

food absorption was distributed to courses in the Philadelphia area.

Research studies came later. Penn State reported on actual figures on increased root growth, the amount of rainfall going into the soil after aeration in comparison to soil showing compaction and how phosphorous was placed in the root zone.

Vertical mowing machines, which aided greatly in removing mat and improving the surface, took many demonstrations before they were adopted.

Japanese beetles arrived in this country 30 years ago and intensified studies on grub control. The application of 3 lbs. per acre of one of the new insecticides and the immediate control of grubs is much different from Joe Valentine's reports on use of so-called insecticides in the early 20's which then were harmful practices. Joe says that when the grubs died so did the turfgrasses.

Research workers first brought forth arsenate of lead, then DDT, followed by chlordane, aldrin, dieldrin and heptachlor. Each one was an improvement on its predecessor.

Fungicides found to have a place in controlling diseases on greens were Tersan and the cadmium compounds. Both were applied by Penn State research workers carrying on studies in the field. Field plots at Merion in 1942 showed the effectiveness of what is known now as Tersan, and in 1948 Bob Mean's work at the Philadelphia CC, in cooperation with Marshall Farnham, determined that cadmium was effective in controlling dollarspot.

The green section's research work showed how effective sodium arsenite was, and still is, in checking weeds. The first work was done by Fred V. Grau, when a graduate student, in the early 30's. Later Mrs. Fanny-Fern Davis, who was in charge of green section's activities during World War II, discovered that 2, 4-D was effective in controlling broad-leaved weeds. It is still in general use today. This work was followed by herbicides developed by Jess DeFrance at Rhode Island U. and others and showed the place of phenyl mercury and disodium methyl arsonate in crabgrass control.

William H. Daniel of Purdue developed facts giving supts. confidence in 2, 4, 5-T to control clover in fairway turf and better guidance in applying arsenate of lead for checking poa annua.

Ureaform fertilizer was offered for general use after studies had been made at Penn State. Plot studies were made at the Experimental nursery; then there were comparison studies on the use of ureaform and known proved fertilizers, these trials having been made on fairway grasses.

Now that ureaform fertilizer is on sale, most of it that is used is being applied to greens. How much to use after application, and how frequently to apply it, calls for further studies which are made from observations, the amount of clippings removed, etc.

There has been a demand for additional facts on the use of ureaform. Again, supts. have been liberal in pooling their information on this new source of nitrogen fertilizer used on greens.

Research has been most helpful, and more is necessary, before we speak with confidence on how to get rid of poa annua. There is a strong demand for further facts on what to put into, or substitute, for soil when constructing greens. All of you know of other projects that show the need for more fundamental facts. As research data becomes available it is equally important that demonstrations be carefully carried out under actual maintenance and playing conditions.

## 1956 Was Great Year for Maintenance Contributions

By ALEXANDER M. RADKO

Northwestern Dir., USGA Green Section

1956 was a good year for supts. to try many things they had learned over the years through research, but had held for future use. When things are going well, it is difficult to sell a membership on needed course improvements, but after the hurricane season of 1955 in the Northeast, the membership was psychologically prepared, and the supt. had the opportunity to set wheels in motion to make necessary changes suggested through research.

The use of select vegetative strains of creeping bentgrass has increased sharply. Most prominent among these has been use of C-1 Arlington and C-19 Congressional strains. Many new plantings of this mixture were made in nurseries or directly into greens. A notable example of the expanded use of these strains: an original planting of 6,000 sq. ft. by Arthur Anderson of Brae Burn CC, West Newton, Mass., has been used to plant 100,000 sq. ft. of putting turf in various courses in the Boston area. During the past two years, local commercial growers of C-1 and C-19 creeping bentgrass were unable to keep up with demand. These creeping bentgrass strains have been working out very well where tried.

### Penncross is Popular

Demand for Penncross seed for putting green purposes also has been on the upgrade. Several nursery putting green plots have been installed for observational purposes. Supts. are enthusiastic about turf cover obtained. Texture, color, and quality generally have been most encouraging. The demand for seed in 1956 exceeded the supply . . . many more supts. would have tried it if they could have obtained Penncross seed.

Use of Merion bluegrass on tees has been on the upgrade. During the tough year of 1955, Merion bluegrass stood up better than most other cool season grasses at several courses in the Northeast. As a result, many new tees were planted to this strain in 1956.

Putting green diseases were a major problem

in 1956 because of exceedingly high and persistent humidity. It seems that every known disease was troublesome, even common diseases such as brownpatch and dollarspot.

Curvularia, pythium, and helminthosporium outbreaks were more numerous in 1956 than they had been in some years. Curvularia continued to be troublesome and a difficult disease to control. Various chemicals were tried with varying degrees of success and this led to supts. trying "shot-gun" mixtures of mercuries and Tersan, or mercuries, Tersan and cadmium.

Malachite green was used with success in checking spread of pythium. This dye product which has fungicidal qualities was recommended by Frank Howard of the University of Rhode Island for checking mycelial growth of pythium.

#### Results Called Inconclusive

The broad spectrum fungicides were used widely, but there are mixed feelings regarding results. Some supts. felt that excellent results were obtained with these new products; others felt results were disappointing. More practical work and observation of results are needed before we can say much about the use of this class of fungicides in the Northeast.

The urea formaldehyde fertilizer products received wide application throughout the Northeast. Many tested it on a limited scale. Here again, results were inconclusive.

There was a decided trend toward increasing the sand content of topsoil mixtures in building new greens. This trend is also evident in topdressing mixtures. Supts. are getting away from the old formula of 1/3 sand, 1/3 clay, and 1/3 organic matter in favor of a high percentage of sand. Research investigations of O. R. Lunt and Raymond Kunze, although conducted separately, generally agreed in findings. They have been widely read in the Northeast and many supts. have made adjustments in topsoil and topdressing practices as a result.

These are but a few of the highlights of recent developments in the Northeast. Results of research are slow in coming through educational institutions, sometimes painfully slow. Often after results of research are released, there is a further time lag before supts. get the opportunity to put these findings to work. However, research certainly is helping them make progress toward the goal of better turf for better golf.

#### Dogwood Tournament

Qualifying rounds for the annual Dogwood Invitational tournament to be held at Druid Hills GC in Atlanta, Ga., will be staged Apr. 7-10 with championship play starting on the 11th and extending through the 14th. An amateur event, the tournament will have A and B divisions of championship flights plus 12 other flights.

## New Approach to Reducing Compaction in Putting Turf

By J. R. WATSON, Jr.

Chief Agronomist, Toro Manufacturing Corp.,  
Minneapolis.

The study of soil compaction, its alleviation and relationship to turfgrass growth has received much attention from research workers in the past. More recently, a somewhat different approach has been undertaken, particularly in regard to the compaction of putting green soils. Efforts have been directed toward determining the mechanical composition of a soil mixture which resists compaction, yet supports desirable turfgrass growth. The work of two investigators, Raymond Kunze in Texas and O.R. Lunt in California, will serve to illustrate current status of developments in this field.

Raymond Kunze, studying under a fellowship grant by the USGA green section at Texas A. & M. College, completed a study during 1956 in which the primary objective was to synthesize a mixture of sand, soil and peat that would resist the effects of compaction, yet produce good turfgrass growth. Ratios of sand, soil and peat studied were 6-3-1, 7-2-1 and 8½-1-2-1 by volume. Percentages of sand (60, 70, 80 and 85) were made up of varying sizes. The soil used was a Houston black clay, which inherently contains 60 per cent clay, 10 per cent silt and 30 per cent sand. The peat content was constant in all mixtures — ten per cent by volume was used.

Kunze concluded from this study that: (1) A mixture containing (by volume) 80 to 85 per cent sand (all sizes), 5 to 10 per cent of a well aggregated clay soil (60 per cent clay) and 10 per cent peat met the requirements set forth as the primary objective. (2) Some compaction was beneficial when applied to mixtures containing 10 per cent or less of clay soil. Such mixtures, when compacted, produced the largest amount of top growth. (3) Differences in particle size of compacted soil mixtures produced significant differences in the amount of top growth. The smaller the particle size, the less top growth produced. (4) In compacted soil mixtures, root growth increased as particle size decreased. (5) Yields of root and top growth did not correlate.

O. R. Lunt of the Department of Irrigation and Soils at UCLA reported "A Method for Minimizing Compaction in Putting Greens" in the July, 1956 issue of "Southern California Turfgrass Culture." This work likewise was supported in part by a grant from the USGA green section. From tests, Lunt demonstrated that soil mixes containing as much as 80 per cent sand could be compacted so that percolation rates became low. When sand content of the mixture was as high as 90 per cent, compaction treatments