Trials and findings

A further report on the work of the Sports Turf Research Institute at Bingley

Some of the first trials by the Institute (in 1929) were on the subject of fertilisers and many of these were kept on as demonstration plots until 1964. The trials were on the value of various standard fertilisers with and without sulphate of iron on fine turf established from seed and on existing meadowland turf. Further differently orientated and organised trials on similar marterials were initiated in 1937, 1939 and 1948. The general picture that emerged was:—

(a) Turf needs a balanced fertiliser with nitrogen the most important plant food, phosphate second and potash third.

(b) Sulphate of ammonia is a very good nitrogenous fertiliser for turf, having a marked effect in keeping down disease, worms and weeds including annual meadow-grass and in producing a firm playing surface but long continued exclusive use leads to poor rooting, fibre formation and lack of drought resistance.
Organic nitrogen fertilisers help drought resistance but continued exclusive use leads to a soft, easily damaged turf prone to weed and worm invasion and susceptible to Fusarium patch disease. Alkaline type fertilisers encourage weeds, worms and disease, especially if used regularly.

(c) A suitable fertiliser for fine turf

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is based on a balanced mixture of organic and inorganic (but non-alkaline) fertilisers. For general sports ground turf where organic matter and re-cycling of plant foods result from return of cuttings a granular fertiliser based on inorganic is suitable.

(d) Sulphate of iron is a useful turf conditioner but can be over-used.

From 1961 to 1968 there were trials on the important subject of slow release nitrogen fertilisers to replace and/or improve on natural organics—the materials in the first place being of the urea-formaldehyde type about which there were glowing reports from the U.S.A. Results were disappointing; about a third of the nitrogen was released very quickly and the remainder very slowly if at all, whilst the effect on turf quality was similar to that of natural organics. New investigations to find a good slow release nitrogen fertiliser were started up in 1966, using several promising materials suggested to us, but again results were disappointing. It may be that the perfect nitrogen fertiliser will never be found—but we are still searching and trials with another new slow release nitrogen product have started this year.

Top Dressing

Work on this subject started right at the beginning and articles on compost dressing and the sterilisation of it for golf greens appeared in the Journals for 1930 and 1932. Some of the results of top dressing trials, e.g. with different kinds of sand. were never reported but simply incorporated into the advisory service as has happened frequently over the years.

Trials on mowing were first carried out in 1931 and further trials on different aspects of the subject have been carried out from time to time since—indeed in a way they are still going on because an important aspect of the present day cultivar trials is the examination of performance under different heights of cut. For fine turf it has been shown that return of cuttings whilst having some advantages, e.g. in the re-cycling of plant foods, is on balance detrimental in that it encourages weeds, worms and disease. On coarser turf practical convenience usually dictates the return of cuttings. Grasses vary in the height of cut they will tolerate—perennial ryegrass needs $\frac{3}{4}$-1 in. while bent will stand as close as 3/16 in. Close mowing does reduce root development, of course.

Scarification

Not much experimental data has been published on this subject but the importance has been clearly demonstrated in trials on fine turf and manufacturers have been influenced to produce suitable equipment.

Aeration

There have been numerous trials on aeration, some reported, some not. It has been shown that hollow tine aeration is of great advantage in reducing compaction, encouraging root growth and getting water away from the surface. It does, however, facilitate invasion by weeds and, if over-done, produces too soft a surface. Solid tine forking is less efficacious in many ways but can be carried out very frequently without apparent detriment and is particularly useful on large areas where disposal of hollow tine cores presents difficulty.

Pest Control

(a) Early trials on materials for

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leatherjacket control resulted in the production of a preparation which became known as St. Ives leatherjacket exterminator. Later trials showed the value of lead arsenate and, immediately post-war, successful trials with D.D.T. and B.H.C. were reported.

(b) Earthworms have their pros and cons but it is generally accepted that on balance they are not advantageous. There have been successful trials with mowrah meal, derris, potassium permanganate, calcium and lead arsenate, chlordane and more recently sevin (carbaryl), the latter being of low mammalian toxicity but not long lasting. Arising out of investigations at the Institute and using the Institute's turf plots. Peter Jefferson, who transferred to Nottingham University, carried out research into the various species of earthworm found in turf under different conditions of pH etc.

Weed Control and Grass Growth Control

Trial materials have ranged from lawn sands to selective weedkillers of various types—more recently to selectives suitable for new turf.

Moss control has received a great deal of attention, emphasis being laid on management. Lawn sands containing sulphate of iron and/or mercurous chloride have been fully tested and trials with newer chemicals are in progress.

Annual meadow-grass is something we could do without but despite numerous field trials a really good solution has not yet been found. A very good base for annual meadow-grass work was provided by a research student from the U.S.A. Victor Gibeault, who did a year's research with us in 1965/66, his salary being covered by a special grant from Messrs. Fisons. We are still actively engaged on the problem, a solution to which is being sought by many people in other countries. There seems to be more hope of a solution being found for eliminating annual meadow grass from seed beds than there is for dealing with it in existing turf.

Keeping swards tidy without mowing has also received attention, numerous trials having been carried out. The most promising product has been maleic hydrazide—which proved only a qualified success. It is, however, commercially available and used to some extent on turf where quality and appearance standards are not too high.

Disease Identification and Control

This is a field that has received attention from the Institute practically continuously. Excellent work by J. Drew Smith and Noel Jackson culminated in the useful book "Fungal Diseases of Turf". Not only has the Institute carried out numerous trials on control of the common turf diseases but it has also been instrumental in identifying diseases not previously reported or identified on turf in Britain, e.g., **Ophiobolus graminis** on **Agrostis** and **Poa** turf (1952), **Helminthosporium sativum** on perennial ryegrass (1953), **Colletotrichum** on annual meadow-grass (1954). At the present time there is a good range of fungicides available, most of which have been tested at Bingley. New materials are tested as conditions allow.

Soil Physics and Related Subjects

Over the last ten years or so there has been a very large amount of research internationally (again especial-

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ly in the U.S.A.) on the subject of producing soil (or at any rate a satisfactory growing medium) of high hydraulic conductivity to facilitate rapid disposal of excess water and yet possessing a sufficient moisture retention capacity and suitable playing characteristics. At Bingley we have not been able to do as much research on this subject as we would have liked but the recent appointment of a soil physicist (and a laboratory assistant) is helping things along. For new golf greens and other areas we have devised laboratory tests aimed at producing satisfactory mixtures of soil, sand and peat. In the U.S.A. some people are working on a similar basis but others have abandoned soil and grow greens on carefully specified sand with a little peat added—there are even a couple of courses with greens like this in Britain.

The particle size of sands suitable for soil amelioration has attracted a great deal of attention throughout the world. In Mr. Dawson's book "Practical Lawn Craft" he suggests that sharp sand should have at least 60% of its particles between 0.5 and 0.2 mm (avoiding coarse and fine particles). Though looking for sands with a narrow particle-size range, the Institute has tended to look to somewhat coarser sands having in mind availability of suitable sands and to avoid the fines. However, although there is some divergence of opinion (the U.S.G.A. supports 1.0—0.5 mm as the most important range) it now seems to be generally held that there should be even greater concentration on the 0.5—0.2 mm particle size. Important research at Aberystwyth and new work at Bingley, as far as we have gone, supports this view.

The relatively new technique of mechanical and slitting (related to the old French draining and to a common practice of practical men, making sand slits with a spade) was first used in this country at Bingley's suggestion at Twickenham in 1966, when sand was fed into a slit made by a modified sub-soiler. The operation was very successful and similar operations have been carried out at quite a number of places. Various contractors have produced their own equipment so that in recent years some kind of "research" has been taking place all the time.

More on the work at Bingley in future issues of the Greenkeeper.