the fine points of turf management. The great majority will depend wholly upon better turf from better grasses for their crabgrass control program. They will buy seed from their dealers and they will sow it on their lawns (much of it out of season), and then hope! A few will use a chemical control, but much of it will be used improperly because they do not know best how to use it. Almost none will use mechanical methods because that involves labor, and the homeowner wants to relax on his lawn. Most of them will cut their lawn closely because that is the way they want it. We will encourage this practice because our improved turf grasses for golf thrive under close mowing for any other use, too.

On golf courses, athletic fields, and many other turf areas, we have learned that periodic soil cultivation provides many benefits to the turf. The net result is stronger turf and, therefore, less crabgrass. This will become standard practice on all turf areas as we learn more about it.

We believe that crabgrass control in turf will become a simpler procedure as we gain knowledge and understanding and as commercial turf interests develop a better basis for disseminating accurate, authentic information. Crabgrass is losing its place as the No. 1 national turf pest where all known methods of control, the introduction of better grasses, and good turf management are practiced.

FACTORS IN CONTROLLING CRABGRASS WITH POTASSIUM CYANATE

This was regarded as one of the outstanding papers presented at the 1951 Northeastern Weed Control Conference in New York, January 3-5. The authors were requested to condense the original paper especially for the USGA JOURNAL. We are pleased to present the condensed material here.

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Potassium cyanate was reported as an outstanding chemical for the selective control of crabgrass in turf by R. E. Engel and D. E. Wolf, of the New Jersey Agricultural Experiment Station in 1948. Further work was reported in 1949. During the summer of 1950 experiments were run to investigate possible causes and remedies for irregular results occasionally observed in field work. Factors investigated include temperature of the solution, degree of concentration, number of applications, rate and type of wetting agent, spray particle size, and possible activators.

Temperature of the Solution

The first tests were made May 25 when crabgrass kill had been rather slow, apparently because of cool weather. Crabgrass plants were in the two-leaf stage. Weedone Crabgrass Killer was applied at the rates of 8 and 16 pounds of potassium cyanate per acre in 180° and in 60° water. The best kill resulted from applying 16 pounds in hot water as the fine spray produced by Monarch nozzle F-97-S No. 20.0. A coarser spray of 16 pounds in hot water was next in effectiveness. The 8-pound treatments followed the same trend. Poorest results were from coarse sprays of cold solution, indicating a possible advantage to using hot water at this time of year and to using a fine spray.

Number of Applications

Cumulative application tests were begun June 23. Applications of 8 pounds of potassium cyanate per acre repeated four times at 3-day intervals produced 100% control which persisted throughout the season. Three similar applications gave nearly as good control, with slight reinfestation. Two treatments were more than twice as good as a single treatment.

Minimum Concentration

In an attempt to obtain satisfactory crabgrass control with a minimum of discoloration to the permanent grasses, Weedone Crabgrass Killer was applied at rates of 4, 6 and 8 pounds of potassium

cyanate per acre and treatment repeated at intervals of 3, 6 and 9 days. Best results were obtained by repeating the 8-pound treatment in 9 days. No 4-pound application gave acceptable results. The 6-pound applications were less satisfactory than the 8-pound treatments. Again, double applications were considerably better than a single one.

Rate and Type of Wetting Agent

It was noticed that the crabgrass blades were not always completely wetted by sprays. Replicated plots were laid down July 21 at the Philadelphia Country Club with treatments of straight potassium cyanate (no wetting agent), and potassium cyanate combined with a wetting agent at the rate of 1.6, 0.8, 0.4 and 0.2 pounds of Igepon per acre. Plots treated with both potassium cyanate and Igepon showed better control of crabgrass than the plots treated with potassium cyanate alone, but there were no apparent differences between the rates of Igepon used.

On August 1 five different types of wetting agents were combined with potassium cyanate and compared with treatments of potassium cyanate alone. Again, there were no apparent differences in performance even though some of the solutions wetted the crabgrass blades better than others.

Possible Activators

Potassium cyanate was applied August 4 at rates of 6, 8 and 16 pounds per acre alone and in combination with 2, 4-D sodium salt at rates of one-half or 1 pound 2, 4-D acid equivalent per acre. These treatments were repeated on half of the plots August 15. All plots were replicated three times.

The best control of crabgrass was obtained with two treatments of 16 pounds of potassium cyanate plus 1 pound of 2, 4-D per acre. However, as was observed with other 16-pound treatments during the season, there was considerable discoloration of desirable grasses. Eight pounds of potassium cyanate plus one-half pound of 2, 4-D per acre applied twice produced nearly as good control and less discoloration. As has been previously mentioned, areas receiving double applications showed considerably better control than those receiving only one application, whether at the 8- or 16-pound rate. All treatments incorporating 2, 4-D controlled broadleaf weeds (mainly plantain and dandelion) satisfactorily.

Ammonium sulfate had no apparent effect, either alone or in combination with potassium cyanate and Igepon. Ammonium thiocyanate produced only tip burn.

Spray Particle Size

Results from using different size spray particles were compared in tests started September 6, the applicators ranging from a common watering can to a knapsack sprayer fitted with a mist nozzle (Monarch F-97 No. 2.0).

The watering can was ineffectual as an applicator, probably because coverage is very poor. Best results were obtained with the mist nozzle which discharged 2 gallons per hour at 100 pounds pressure. Coverage with this was excellent, but the large amount of extra time required for application did not seem justifiable.

Applying a lower volume of higher concentration will be investigated. A fan nozzle applying approximately 20 gallons per hour at 100 pounds pressure (Monarch F-97- S No. 20.0 was used) seemed most advisable from the standpoint of getting in a reasonable length of time the thorough coverage which appears essential.

Conclusions

Under the conditions of these experiments, it was concluded that a hot solution of potassium cyanate was more effective than a cold one, at least in early spring. Double applications of 8 or 16 pounds of potassium cyanate per acre gave more than twice as good results as single treatments. Eight-pound treatments of potassium cyanate produced a satisfactory kill of crabgrass with little discoloration of turf grasses. Sixteen-pound treatments killed crabgrass somewhat better but discolored turf grasses more. Six pounds per acre was less satisfactory than 8, and no 4-pound treatment gave acceptable results.

There was an advantage to using a wetting agent with potassium cyanate, the types and amounts tested appearing unimportant. There was an advantage to combining 2, 4-D with potassium cyanate for weed control. A fairly fine spray gave best results. *Thorough coverage and uniform distribution over the prescribed area appear essential to the successful use of potassium cyanate for killing crabgrass.*

From general observations during the season, it was also concluded that even though crabgrass was not completely killed, it was thinned out so permanent grasses either were not crowded out or were able to re-establish themselves. Such crabgrass was stunted, did not appear to develop further, and did not set seed. Seed sown on treated spots, even when crabgrass was not raked out, germinated and overcame crabgrass remnants. Re-treatment should be made in about a week if crabgrass shows signs of recovery.

Although discoloration of permanent grasses was often noted, it was temporary and was usually eliminated with the first mowing after treatment. Some fescues and bent grasses appeared more sensitive to potassium cyanate than other grasses and should be treated cautiously. Turf less than a year old should not be treated with potassium cyanate, and treatment of all turf should be avoided during very hot or dry weather.

Permanent grasses injured by mid-summer treatment were slow to recover. Results with potassium cyanate at that time were erratic, and there seems to be little advantage to treating in mid-summer. More advisable times are late spring when crabgrass seedlings are appearing and early fall when permanent grasses are resuming strong growth. Spring treatment is useful where crabgrass infestation is light, but early fall treatment is more advisable where infestation is heavy. Fall treatment should be followed by reseeding and adequate fertilization to heal over bare spots left by dead crabgrass.

This report concerns one year's observations. Some of the tests will be repeated next year under different conditions. There are several other factors which may have direct bearing on the successful use of potassium cyanate to control crabgrass in turf, and some of them will be tested also during the coming year.

IMPROVED TURF GRASSES

February 10, 1951, marked the 30th anniversary of the Green Section's existence. During those 30 years a large part of the research effort has been aimed toward improvement of turf grass strains. The research program has involved selection, increase, and testing.

The testing phase has been done on as broad a scale as possible. The assistance of golf courses and state experiment stations in this has made the release of some strains possible. Many readers remember the "pie greens" in which strains of bentgrasses for putting greens were tested.

In recent years, the Green Section has cooperated much more closely with state experiment stations. Research grants established at many experiment stations by the Green Section have facilitated testing strains developed by the Green Section and development of new strains by the stations themselves. The Green Section has attempted to reciprocate by aiding in the proving of these strains developed at the state experiment stations and by coordinating the testing program in other areas.

The search for improved strains of turf grasses has been successful, as evidenced by the commercial availability of many of these strains. More will be coming into use as strains now being tested are released for commerce.

Merion bluegrass is one of the most promising grasses developed by the Green Section. It was described in an article by Charles G. Wilson and Fred