Selective Control of Weeds Explained

By GEORGE SARGENT

In August GOLFDOM I discussed the pros and cons of ammonium sulphate as a weed-control agent, while the importance of proper fertilization and management of turf were stressed in the September number from the weed control angle. While it is vital that the greenkeeper be thoroughly versed in both the theory and practice of the above phases of turf maintenance, nevertheless, in themselves, they do not furnish him with ammunition adequate for a winning battle with the weed problem. It would appear that I can wind up this series of three articles on weed control in no better manner than by supplying him with a few soft-nosed cannon balls.

Weeds and the fine turf grasses are all plants, obvious as it may sound. Consequently if you have a turf in which both are present, and wish to eradicate the former by chemical means, it is good business to watch your step. Don't get too rough in your tactics or you will succeed in eradicating not only the weeds, but the grass as well. To succeed in the quick elimination of weeds by chemical means, you must use what is technically termed a selective agent. You might, in ordinary parlance, refer to it as having a discriminating action, if we can attribute such a quality to such an inanimate material as a chemical. Iron sulphate, for instance, has been known for years as a weed control agent. Theoretically, at least, you can spray a mixed turf of weeds and grass with this compound and the weeds will die while the grass will be unharmed. Theoretically this may be true, but in actual practice the compound is tricky and uncertain. You never know what the ultimate result will be, and often the grass is killed. Greenkeepers are afraid of it, and justly so. Consequently it has never had much vogue in turf maintenance circles. The compound lacks discrimination, or, in other words, it is not foolproof.

Selective Control Agent

Arsenate of lead, on the other hand, from the standpoint of its use on turf, is a striking example of a successful selective control agent in that it is rich, juicy meat for the majority of fine turf grasses and poison to the majority of weeds. In order to explain this fact, suppose we consider briefly the chain of chemical events which occur when arsenate of lead is mixed with the soil in which a mixed stand of fine grass and weeds are growing.

When arsenate of lead is added to soil it is acted upon chemically by the soil solution or, in plain language, the soil moisture. This soil solution or soil moisture is not just simply water, as a great many people think. Rather, it is water in which are dissolved a great many things, such as phosphates, nitrates, sulphates, potash salts, etc. It is from this soil solution that the plant obtains a por-
Crab-grass control by arsenate of lead is well illustrated in this picture. Early in June, as the crab-grass began to sprout, the plot on the right was treated with arsenate, while the plot on the left received none. Note also how stunted are the few crab-grass plants which have not yet succumbed to the treatment.

tion of its food. This soil solution, acting on the arsenate of lead, causes a chemical change to take place as regards the latter, or, in chemical jargon, “breaks it down,” with the result that we then have in the soil some soluble arsenic, some basic arsenate of lead, this being virtually inert as far as toxicity to grubs, worms and weeds is concerned, and some ordinary arsenate of lead which has as yet been untouched, since the capacity of the soil solution is such that it can break down only a comparatively small amount of arsenate of lead at a time. The process, however, while relatively slow, is continuous, and ultimately all the arsenate of lead undergoes this chemical change, with the result that in time the arsenate of lead loses its grub, worm and weed controlling virtue and additional arsenate of lead must be added to the soil to restore its grub-proof condition.

Does Arsenate of Lead Doom Soil?

The opinion is still held in some quarters that the continued addition of arsenate of lead to turf will ultimately result in the ruination of the soil due to the cumulative action of the chemical. From the theoretical chemical standpoint, such an ultimate soil condition is improbable, if not impossible, while in actual practice, turf treated eight years ago with relatively huge applications of arsenate of lead is still going strong.

As stated above, one of the products of this chemical action between the soil solution and arsenate of lead consists of soluble arsenic, or, in other words, the soil solution or soil moisture, as a result of the chemical action, contains some arsenic in solution and consequently capable of being absorbed by the plant roots present in that soil.

When the roots of a grass plant, as, for instance, creeping bent, come in contact with this soluble arsenic in the soil solution, one of two things happens, but which one we do not as yet know any more than we know why a chicken crosses the road or a canary bird sings. Either the roots of the grass absorb the soluble arsenic out of the soil solution and find it palatable or they possess the ability of taking their regular soluble food out of the soil solution and rejecting the arsenic. At any rate the vast majority of fine turf grasses thrive in soil containing arsenate of lead. Not so the majority of weeds commonly found in fine turf. When the roots of these plants come in contact with the soil solution containing soluble arsenic they apparently absorb it, with the result that the weed is poisoned by degrees and ultimately dies. This reaction is evidenced to the close observer by the stunting of weed growth following the application of adequate amounts of arsenate of lead to the turf and the gradual yellowing and ultimate death of the individual weed. This reaction is especially noticeable with such rank growing weeds as crab grass and chickweed. It can be mathematically measured in the instance of a solid mat of chickweed by pegging the
outer boundaries of a specific patch of this weed prior to the institution of a program of lead arsenate treatments.

**Slow Death to Poa Annua**

In the case of such relatively inconspicuous growths as *Poa annua*, the elimination takes places with the greenkeeper hardly aware of what is going on, or as the poet says, "unheralded and unsung."

So much for weeds already present and in full growth prior to the institution of the program of lead arsenate applications. How about the weed seeds which rain onto the turf with every puff of wind and swirl of rain? Of the numerous species of weed seeds which locate on an arsenated green, many are killed as soon as the seed takes up some of the soluble arsenic and before it even sprouts, while many others, while they may germinate, are nevertheless stunted in growth, cannot compete with the heavy turf grass growth and fade out of the picture.

As stated in last month's article, we are concerned as regards the weed problem in fine turf with only the upper quarter to half inch of surface soil, since weed seeds present in the soil below this depth are ordinarily not sufficiently strong to germinate and push up through a greater depth of soil. The problem of weed control, therefore, narrows down to that of so treating this surface-soil layer that weeds already present will die and weed seeds subsequently deposited thereon will not germinate normally, but on the contrary will die. Furthermore, on greens where top-dressing is practiced such top-dressing must also be rendered weed-proof.

**Weed Control Directions**

I have in previous articles gone into detail as to the best methods of applying arsenate of lead to fine turf, and the reader is referred to these previous articles for specific directions. It will, no doubt, however, be advisable at this time to make a few recommendations for the use of this compound purely as a weed control agent for those who have no particularly pressing grub or earthworm problems confronting them.

Let us suppose that you have a green with a heavy weed content and you are desirous of adopting the arsenate of lead method of control. If you are desirous of obtaining quick action and sharply outlined results, it is advisable to use five pounds of lead arsenate per one thousand square feet of turf, applying this amount of the chemical in one application and taking care to secure an even spread. The question of evenness of application cannot be over-emphasized since it is obvious that if the chemical does not come in contact with a given weed that weed will not be killed. Unevenness of application results in uneven weed kill or spotty control, as some would term it, and this can be corrected only by again arsenating those spots in which the weeds persist. The above application will go a long way toward cleaning up such weeds which are so difficult of removal by ordinary hand weeding.

The removal of these types of weeds by hand result in bare spaces in the turf and necessitate the insertion of plugs wherever a matt of weeds is removed. In addition to being laborious and expensive, it usually has a tendency to make a rough green, no matter how carefully the operation is performed.

By the use of arsenate of lead, this "plugging" is rendered unnecessary. As the weeds begin to feel the effects of the arsenic they become stunted in growth, take on a sickly appearance and gradually fade out, during which time the bent grass in the immediate vicinity makes a heavy growth, pushes in and fills up the spot formerly occupied by the weed. So quiet and orderly is this transformation that it is not apparent unless certain weeds or matts of weeds are marked and maintained under consistent observation.

Inasmuch as the top-dressing material teems with weed seeds, arsenate of lead must be applied with each top-dressing application in order to maintain the so-called weed-proof surface layer. For this purpose the chemical should be applied at the rate of one-half to one pound per thousand square feet of turf with each top-dressing. For light top-dressings, use the half-pound rate, while with heavier applications, use the pound rate.

Crab grass is probably the most annoying of weeds in fine turf, not only on the greens, but the fairways as well. Arsenate of lead will kill it off at any stage of its growth, and on arsenated greens it is rarely much of a problem. For the control of this weed on fairways, where consistent top-dressing is not practiced, it is best to apply the chemical just as the crab grass is beginning to sprout (250 pounds per acre). Of course, you can apply the arsenate at any time and clean up the
Public course golfers are exacting and they are getting increasing higher grade facilities from enlightened and competent municipalities. Here is one of the public park clubhouses at Minneapolis where park golf management is of excellent character.

I propose to write in GOLFDOM on the “problem of the worn-out fairway and how to bring it back.” I have a few ideas on this subject which may prove interesting and furnish food for thought for the up-and-coming greenkeeper.

ARSENATE of lead has no direct nutrient value for grasses, but treated and untreated plats, side by side, show that the majority of grasses grow more luxuriously in arsenated soil than in soil not so treated. The explanation of this grass stimulation lies no doubt in the fact that arsenate of lead does a great deal in controlling nematodes, and adverse bacteria and fungi which infest all grasslands and tend to slow down the growth of vegetation. Consequently, it may be said that arsenate of lead has an indirect nutrient value for grasses.—B. R. Leach.

ARSENATE of lead, at the dosages recommended for grub-control, is death to Poa annua and it is having considerable vogue in the East as a means of ridding greens infested with this grass, which to most golf clubs is highly objectionable. Under the circumstances, would not advise the use of this chemical by greenkeepers who wish to retain their Poa annua greens. —B. R. Leach.