

# 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

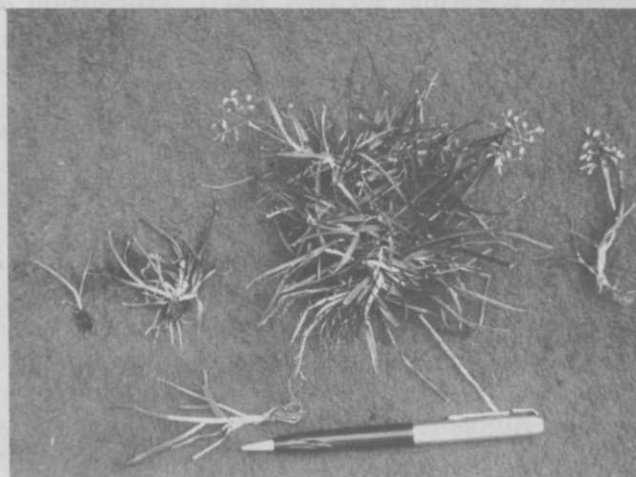
and poor golfing conditions prevail.

(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 continuous 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 tri-calcium 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, fox-tails, 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 Pfothenauer 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<sub>2</sub>O<sub>5</sub> 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

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### Turf Enemy No. 1

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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 An-*

*nua*, 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% tri-calcium 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 tri-calcium 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.

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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 retarded overseeding.
6. Suggest start applying 6 to 10 pounds of 48% tri-calcium 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.**