Chemical Methods of Weed Control

THE effective control of weeds is always a subject of great interest to market gardeners, farmers, and those concerned with pasture improvement. The Extension Division of the Department of Agriculture has conducted extensive trials on weed control by chemical methods, and in this, the first part of a two-part article, L. J. Matthews, Weeds Research Officer, Department of Agriculture, Wellington, gives information on the results so far obtained from these trials. The writer gives details of the various chemicals and their effect on different types of weeds, and advice on the best time of application of each preparation. The second part of the article will appear in next month's issue.

THE chemical weedkillers consist of two groups, the hormone preparations and the non-hormone, the latter including the grass-weed killers and the phenol preparations.

HORMONE WEEDKILLERS

Hormone weedkillers, more correctly called growth-regulating compounds, form an important group. Most weeds fall into the category of broad-leaved, flowering plants and many are destroyed by this group of chemicals. The advantages of hormone weedkillers over other types of chemicals used for weed control are that they are non-poisonous to animals, non-corrosive, and relatively easy and pleasant to use. They are derived from three parent materials, M.C.P. A (2 methyl, 4 chlorophenoxyacetic acid), 2,4-D (2,4-dichlorophenoxyacetic acid), and 2,4,5-T (2,4,5-trichlorophenoxyacetic acid).

Salts, Amines, and Esters

From each of the parent acids (M.C.P., 2,4-D, and 2,4,5-T) the following salts, amines, and esters are formulated:—

Sodium salt of M.C.P.: This is the most selective hormone weedkiller; it kills a smaller range of weeds than the 2,4-D preparations, weeds with a waxy leaf being little affected. It is the most suitable preparation for crop spraying.

Sodium salt of 2,4-D is slightly more toxic and hence less selective than the sodium salt of M.C.P. As it is only 4 per cent. soluble in water, it is always sold as a powder, but for ease in mixing a 3 per cent. mix is recommended, that is, 3lb. of sodium salt to 10 gallons of water.

Amine salt of 2,4-D: This material is more toxic than the sodium salt of 2,4-D. It has been employed largely for the control of weeds in crops, but as it is less selective than the sodium salt of M.C.P., there is more likelihood of crop damage. Its use should be further developed for weeds that are difficult to kill such as convolvulus and Californian thistle, which possess a mass of interlacing roots. With these weeds a slow foliage kill results in fewer regrowths than if the above-ground parts are destroyed quickly by the ester preparations.

Flat weeds in pastures are eradicated very easily with hormone weedkillers, but trials have demonstrated that elimination of this type of weed does not give increased pasture production unless the weeds are replaced by desirable pasture species.

Poa (Glyceria) aquatica in a drainage canal in the Hauraki Plains district.

Esters of 2,4-D: As is shown in Table 1 on page 274 both volatile and non-volatile esters are manufactured. Because volatile esters pass off toxic fumes under high temperatures, they are dangerous to nearby plants if humidity is high and the wind is negligible. In enclosed spaces non-volatile esters should be used. It should be noted, however, that spray drift of both non-volatile and volatile materials is toxic. The esters are largely oil based and, unlike the water-based preparations, are not affected by rain immediately after application.

The esters are the most potent materials. As contact chemicals for the destruction of annuals and seedling perennials the oil-based esters are two or three times as toxic as the salts, but on deep-rooted perennials they usually give inferior results. The water-based salts and amines are repelled by plants such as periwinkle which possess a waxy coating, or cuticle, on the leaves. For such plants an oil-based ester is necessary to secure penetration or absorption of the hormone. The addition of dieselene or kerosene also aids absorption of the hormone into weeds such as periwinkle which are difficult to kill.

In general terms esters give better penetration, but not translocation, that is, movement of weedkiller into the roots. The salts and amines have poorer penetration, but are translocated better in the plant. If sufficient penetration is secured, the salts and amines give a slow foliage kill, which ensures that the roots are partly or wholly destroyed, so that fewer regrowths occur than if the foliage had been killed quickly.

A recent development is the preparation of water-based esters. They have a higher toxicity per unit than the oil-based esters and also possess some of the properties of amines and salts. Consequently, they may prove valuable for the destruction of deep-rooted perennials with leaves sufficiently waxy to repel the salts and amines.

As shown in Table 1, M.C.P. and 2,4-D formulations control annual and herbaceous perennials. The 2,4-D esters also control a few species of woody perennials.

Formulations of 2,4,5-T: The properties of 2,4,5-T amines and esters closely parallel those of the 2,4-D amines and esters. The 2,4,5-T formulations are used for the control of woody perennials resistant to the 2,4-D preparations. As a rule both 2,4-D and 2,4,5-T formulations are specific in their action. Mixtures of 2,4-D and 2,4,5-T are not recommended for New Zealand conditions.

Acid Equivalent

The term "acid equivalent" refers to the active principle of the hormone preparations. For liquids the acid equivalent is expressed in pounds of active weedkilling material per gallon, and for dusts the amount of active