

equipment between the bunker and the green. Greens can be shaped so that bunkers will be relatively near the hole even though there is room for mowing units to pass between the bunker and the green.

Plant materials should be used judiciously on the golf course to prevent their

interference with maintenance. Trees should be spaced so that there is not a necessity for the use of small mowing units. Shrubs probably should not be used on the golf course. Their place is around the clubhouse. Golf balls cannot be played from beneath shrubs and they invariably constitute a difficult maintenance problem.

Technical Advances Which May Counteract Unnecessary Maintenance Costs

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TECHNICAL advances have had profound effects upon the quality of turf and upon the cost of maintenance. Better grasses have been uncovered, management procedures have been simplified, and costs have been reduced, in some instances.

At one time grubs of the Japanese beetle threatened complete destruction of turf in the Philadelphia area. Control with carbon disulfide was tried first. It killed the grubs, but turf damage from its use was worse than from the grubs. The USGA Green Section induced the United States Department of Agriculture to attack the problem. Leach got the assignment and promptly developed the lead arsenate method of grub-proofing turf. He pointed out other virtues of lead arsenate usage—such as worm cast control and the marked reduction in weeds, notably crabgrass and chickweed. Then chlordane displaced lead arsenate. It killed grubs quicker and more effectively and solved the ant problem. An over-all spray gave better control and was cheaper than the old method of poisoning each ant hill by hand.

This is but one instance of a case where applied research saved the day and in doing so provided other important benefits including a better and cheaper way to control ants.

Even more startling advances are in prospect because of intensified research by the various experiment stations. Research workers there are the true missionaries in the turf field. Besides finding the answers to immediate practical problems, it is their task to delve into the realm of the unknown. As a result of such research the

impossible of today becomes the commonplace of tomorrow.

The problem of translating research into practice must be faced by the superintendent. You must separate the wheat from the chaff. In most instances it is a simple matter. To put any proposal of a revolutionary nature into large scale use immediately is unwise. Field testing first, followed by pilot scale use is the wise procedure. It is the way to acquire the know-how to do the job, and to uncover any weaknesses in the method. Some can be corrected, but others may nullify what seemed like a desirable change.

The same kind of approach should be used by outside advisory agencies. The money spent is not their own. They must be sure of their ground when offering a positive recommendation, and must be prepared to defend the program.

Budgets for course maintenance have not been out of line. They have been within reason, mostly too low rather than too high. Any attempt to make a moderate or drastic cut will be bad for the turf. Economy-minded officials have made slashes before. Turf deterioration occurs gradually, especially where there has been a high standard of maintenance. The economists have their day for several years. After the day of reckoning, the cost of rehabilitation is more than would have been spent to keep the course in good playing condition.

The golf course is no place to waste or to save money. It is important to provide those things which make the golf course

pleasant to play and to get full value for each dollar spent. Metropolitan clubs can afford to schedule fungicide treatments to prevent disease, and can provide the niceties their members want. A small town club may be compelled to take more chances with disease and provide the bare necessities only. By good management they can keep their members happy.

Agricultural Chemicals in Efficient Turf Management

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YOUR first question is: What can agricultural chemicals do for me? In reply you must answer the questions: What are my problems and my needs? What equipment, labor, experience and technology are available for the utilization of agricultural chemicals?

Agricultural chemicals is a term which encompasses a broad field. It includes fertilizers, insecticides, fungicides, and many other special items. Let us consider fertilizers first.

Fertilizers include organic materials, such as cottonseed meal, sewerage sludge (either activated or processed) and waste by-products. There are also four types of manufactured or synthetic nitrogen; ammonium salts, nitrate salts, urea and urea-formaldehyde. Besides these there are two major forms each of phosphates and potash. One is concerned then with the desired combination of three major nutrients which are available in twelve major forms.

Recent studies of plant tissue content and compilations of soil test results confirm earlier observations which indicated that when phosphorus is present in the soil at an adequate (medium) level, growth response to further additions of phosphorus should not be expected. Therefore phosphorus incorporation should be a part of seedbed preparation. Phosphorus should be incorporated as completely into the root zone as possible. Dr. Alderfer, in New Jersey, reports that roots will grow only where phosphorus is above minimum levels.

Phosphorus use has been emphasized in the growing of field crops, and its use in seedbed preparation has been stressed.

Although the session is designed for the superintendent, it would seem fitting to stress the wisdom of keeping abreast with new developments. By the same token it is important for the club to have a competent man at the helm. Besides being well versed in the technical problems of turf management, he should have labor management know-how.

These facts may cause one mistakenly to apply unnecessary amounts of phosphorus. The fact that phosphorus has been used in more than adequate amounts is evidenced by the findings of recent studies which disclosed that 98 per cent of the established golf greens in the Midwest have excess phosphorus accumulated in the upper 2" of the soil. The fertilizer industry is rendering a valuable service in the current trend to produce fertilizers of a 4-1-2, 3-1-2, or 2-1-1 ratio. These permit you the convenience of using a complete fertilizer without the necessity of over-using phosphorus.

Potash is a different matter. Its repeated application on irrigated turf should be mandatory. For many golf greens I would like to see some potash applied monthly. This applies to those fertilizers which give a peak availability, then a dearth of supply. These must be used more frequently and at lighter rates per application to achieve satisfactory results.

You are well acquainted with the organic nitrogen materials whose excellent performance is particularly noticeable in the late summer and fall periods. Under comparative testing the new class of urea-forms has been brought to the attention of many of you. These materials, which are chemical compounds produced industrially by the combining of urea and formaldehyde, can give a rather uniform release of nitrogen so that two applications per year may perform very satisfactorily. Continued use of these materials will contribute to successful understanding of their performance.

As with organics, you may use the urea-