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Jack Nicklaus

Please send me information on these National Golf Foundation activities:

- ☐ Junior Golf programs
- ☐ Golf instruction aids
- ☐ Associate club membership program
- ☐ Check if you actively teach golf

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Address _____

City _____ State _____ Zip _____

National Golf Foundation, 200 Castlewood Drive, North Palm Beach, FL 33408

Figure 1. Crabgrass control in the right plot treated March 7 with Betasan compared with no control in untreated left plot. Picture made June 14.

Figure 2. Crabgrass control with Balan. Plot on left treated February 25 and May 10, compared with single February 25 treatment on right. Picture taken August 16.

Figure 3. Comparison of dates of Betasan treatments on crabgrass control.

Upper: Right plot treated February 12.

Lower: Right plot treated May 13.

Figure 4: Goosegrass control in right plot treated with Ronstar compared with poor control in left plot treated with Dacthal.

Golf Business

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Check one box in each category

1 Check one that best describes your golf facility or business:
- 10 ☐ Private golf course
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- 20 ☐ Daily fee golf course
- 25 ☐ Municipal/County/State golf course
- 30 ☐ Hotel/Resort golf course
- 35 ☐ School/College/University golf course
- 40 ☐ Military golf course
- 45 ☐ Dealer or Distributor
- 50 ☐ Architect
- 55 ☐ Course Builder
- 60 Other (Specify) _____

1a Check # golf holes at your facility:
- 65 ☐ 9 Holes
- 70 ☐ 18 Holes
- 75 ☐ 27 Holes
- 80 ☐ 36 Holes
- 85 Other_____

2 Check one which best describes your buying responsibility:
- 21 ☐ Purchase
- 22 ☐ Specify or recommend purchases

3 What is your estimated annual expenditure for each of the following:

3A/ Chemicals (for weed, disease and pest control)
- 31 ☐ Up to $1,000
- 32 ☐ $1,000 to $5,000
- 33 ☐ $5,000 to $15,000
- 36 ☐ $15,000 to $30,000
- 37 ☐ $30,000 to $50,000
- 38 Other_____

3B/ Fertilizers (All Formulations)
- 51 ☐ Up to $5,000
- 52 ☐ $5,000 to $15,000
- 53 ☐ $15,000 to $30,000
- 56 ☐ $30,000 to $50,000
- 57 ☐ $50,000 to $70,000
- 58 Other_____

3C/ Equipment (for turf, tree and grounds care)
- 91 ☐ Up to $10,000
- 92 ☐ $10,000 to $30,000
- 93 ☐ $30,000 to $60,000
- 96 ☐ $60,000 to $100,000
- 97 ☐ $100,000 to $150,000
- 98 ☐ Other_____

3D/ Irrigation (Installation and replacement parts)
- 71 ☐ Up to $5,000
- 72 ☐ $5,000 to $15,000
- 73 ☐ $15,000 to $30,000
- 76 ☐ $30,000 to $60,000
- 77 ☐ $60,000 to $100,000
- 78 Other_____

3E/ Plant Materials (Trees, Ornamentals, Seeds, Sod, etc.)
- 81 ☐ Up to $5,000
- 82 ☐ $5,000 to $15,000
- 83 ☐ $15,000 to $30,000
- 86 ☐ $30,000 to $60,000
- 87 ☐ $60,000 to $100,000
- 88 Other_____

4 Please estimate the following:
- 41 Total acres in your facility _____ Acres
- 43 Amount of lake and pond water _____ Acre Feet

5 **For more information** about products displayed in this issue, print the reader service number in the spaces provided below and block out A, B, C, or D for specific information needed.
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- 62 [b] Need more price Info
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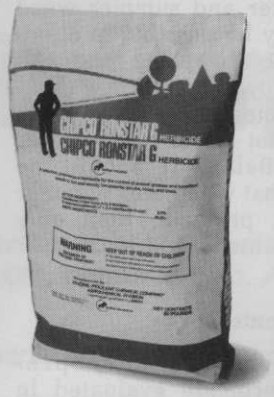
Got a goosegrass problem? Get the most effective, longest lasting pre-emergent goosegrass herbicide there is: Chipco Ronstar G. Rhône Poulenc Chemical Company Agro-chemical Division, Rhône Poulenc Inc. Monmouth Junction, New Jersey 08852.



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Please read label carefully, and use only as directed.

*In field trials conducted from 1973 to 1977. • Balan is a registered trademark of Elanco Products Company • Dacthal is a registered trademark of Diamond Shamrock • Betasan is a registered trademark of Stauffer Chemical Co.

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Herbicides *from page 30*

2-week period, crabgrass seed will initiate germination.

In a later study we found that MSMA could be applied in combination with either Dacthal or Betasan when crabgrass had already emerged before preemergence treatments were made. MSMA treatments controlled the emerged crabgrass and preemergence treatment prevented additional crabgrass from germinating. The combination treatments works good when applied in April or early May when the weeds are small. When combination treatments are delayed until June, it may be necessary to apply a second MSMA treatment at 7 to 10 days after the initial treatment to control larger crabgrass plants. When granular herbicides (Balan or Ronstar) are used in preemergence treatments, each chemical (preemergence and MSMA) must be applied in separate applications.

Fall vs spring treatments. It was found in our studies that when Betasan was applied in September for winter weed control, crabgrass was effectively controlled throughout the following summer without any additional treatment. However, it was necessary to repeat Ronstar treatments the following spring, but only at the one-half rate. Therefore, when chemicals are used for both winter and summer weed control, it may be possible to eliminate or reduce the spring treatment rate when following the winter treatments of selected herbicides. These results did not occur with either Dacthal or Balan. It should be emphasized that when only summer weeds are a problem, then only spring treatments should be made.

Goosegrass Control

Ronstar was the only preemergence herbicide evaluated in our studies that controlled goosegrass acceptably with a single spring treatment. Dacthal and Balan controlled goosegrass slightly in early spring, but the control did not last through the summer. A comparison of Dacthal and Ronstar treatments on goosegrass control is shown in Figure 4 (page 32). In our studies Betasan did not control goosegrass at any time. Recently a combination product of Betasan and Ronstar[2] has given similar goosegrass control when compared with Ronstar applied alone. In this product both chemicals are included at lower than the recommended rate. Betasan is included mainly for crabgrass and Ronstar for goosegrass.

Goosegrass germinates about 30 days later in the spring than crabgrass. Therefore, in the Piedmont region of Georgia, Ronstar should be applied by mid April for effective control. In most instances goosegrass control was nearly as good when Ronstar was applied in February and March as compared with April treatment. This indicates that Ronstar has good residual activity on goosegrass.

Ronstar should not be applied to bermudagrass overseeded with cool-season grasses unless a poor quality turf can be tolerated for up to 6 weeks after treatment. Immediately following Ronstar treatment, the cool-season grasses will be discolored and stands reduced. The poor transition occurs since cool - season grasses will go out faster than bermudagrass will initiate early spring growth. Preliminary data from Betasan and Ronstar treatments indicates that the lower rates in this combination will not injure the cool-season grasses as severely as when Ronstar was applied alone.

Bermudagrass Tolerance

Dacthal and Ronstar were applied at 1X and 3X rates to Tifway, Tifgreen, Tifdwarf, and Ormond bermudagrasses for 6 consecutive years. A delay in early growth of bermudagrasses in the spring was generally effected by both chemicals at sometime during the 6-year study.

Turf treated with 3X herbicide rates tended to have a reduced rate of growth in the spring than did turf treated at recommended rates. There was generally no pattern in delayed growth of bermudagrasses treated with various herbicides each year. Dacthal treatments generally delayed early growth of Tifgreen, Tifdwarf and Ormond bermudagrasses more severely than Tifway. Ronstar tended to delay early growth of Tifdwarf less and Tifgreen more than other bermudagrasses.

These results show that herbicides will more than likely influence early spring growth of turf in the spring. Therefore, it is important to select a chemical that causes the least turf injury. It was also noted that herbicides applied at 3X rates injured the turf more than 1X rates. This indicates that care should be taken to insure proper rate usage during chemical application. This not only saves money in cost of chemicals but will reduce or eliminate unnecessary turf injury.

Although Balan and Betasan treatments were not included in the present studies, it was noted in a separate study that Balan will generally delay early growth of bermudagrass slightly more than Dacthal. In most instances, Betasan delayed early bermudagrass growth similar to Ronstar treatments.

Even though Dacthal and Ronstar delayed early bermudagrass growth in early spring, neither of the chemicals affected quality of turf in May or stand of turf anytime during the summer when applied at recommended rates. This indicates that the delay in early turf growth in April was temporary and the turf fully recovered within a 4-week period.

Summary

To have and maintain a good quality turf as shown in Figure 5, care must be taken to select a herbicide that will control weeds without injuring the turfgrass. Some major findings for crabgrass and goosegrass control in bermudagrass turf are:

1. Betasan and Ronstar controlled crabgrass throughout the summer with a single application.
2. Balan applied in March and May controlled a higher percentage of crabgrass than a single March treatment.
3. Dacthal did not control crabgrass consistently even when repeated applications were made.
4. Betasan applied in the fall controlled crabgrass the following summer without additional treatment. Ronstar required an additional one-half rate in the spring.
5. Ronstar was the only herbicide evaluated in these studies that effectively controlled goosegrass.
6. Preemergence herbicides for crabgrass control must be applied by mid-March while goosegrass treatments can be delayed until mid-April.
7. Dacthal and Ronstar treatments delayed early spring growth of bermudagrass, but did not affect turf quality in May or turf stands during the summer.

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Calibrate to spray accurately

The method of applying pesticides is determined by formulation of the chemicals involved (i.e., liquid or granular) and the application equipment available. A superintendent should feel free to select the method and equipment best suited to a program's needs so long as accuracy and uniformity are assured. A critically important facet of minimizing error concerns accurately calibrating application equipment. Small areas magnify minute application errors. As an example, a desired rate of three (3) kilograms (kg) of material per hectare (ha), based on a 10 square meter (m^2) plot becomes 3.3 kg/ha if inadvertently applied to only 9 m^2, or 2.7 kg/ha when applied to an 11 m^2 area.

There are two general approaches to, or methods of, applying herbicides: area basis and volume basis. Calculations for the amount of herbicide needed will be based on the application method chosen.

Area basis

The area of a plot, or plots, to be sprayed with a particular material at a predetermined rate forms the keystone of this system. However, should less than the full plot width be sprayed, the area actually sprayed supercedes the full plot area in calculating amounts.

Note: A small amount of liquid is sprayed at the beginning edge of (but outside) each plot to be sure that all lines and the boom are full and that all nozzles are operating properly. An additional amount is left in the boom and hoses at the end of the plot. Allowances are made by adding a predetermined amount of water and herbicide. With the area system, this step amounts to simply factoring additional area into the calculations. The added area should always be the same for a given boom, regardless of plot size, being based on the extra liquid needed to fill that boom and to check nozzle operation. This method is most satisfactorily used with a spray tank shaped to allow discharge of all the liquid.

(Editor's note: This section is included because many superintendents experiment with pesticides to determine which will give optimum performance and economy on a given course. Extreme care should be taken when spraying to fill the lines and boom, as mentioned in the note above, so as not to overspray in one area and kill the turf.)

Using a predetermined area size permits all calculations to be made in advance. Dry herbicides should be weighed into bottles, plastic bags, or paper envelopes in the herbicide storage area, because most balances do not function well under field conditions. Liquid formulations either can be measured in advance or

Continues on page 38

On the greens, the fairways...all around the links, inside the clubhouse and under all the sinks

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measured from original containers in the field immediately prior to application.

Example 1

Material: atrazine
Rate: 2 kg active ingredient (ai)/ha
Plot size: 2 x 5 m
Replications: 3
Calculations:

(1) Plot size—2m x 5m = $10m^2$ x 3 replications = $30m^2$

(2) Add 1.5 m^2 to allow for filling boom and hose

(3) One hectare ($10,000m^2$) requires 2000g ai. $31.5m^2$ ($30m^2$ + $1.5m^2$) requires X g

$$x = \frac{31.5 \times 2000}{10,000} = 6.3 \text{ g ai}$$

Caution: The above example assumes the pesticide and water for all three replications are mixed together. *When spraying wettable powders, each replication should be MIXED and SPRAYED SEPARATELY unless great care is taken to prevent the herbicide from settling to the bottom of the tank.*

Greater accuracy is also required when all replications are mixed together; any error in application rate will not be noticed until the last plot of the series is sprayed. This is especially serious if all the spray is used before completing the last plot.

The amount of water required to cover the area to be sprayed can be determined by filling the sprayer's tank with clean water (only) and spraying the area at the desired pressure and speed and measuring the amount of water consumed. The operator should then pace himself by applying the measured amount of water to a non-plot area having the same size, surface, and walking conditions as the actual plot. Pacing requires several passes until the correct amount of water can be sprayed each time, making sure to actually begin spraying at the beginning of the pacing test and to stop spraying precisely at the test end as will be the case in applying herbicide to the plots.

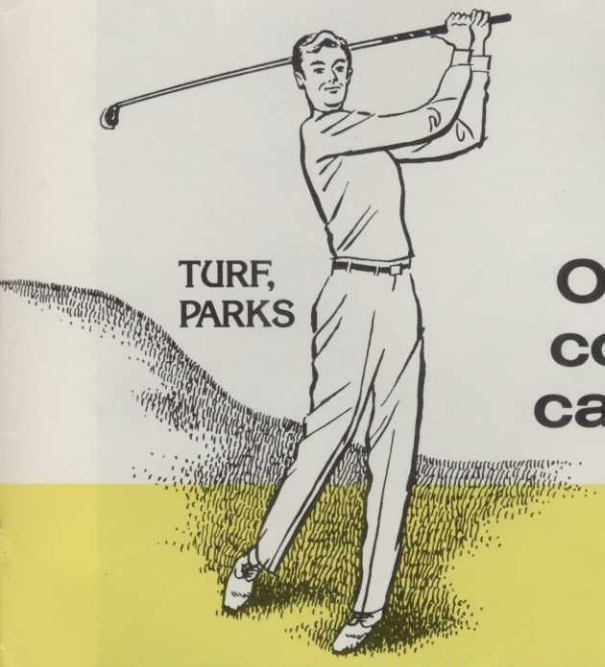
Volume basis

With this method, the amount of herbicide is calculated for a given amount of water rather than for a certain area. The volume of water used usually exceeds that required to spray the plot or plots; consequently a method should be devised to assure a constant and accurate speed. A stop watch serves this purpose. The volume method is useful when plots are large enough to require refilling the spray tank and when the spray tank design prevents using all of the liquid. There does not appear to be any other advantage in spraying small plots by this method.

The first step requires calibrating the sprayer to determine the output of water. A very convenient method of calibrating a small plot sprayer is described by L. Kasasian in his book, *Weed Control in the Tropics:*

"Pour a measured amount of water in the sprayer and spray 100 m^2 exactly as if one were applying herbicide. When this is done, measure the amount of water left, and by subtraction, calculate the amount used. Then multiply by 100 to obtain the volume rate per hectare."

SULPHUR COATED UREA



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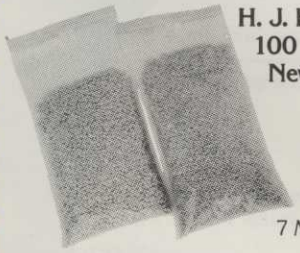

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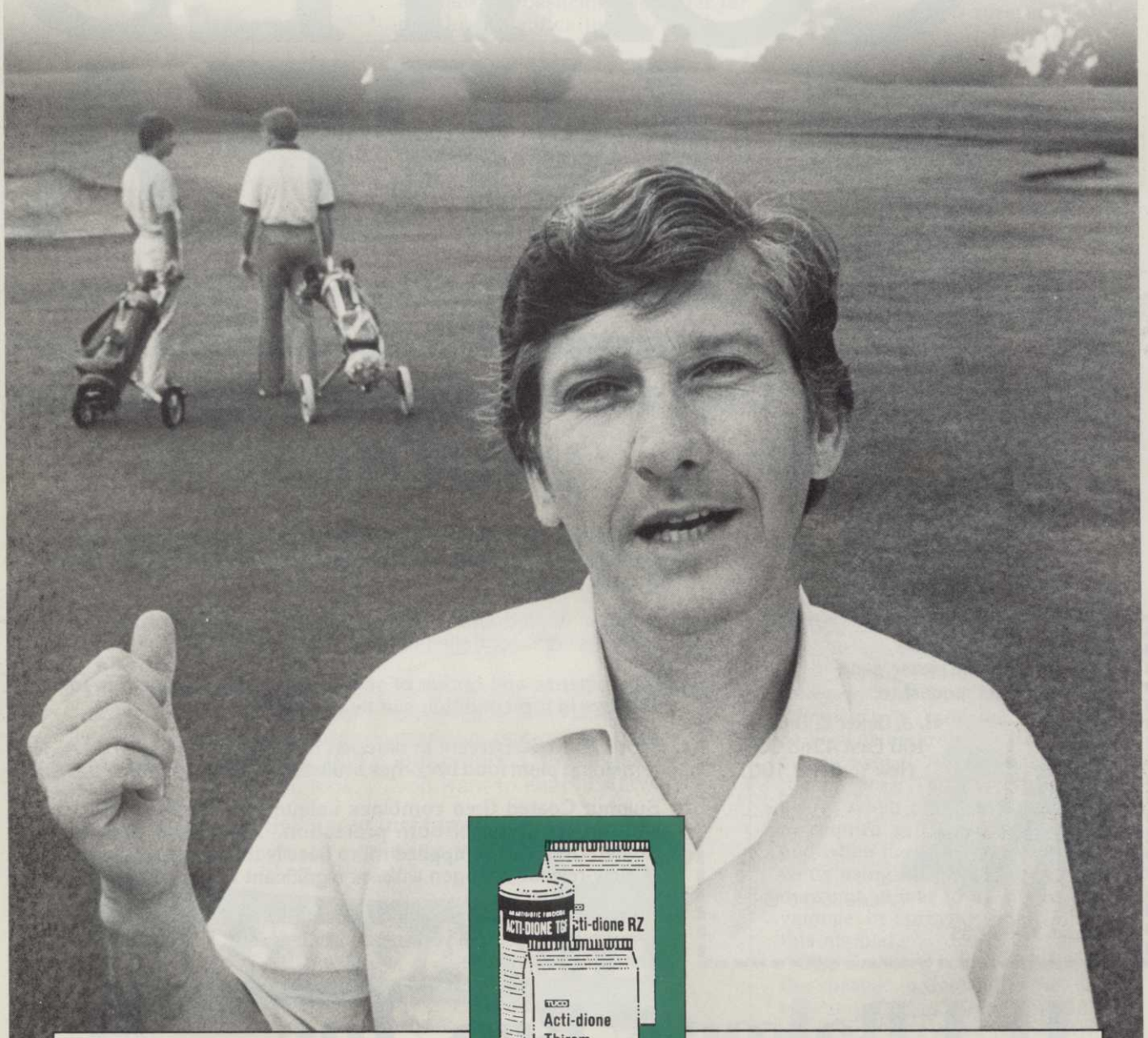

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