amounts of which were present in a form available to plants.

The experiments discussed in the more recent article demonstrated that Milorganite could supply the minor nutrient elements to corn, tomato, and sunflower plants growing in nutrient solutions in Mason jars. In some jars the plants were grown in the nutrient solutions free from one or more of the minor elements until symptoms of the deficiency appeared after which time a carbonic acid extract of Milorganite was added along with the nutrient solution. The authors state that "In every instance where a minor element deficiency existed and the Milorganite extract was later added, increased yield resulted which was attributed to correction of the deficiency by the minor element contained in the extract."

In control jars in which the plants were grown in nutrient solutions containing the minor elements in addition to nitrogen, phosphorus, potassium, calcium and magnesium, the plants showed normal growth and were not stimulated to additional growth by the addition of the Milorganite extract.

Analyses of the dried tops and roots were made and in general the amounts of these elements present in the plant tissues were closely correlated with the amount of growth expressed in terms of dry weight. Increases both in plant yields and the minor element contents were associated with the addition of Milorganite extract to the cultures deficient in any of the minor elements but not with its addition to the control cultures which were already receiving the minor elements.

From these experiments the authors concluded that "Since Milorganite extract did not stimulate additional growth in control cultures which already contained all of the minor nutrient elements, it is evident that the highly stimulating effects of the extract which were observed in the other cultures, can be attributed to the presence of available minor nutrient elements in Milorganite" and that "These observations and results undoubtedly explain, at least in part, the additional unusual stimulating effects which have been noted following the use of Milorganite on certain soils."

THE USE OF POTASSIUM PERMANGANATE

Potassium permanganate is known to be an active oxidizing agent. As such it hastens the decay of organic matter. C. B. Greening, of the Wisley Experiment Station in England, has conducted a number of experi-

ments on the use of potassium permanganate to hasten the decay of organic matter and on its value when applied directly to turf.

These experiments are reported in the Journal of the Royal Horticultural Society. Under the heading, "The oxidation of soil humus" the author describes certain experiments on hastening decay by the use of potassium permanganate. On July 23, "a heap consisting of 1 cubic yard of mixed garden refuse was soaked with 6 gallons of a solution containing 3 ounces of permanganate. The heap was lightly covered with sifted soil." The heap was turned on August 21 and 26 and on September 1. It was treated with 3 gallons of water containing 3 ounces of potassium permanganate on August 21, and 2 gallons containing 2 ounces of potassium permanganate on August 26 and September 1. A control heap was turned and watered each time without permanganate, while in a third heap crystals of potassium permanganate were "sprinkled throughout the heap and water was applied in the same quantities as used in the solutions and on the same dates."

By the middle of September the pile treated with the solution was ready for use, while the untreated pile had not decomposed nearly so rapidly. "Although decomposition proceeded more rapidly than in the control heap, the use of crystals was not found to be as effective as that of the solutions."

The author feels that these results are important on two scores. They demonstrate a quick and simple method of producing good compost and they provide an explanation of the probable action of potassium permanganate on soil.

While the treated material is not described except as "mixed garden refuse" it seems likely that most of such refuse would consist of green matter comparable to grass clippings. Material of this sort is much more easily decomposed than are the tree leaves and strawy mixtures used in many compost piles. It should also be noted that while the pile treated with potassium permanganate did decompose more rapidly than an untreated pile, no comparisons were made with other treatments known to speed decomposition.

To test the effect of potassium permanganate on established lawns a strip of turf was treated at the rate of "¼ ounce of permanganate dissolved in 2 gallons of water to 3 square yards. A large number of earthworms came to the surface immediately and were brushed up. Within a week from the time of ap-

plication it was evident that the turf had received marked manurial benefit from the treatment. The grass on the treated strip was growing more vigorously and was of a darker green than that on the untreated turf." This distinction was still evident 6 months later. There was no apparent difference between the effects of spring and fall applications. The author believes that the potassium permanganate added to the soil decomposed the organic matter already in the soil, thus causing the release of nitrates and other plant foods within the soil itself in quantities sufficient to stimulate plant growth. Similar stimulating effects were produced on geraniums, tomatoes, radishes, lettuce, and currants. Applications to new grass did not produce the same amount of stimulation, due, according to the author, to the lack of organic matter in the soil.

Accompanying the control of earthworms and the stimulation of the grass by the potassium permanganate there was a reduction in the amount of moss and an elimination of matted growth on the surface of the lawn. Very mossy or badly "matted" turf may require stronger solutions or several applications.

In tests at Arlington Farm the benefits described above have not been apparent. This difference may be due to the smaller amounts of organic matter in the Arlington soil than in the soil referred to above. In our tests potassium permanganate has affected earthworms as described but the control has not been so good as that obtained with other chemicals.

According to the *Australian Greenkeeper,* tan bark is used in Jueensland for dressing fairways and greens. On fairways a fair dressing is 75 to 100 cubic yards to an acre, and gave satisfactory results particularly when used in conjunction with fertilizers. According to Mr. Black its greatest value is as a mulch for "softening" the hard-natured surface of the fairways and for the ultimate supply of much-needed humus, of which his soils were particularly deficient. It was preferable to animal manures because of being free from weed seed. In spring and early summer it was particularly useful for the purpose of moisture conservation.

On greens, after two dressings of screened tan bark at an interval of 6 weeks, and subsequent, frequent dressings throughout the year with a good sandy material, the greens improved unbelievably in both turf and play.