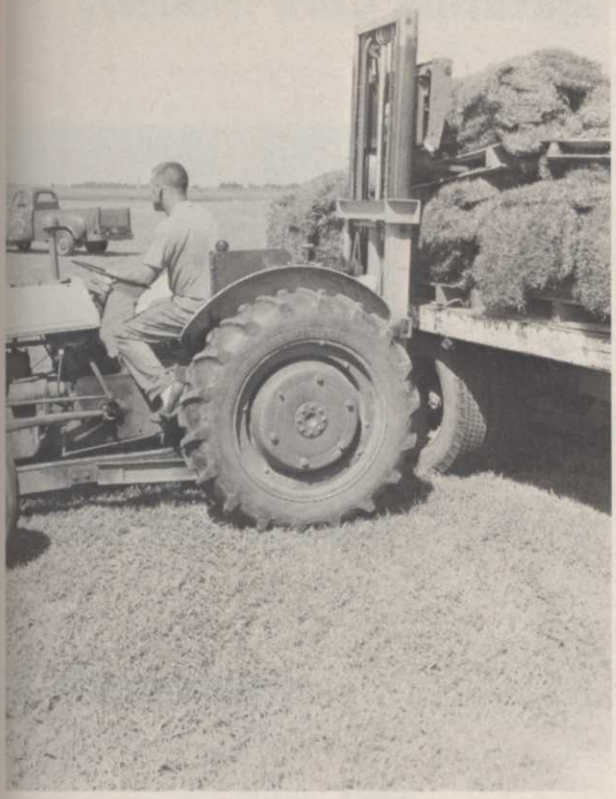
Deal says that all the chemicals except methyl-bromide and trifluralin were applied to Tufcote bermudagrass plots seven days after planting.

Quality of Water Important In Irrigation

Turf specialists in greater numbers are beginning to check the quality of water used on turf areas. This can help eliminate many of the so-called grass problems, according to Dr. Robert W. Miller, agronomist at the Ohio State University, Columbus, O.

Miller says that excessive concentrations of inorganic salts, boron which is toxic to plant growth in many instances, organic toxic compounds, and high sodium concentrations may prove troublesome.

All water used for irrigation contains inorganic salts derived from rock, soil, or other solid phase materials through which water percolates, according to Miller. The concentration of these will determine the suitability of any water supply for irrigation purposes on turf. Thus, the need for a laboratory check is evident before turf problems arise.



Century forklift is used to handle cut sod, "green side up," on Simmons Turf Grass Farm, Topeka, Kan.

Sod Carried "Green Side Up" On Simmons Farm

Handling of cut sod using a forklift with a pellet for loading trucks rather than rolling sod is finding favor on some turf farms. Simmons Turf Grass Farm, Topeka, Kan. has been using a Century rear mounted forklift tractor attachment and finds it requires less labor and effort than lifting sod by hand to the truck bed.

Century Forklifts, both 7 and 10-foot models, can lift from 1500 to 2500 pounds. They offer 3 types of tractor mountings, 3-point, axle, and underframe. With a shortage of field labor, Simmons has found their method reduces time and labor in loading, transporting and unloading sod.

Meeting Dates

Midwest Regional Conference, Midwest Regional Turf Foundation, Purdue University, Lafayette, Ind., March 4-6.

Maryland Sod Conference, University of Maryland, College Park, Md., March 6.

Massachusetts Fine Turf Conference, White House Inn, Chicopee, Mass., March 6-8.

Western Agricultural Chemicals Association, Spring Meeting, Hilton Inn, San Diego, Calif., March 11-13.

Western Society of Weed Science, formerly Western Weed Control Conference, Owyhee Hotel, Boise, Idaho, March 19-21.

SCOPIC, Sun Country Operators Professional Improvement Conference, Short Course, Rodeway Inn, El Paso, Tex., March 19-21.

Michigan Turfgrass Conference Annual Meeting, Kellogg Center, Michigan State University, East Lansing, Mich., March 20-21.

Northern California Turfgrass Exposition, Northern California Turfgrass Council, Hall of Flowers, Golden Gate Park, San Francisco, Calif., March 20-21.

Turfgrass Grower's Seminar, Annual Meeting, Memorial Union, University of Rhode Island, Kingston, R.I., March 21.

Northeastern Aerial Applicators, 4th Annual Conference, Alice Statler Auditorium, Cornell University, Ithaca, N. Y., March 13-15.

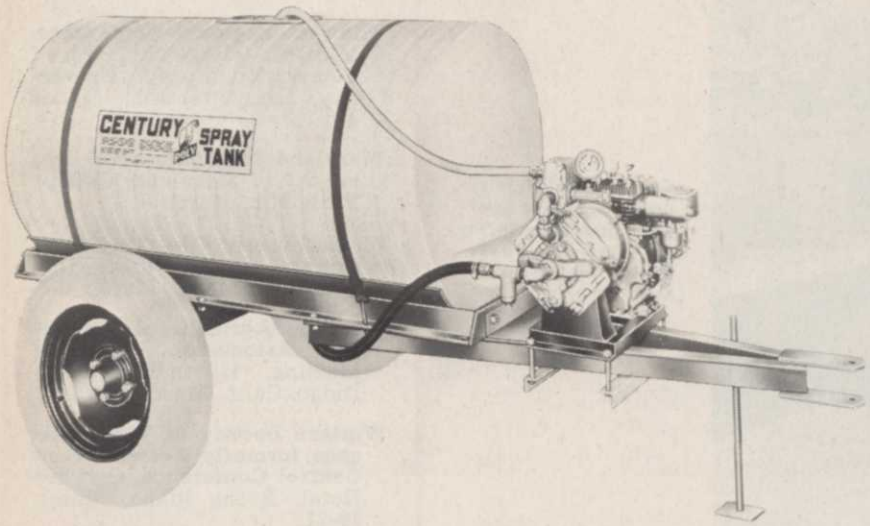
National Pollution Control Exposition and Conference Houston Chamber of Commerce, Astrohall, Houston, Tex., April 3-5.

Florida Turfgrass Trade Show, Florida Turfgrass Foundation, Jack Tar Harrison and Belleview - Biltmore Hotels, Clearwater, Fla., April 24-26.

Tri-County Chapter, California Landscape Contractors' Association, 17th Annual Convention, Ojai Valley Inn and Country Club, Ojai, Calif., June 25-29.

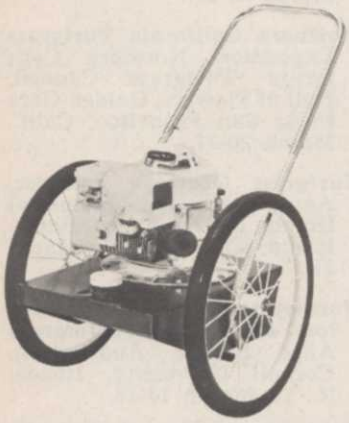
American Society of Agronomy, 1968 Annual National Meeting, Jung and Roosevelt Hotels, New Orleans, La., Nov. 10-15.

New Products . . . Designed for the Vegetation Care Industry

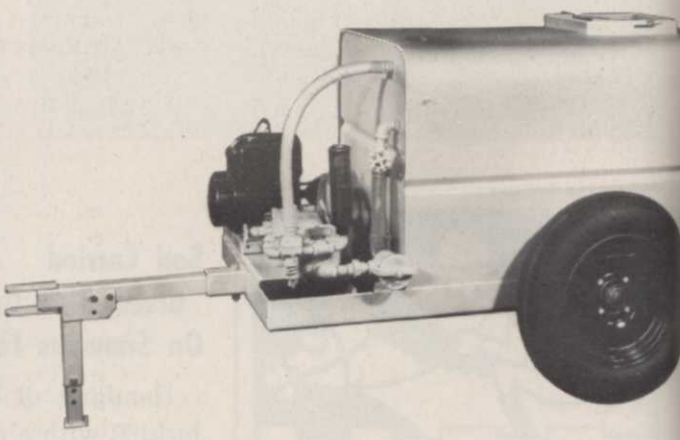


Narrow, pull-type trailer with low center of gravity sprayer introduced by Century Engineering Corporation, Cedar Rapids, Ia. 52401. No. 1260-V Century Low Trailer safely maneuvers along roadsides or fences, between pens or bins and beneath low hanging trees where clearance is a problem. A full length saddle and straps are included to accommodate a 125 or 200 gallon Century "Poly" spray tank. The No. 1260-V Low Trailer can be used with an engine unit, PTO mounted pump or trailer mounted pump driven from PTO by a telescoping drive shaft. Hand gun can be added or Jet (boomless) sprayer. Or 6 or 8 row boom can be mounted at the rear.

New Thermo-Fogger F-2107 offers 7 gallons per hour output for golf courses, small estates, parks. Manufactured by Burgess Vibrocrafters, Inc., of Grayslake, Ill. Precision metering valve controls fog density and output.

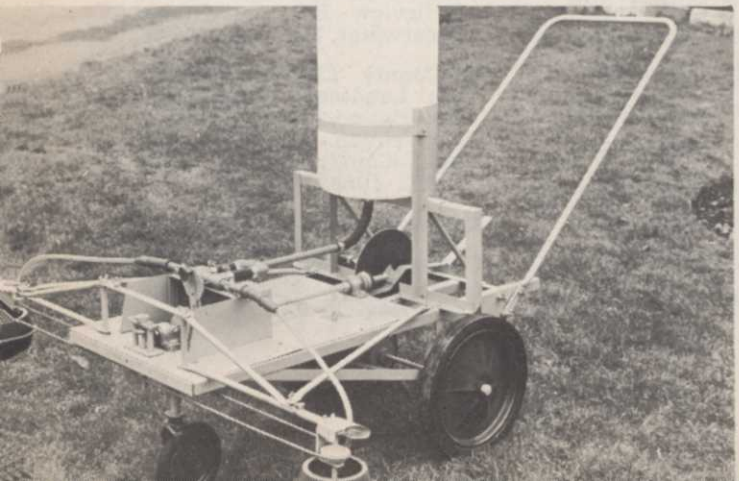


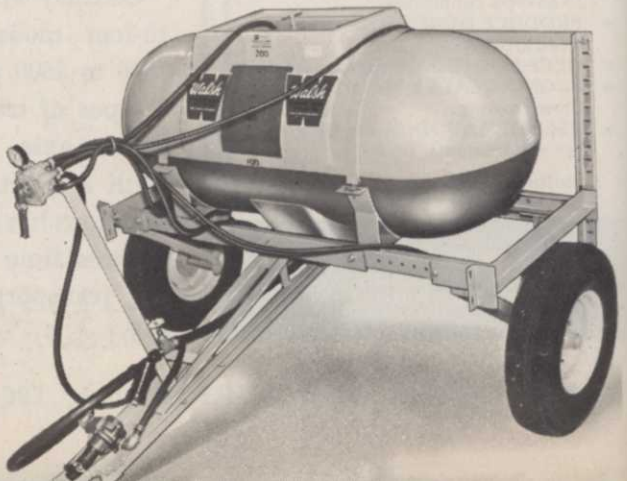
High pressure sprayer designed for general purpose spraying by Hardie Sprayers, Division of Universal American Corp., 4200 Wissahickon Avenue, Philadelphia, Penna. 19129. Features enclosed pump, pressure up to 400 P.S.I. Available in 10 and 20 G.P.M. pump capacities.



Vortex centrifugal sprayer for use on lawns and paths has no engine or pump. Machine can be used for weed killing, foliar feeding and fertilizing. Available in three models, of 4', 8' and 12'. Write: Richmond Gibson, Ltd., 43b Bells Hill, Bishop's Stratford, Herefordshire, England.

New sprayer featuring all fiberglass, non-corrosive tank, designed around a revolutionary sump-trap bottom is being manufactured by the Walsh Manufacturing Company, Box 351, Charles City, Ia. 50616. Tank has a 2-gallon sump trap outlet which completely empties each fill. Walsh "Posi-Sump" trap sprayer tanks are available in 110, 165, 200, 300 and 500 gallons capacity.





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DIBROM is available also as DIBROM 8 Emulsive, for application in water by ground equipment, where fogging or aircraft application isn't practical. (For either formulation, be sure to read and follow product label directions.)

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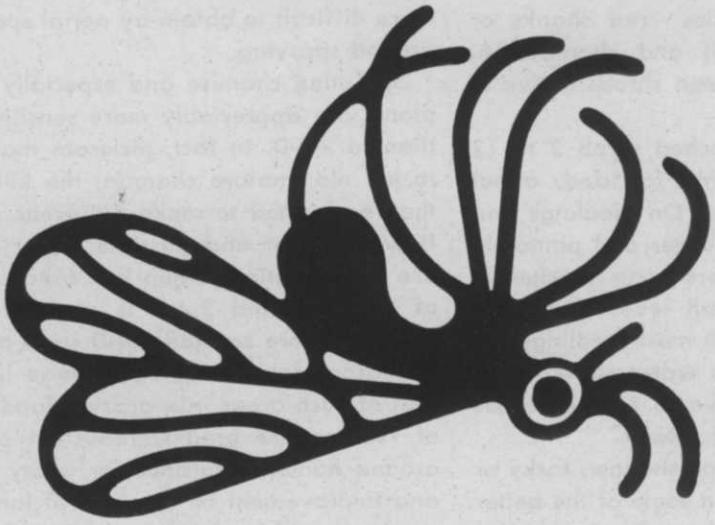
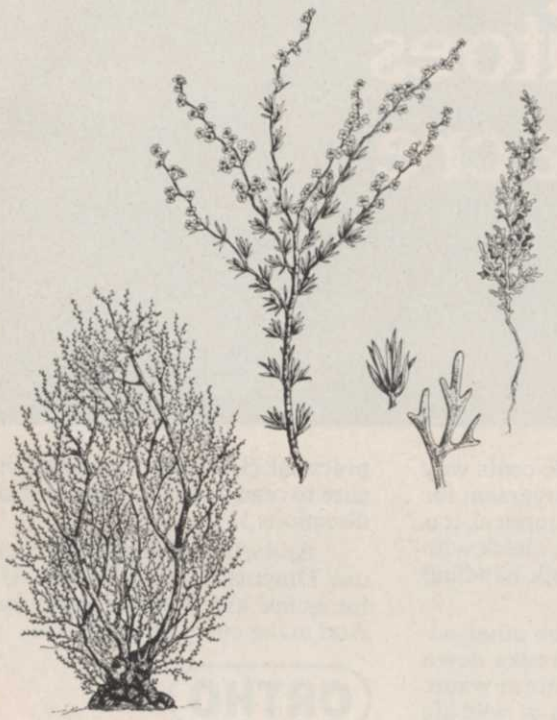


DIBROM 14

CHAMISE

(Adenostoma fasciculatum)



Drawing from: California Range Brushlands and Browse Plants by Arthur W. Sampson and Beryl S. Jespersen. Calif. Agric. Expt. Sta. — Ext. Ser. Manual 33.

Prepared by: O. A. Leonard, Botanist, Assisted by B. J. McCaskill Senior Herbarium Botanist, Botany Department, University of California, Davis, California

The genus **Adenostoma** belongs to the Rose family and consists of two species — red shanks or ribbon bush (**A. sparsifolium**) and chamise (**A. fasciculatum**). Both are evergreen shrubs native to California.

Chamise is a diffusely branched shrub 2 to 12 feet tall. Its leaves are mainly fascicled, about ¼ inch long and sharp pointed. On seedlings and stump sprouts the leaves are larger and pinnately lobed. The small, white flowers occur in clusters 1½ to 4 inches long. The small seeds germinate profusely following a fire, with most seedlings not surviving the first year due to water stress; however, sufficient numbers survive to recover areas not already filled by sprouting species.

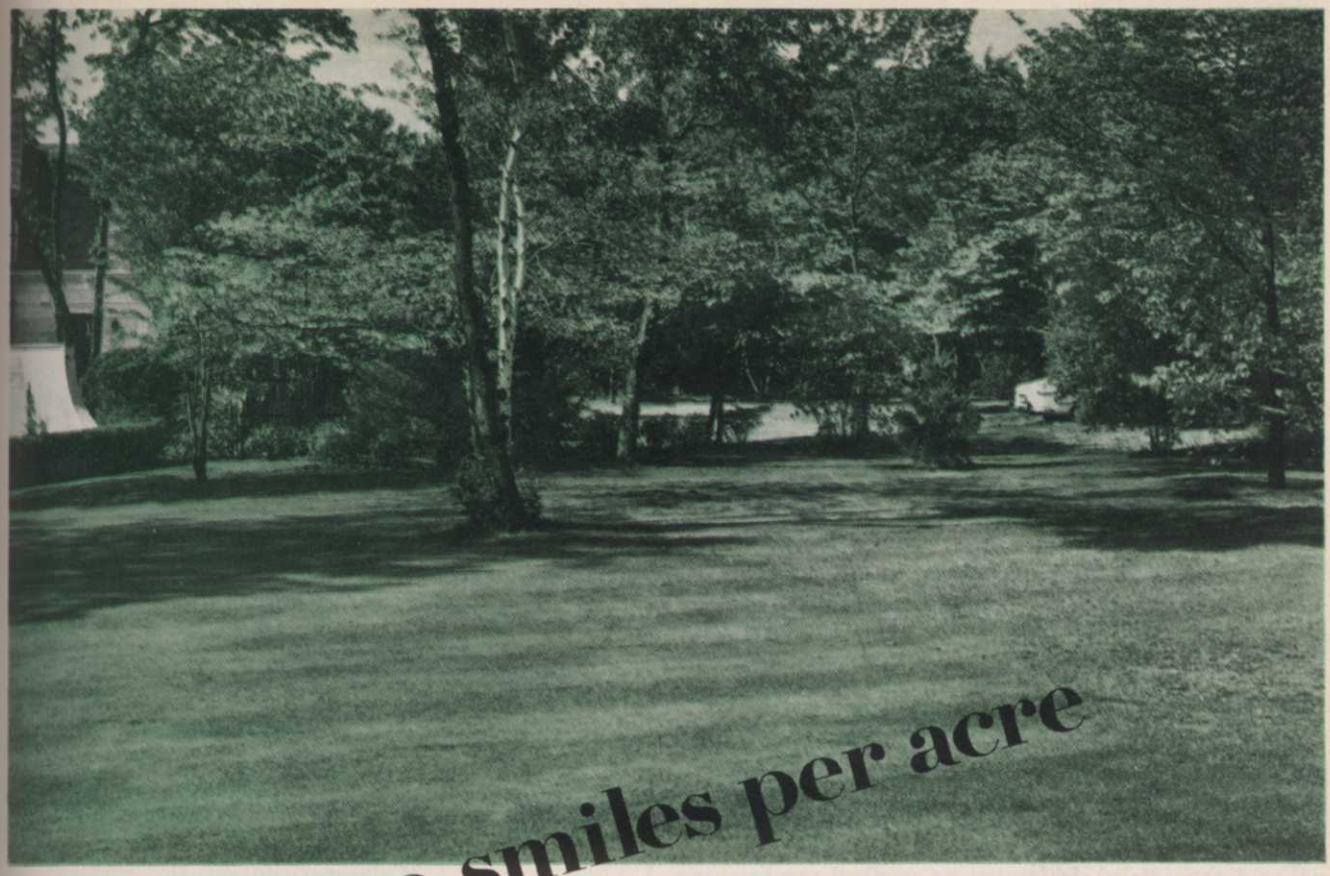
Commonly this shrub grows on shallow, rocky or poor soils, but is also present on some of the better sites. Because of its inflammable nature it is sometimes called greasewood. Chamise-covered areas are subject to periodic fires, and following such fires this plant develops numerous sprouts from its enlarged basal burl. These sprouts may be eaten to some extent by livestock or big game for 2 or 3 years following a fire; the brush then usually gains the upper hand, crowding out perennial grasses and reverting again to dense stands of brush. In general, associated with chamise are other species of sprouting and non-sprouting evergreen shrubs. These belong mainly to the **Quercus** (oak), **Ceanothus** (wild-lilac) and **Arctostaphylos** (manzanita) genera. When controlling chamise, one is confronted with controlling these other plants as well.

Chemical control of chamise should normally be initiated following a fire. Reasons for so doing include: 1) accessibility of the area is greatly increased; 2) fire hazard is greatly reduced over that existing in either living or chemically-killed unburned chamise; 3) grasses become established best following a fire, which helps to prevent the reestablishment of chamise from seedlings; and 4) chamise sprouts are far more easily killed by 2,4-D than are old unburned plants. It is important to plant grass because it competes successfully against chamise and other brush seedlings. Further, following chemical control of sprouts, grass maintains such areas as grasslands, since it tends to kill brush seedlings which germinate later by removing soil moisture.

Sprouting chamise can be controlled by broadcast applications of 2,4-D or brushkiller mixtures of 2,4-D and 2,4,5-T applied at yearly intervals. Two or more applications may be required to achieve complete control. Some of the woody species associated with chamise, such as scrub oak (**Quercus dumosa**), require repeated individual plant treatment to kill. It is usually desirable to start with spraying of chamise in the spring following a fire, especially when helicopters are used. Control is more difficult to obtain by aerial spraying than by ground spraying.

Sprouting chamise and especially old unburned plants are appreciably more sensitive to picloram than to 2,4-D. In fact, picloram makes it possible to kill old, mature chamise; the killed plants can then be burned to make the areas accessible, etc. However, cost and possible water contamination are considerations when it is used. A combination of picloram and 2,4-D is also effective against chamise, more so than 2,4-D used alone.

Reasons for controlling chamise include conversion of such areas into grazing land, development of fuel or fire breaks, reduction of fire hazard around homes, clearance for utility rights-of-way, and improvement of the natural landscape. Some shrubs should be left but these should not be too closely spaced in order to minimize competition for water between the shrubs. With prudence, beautiful shrub-covered areas can be developed.



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Write for Velsicol Turf Chemicals Catalog:
Velsicol Chemical Corporation, 341 E. Ohio St., Chicago, Ill. 60611. Dept. GM

Insect Report

WTT's compilation of insect problems occuring in turfgrasses, trees, and ornamentals throughout the country.

Turf Insects

APHIDS
(Aphis spp.)
Arizona: Heavy in spots in Bermudagrass seed fields at Yuma Valley, Yuma County.

A BILLBUG
(Sphenophorus phoeniciensis)
Arizona: Adults light in uprooted Bermudagrass sod at Phoenix, Arizona, Maricopa County.

RHODES-GRASS SCALE
(Antonina graminis)
Arizona: Moderate in crowns of Bermudagrass on many properties in Phoenix, Maricopa County.

A SNAIL
(Rumina decollata)
Arizona: Feeding on dichondra lawn at residence in northwest Phoenix, Maricopa County.

Insects of Ornamentals

A CONIFER APHID
(Cinara tujafilina)
Alabama: Moderate to heavy on several 4- to 6-foot arborvitae planting; honeydew heavy.

AN ERIOPHYID MITE
(Calacarus adornatus)
Alabama: Light on numerous camellia plants in central area; up to 100+ per leaf damaging few plants.

HEMISPHERICAL SCALE
(Saissetia coffeae)
Florida: All stages severe on 3,000 coontie plants, *Zamia floridana*, at Tampa, Hillsborough County.

A PIT SCALE
(Cerococcus deklei)
Florida: Adults severe on stems of 342 of 427 hibiscus plants at nursery in Miami, Dade County.

A SOFT SCALE
(Ehrhornia cupressi)
California: Moderate on juniper nursery stock in Sunland, Los Angeles County.

CUBAN-LAUREL THRIPS
(Gynaikothrips ficorum)
California: Moderate on *Ficus retusa* in San Francisco, San Francisco County, for a new county record. This is most northern find in State.

Tree Insects

BARK BEETLES
(Dendroctonus terebrans)
Alabama: Adults and larvae inactive, 1-10 per tree, under bark of twenty 10 to 25-year-old loblolly and shortleaf pines at Lee County home. **Texas:** Total of 330 *D. terebrans*-infested trees treated in Davy Crockett and Angelina National Forests October through December. *D. frontalis* decreased to negligible level October through December. Total of 31 multiple-tree spots found over 4.5 million acres during detection flights in October. Total of 66 infestations involving 4,531 trees controlled by mid-November. *D. brevicomis* light in ponderosa pine stand in western area in October through December. *Ips. avulsus, I. grandicollis,* and *I. calligraphus* activity continued heavy October through December. Losses heaviest in southeastern area; up to 25 percent tree mortality in localized areas.

Compiled from information furnished by the U. S. Department of Agriculture, university staffs, and WTT readers. Turf and tree specialists are urged to send reports of insect problems noted in their areas to: Insect Reports, WEEDS TREES AND TURF, 1900 Euclid Ave., Cleveland, Ohio 44115.

Classifieds

When answering ads where box number only is given, please address as follows: Box number, c/o Weeds Trees and Turf, 1900 Euclid Avenue, Cleveland, Ohio 44115.

Rates: "Position Wanted" 5¢ per word, minimum $2.00. All other classifications, 10¢ per word, minimum $2.00. All classified ads must be received by Publisher the 10th of the month preceding publication date and be accompanied by cash or money order covering full payment.

HELP WANTED

FIELD SUPERVISOR Industrial Weed Control firm in eastern Pennsylvania is looking for a field supervisor. Degree in one of the agricultural sciences is desirable but not necessary. Write Box 30, Weeds, Trees and Turf, 9800 Detroit Ave., Cleveland, Ohio 44102.

IMMEDIATE OPENING FOR ASSISTANT PRODUCTION MANAGER. Being the largest Landscape Company in N.E. Ohio and due to an increasing volume of business we are in need of a man with experience in landscape plants, construction, equipment and management. Some knowledge of Spanish helpful. Standard benefits and paid vacation up to 4 weeks. Transportation provided. This is not a 9 to 5 desk job, it's a job for a man who likes the outdoors and to visit various jobs daily. Send resume to P.O. Box 300, Bath, Ohio 44210. Salary open as to qualifications.

FOR SALE

SPRAYERS, USED, all sizes and makes, at large savings. Send your requirements. Equipment Sales Co., 4742 Sunrise Highway, Massapequa Park, N. Y. 11762.

Turf Enemy No. 1

(from page 16)

weeks apart. His first application was made August 19, 1966. He mixed 300 pounds of material in 300 gallons of water. He washed the material off the grass blades with irrigation sprinklers for about 45 minute settings. He sprayed the tri-calcium arsenate with a boom nozzle (Spraying Systems KLC 108). This nozzle requires a 25 gallon per minute pump.

The second seeding was made Sept. 12, 1966, after fairways were aerobladed and dragged.

The original bluegrass seeding didn't do well because of the thick matted thatch in which it was seeded. The bent, which was estimated at the beginning of the program as 5%, was filling in the voids left by weak *Poa Annua,* Woehrle estimates that his bent is approximately 80%, and the bluegrass 5%, with the *Poa Annua* occupying about 15%. Ted states, "This isn't bad, considering that we were in the program less than a year."

Ted noticed more kill both to the *Poa Annua* and the permanent grasses in low poorly drained areas. Ted believes that the grass dies because of lack of oxygen. Drainage has been improved with the installation of slit trenches filled with pea gravel.

During the summer months the *Poa* kept fading and the desirable grasses continued to fill in the voids. After a time it became apparent that Ted might have to control the loss of *Poa* in order to have turf cover for the Western Open in August. He sprayed on a soluble product 12-48-6 and was able to save his *Poa* through tournament time in August. On Sept. 11, 1967, Ted applied 2 pounds of 85% tricalcium arsenate per 1000 sq. ft. This last application provided a noticeable reduction in the vigor of the *Poa Annua.* Woehrle suggests that you never attempt to seed grass into a heavy thatch condition with a drill seeder. He believes that the aero blade is better because it brings up some soil for a suitable seedbed.

The rate of kill can be controlled with the use of liquid soluble phosphates. Good drainage is a must! Good public relations are a must. The members must be told that the course is going to look bad for a year or two. Aerification and thatch reduction are necessary.

Case History Analysis:

1. The granular form of tricalcium arsenate, because of safety and ease of application is suggested.
2. Good management practices should be followed, such as surface drainage, aerification, thatch removal and repeated overseeding. Avoid applications on frozen ground.
3. Plugging, sodding or vegetative improvement may be needed. Emergency use of liquid soluble phosphates may be used to control the rate of *Poa Annua* kill.
4. Low or no phosphate fertilization should be followed prior to and while controlling *Poa Annua.*
5. Light split applications should be followed to avoid objectionable dead spots and retarted overseeding.
6. Suggest start applying 6 to 10 pounds of 48% tricalcium arsenate granular spring and fall applications until toxicity is achieved. This will vary between 24 and 32 pounds per 1000 sq. ft. depending upon the soil type, soil pH, and soil phosphate level. This program should then be maintained annually with 2 to 4 pounds applied either spring or fall.

Editor's Note: Dr. William H. Daniel, Turf Specialist, Purdue University, has worked closely with Mr. Kerr in assessing the problems which beset turf areas containing POA ANNUA. Dr. Daniel assisted Mr. Kerr in editing the material presented here.

Advertisers

INDEX TO ADVERTISERS

Calibrate Sprayers

(from page 10)

determine manpower distribution for spraying programs. This formula calculates the number of acres sprayed in one hour. The formula to determine this factor is as follows:

$$\frac{Y \times MPH}{8.25 \text{ (constant)}} = APH$$

With the symbol Y, representing the boom width in feet, we multiply the ground speed (MPH), divided by the constant 8.25. The product is the APH, or acres sprayed in one hour.

As an example, let us say you are using a Model 308 John Bean Duo-Flex Boom which has 13 nozzles spaced at 20 inches and provides a spray swath of 21 ft. 8 inches or 21.67 ft. You have decided on a spray program which requires a ground speed of 4 MPH. This would be your calculations:

$$APH = \frac{21.67 \times 4}{8.25}$$

$$= \frac{86.68}{8.25}$$

$$= 10.5 \text{ acres per hour}$$

Calibrating sprayer equipment is important in your overall operation. Experiment stations and turf advisors should be consulted for their recommendations before a spraying program is started. If their recommendations are followed faithfully, your spraying program will be successful. If not, the best sprayer made cannot do the job for which it was intended.

Another important point to consider is the choice of spraying equipment. Be sure the sprayer has sufficient capacity to carry out your full program. Make sure it has a tank and piping system which are protected against the ravages of modern day chemicals. Be certain it has a good filter or ample capacity; plugged nozzles will upset your rate of application. Be doubly sure it has a pump that can withstand abrasive and corrosive chemicals you will be using. It should have an accurate and reliable pressure gauge and pressure regulator or relief valve. Make sure also that the boom is protected inside against rust and corrosion.

Buy your sprayer from a reliable source, preferably your turf equipment supplier. He has access to factory warranty and service programs which can be very helpful. Take good care of your spraying equipment; keep it in good condition. Periodically check nozzle capacities. Follow closely the recommendations of your turf advisors, and your spraying program will be successful.

Pit Scale Control

(from page 22)

ly free from phytotoxcity. Apparently certain environmental stresses on trees such as excess or deficient soil moisture, or root disease, have an important bearing on the likelihood of foliage injury following the application of a spray chemical. None of the trees, however, showed subsequent symptoms of leaf injury when the treatments were made before bud break. Unfortunately, these California trials indicate that applications made between late April to early June, when trees are in a foliated condition, result in more effective pit scale control than applications made in the late dormant stage. As is the case with many scales, maximum control apparently is contingent on application of the insecticide when the insect is in the vulnerable immature stage.

New Adjuvants

(from page 33)

which may be a 30 or 55 gallon drum.

Development of these application adjuvants when used with the Bi-Vac Inverter have many advantages over straight solutions or conventional emulsion applications. Through the Stull system, the spray mixture becomes a water-in-oil emulsion. The advantages over oil-in-water emulsions include less evaporation, more uniform droplet size, ease of control, and greater leaf penetration. Users also report reductions in run-off, spray drift and application costs.

Trimmings

Plaudits to John Gallagher. Special thanks are due John Gallagher for his time and effort in seeing that technical conference material is made available to the industry. We've attended two major meetings within the last few weeks, the Northeastern Weed Control Conference and the Weed Science Society of America. In both sessions, John, as president of NWCC and public relations committee chairman of WSSA was busy lining up officers and participants for the benefit of the press. Previously, in addition to his duties at Amchem Products, Inc., he, along with his committee members, had spent months in getting technical papers produced for press use. We appreciate this kind of help.

* * *

The When of Preemerge For Crabgrass. We've heard a number of of opinions on the best time to use preemergence treatment for crabgrass control. Because of the difference in climates and the variation in seasons, we believe the practical approach is that advanced by Dr. L. J. King in his book, "Weeds of the World." The chemical according King is best applied just before or just as the crabgrass begins to germinate. This will be the time between the withering of the flowers of Forsythia and the beginning of the flowering of dogwood. These are both easily recognized events for the sprayman.

* * *

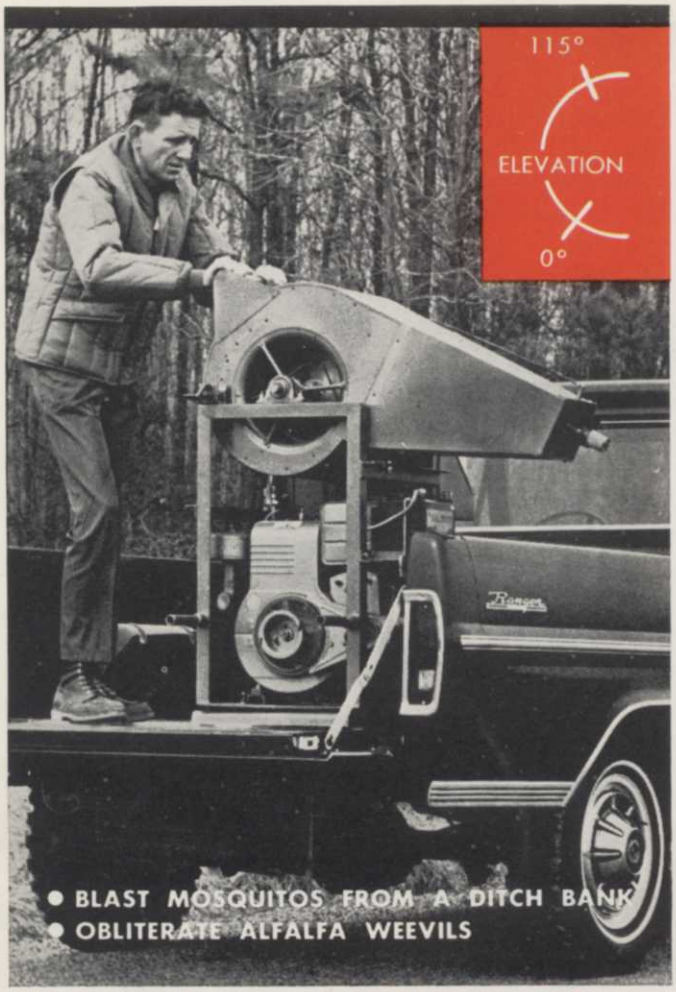
Lots of Room For Better Golf Courses. We are amazed at the recent National Golf Foundation report on golf course irrigation. Of 7880 courses surveyed, only 42 percent had irrigated fairways. So, we can expect lots of business for irrigation contractors during the next few years. Another surprising statistic was that Kansas has 116 of 500 sand greens still in use across the country.

* * *

DED Now In Idaho. Dutch elm disease continues its trek westward. Dr. Arthur D. Partridge, forestry professor at the University of Idaho, reports that recent laboratory tests confirm findings of the Boise City forestry department. Citizens are being asked to report symptoms to get a further check on the extent of DED in the state.

* * *

Welcome to the Club. Delaware turf interests have just organized a new group, the Delaware Turf Grass Association. Purpose, like those in many other states, is to get turfmen together for management sessions and to further and review research. Walter Petroll, Winterthur Gardens, heads up the bylaws committee, and Edgar Downs, Rehoboth Country Club, is the new president.



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