INTRODUCTION

The high light intensity, high temperature and high humidity which characterise the tropics provide a favourable environment for the growth of not only crop plants but weeds as well. Weeds compete for light, air, water, root space, harbour pests and diseases, make mechanical harvesting more difficult and their seeds may spoil grain samples.

Weed control can take one or a combination of forms, but owing to rapidly increasing costs of improved cultural control methods, the method of modern weed control which is taking prominence is the use of selective herbicides.

The first use of a selective method of weed control can be attributed to Bonnet, a French worker, who in 1895 showed that a solution of copper sulphate would kill charlock plants growing with cereals. Rabate demonstrated in 1911 that dilute sulphuric acid could also be used for this purpose. In 1932 the use of DNC (Dinitro-ortho-cresol) to destroy annual weeds in cereals was discovered in France.

The big development in selective weed control however arose in 1941 from the observations of Templeman in England that alpha-naphylacetic acid applied to charlock plants growing with wheat, caused distortion and final destruction of the charlock, without damage to the wheat (Blackman et al 1949). This was followed by another great discovery, that of 2, 4-D (2, 4-Dichlorophenoxyacetic acid) by Zimmerman and Hitchcock (1942) in U.S.A., and Slade, Templeman and Sexton in England, in 1942 (Slade et al 1945). In 1944, Hammer and Tukey (1944) announced another selective weedkiller which has since been used a great deal, 2, 4, 5-T (2, 4, 5-Trichlorophenoxyacetic acid). Since then there has been a very considerable expansion in research work on selective herbicides and their use, until at the present day we have a wide range from which to make a choice.

The phenomenal rise to popularity of these materials is a familiar story. Wain (1957) gives a figure of over 100,000,000 acres sprayed annually with these chemicals, and this figure is increasing each year.

Up to the present time, by far the greatest amount of work on the use of selective herbicides has been done in the more temperate areas. However, soon after the discovery of 2, 4-D, this chemical came into general use in weed control in sugar cane in Hawaii (Hanson 1956), and since then there has been an ever-increasing use of chemical weed-killers in tropical and sub-tropical countries. Selective herbicides are now used in a wide variety of tropical and sub-tropical crops which include sugar-cane maize, coffee, tea, sisal, pineapple, rice and cocoa.

In tropical areas the weed problems are in many cases of a different order from those in temperate regions. Some measure of this is seen when we compare the differences in size and speed of regrowth of vegetation on bare ground in the two types of climatic zones. A further difference is shown by comparing the effect of weed control on crop yield. In the temperate zones, yield increases are generally of the order of 25 per cent, whereas in the tropics and sub-tropics, yield increases of 100 per cent or even more result very frequently from weed control by proper methods. (Ashby et al 1956).

In the tropics and sub-tropics there is an urgent need for more research into the use of selective herbicides. In Africa for example, the present policy of agricultural departments is to reduce the practice of shifting cultivation, and this will lead to more intensive land use. Intensification in land use has resulted in the use of a shorter rotation in many areas, and often to abandoning land fallowing which was of considerable value as a weed control measure.

A problem very much to the fore at present in many tropical and sub-tropical agricultural areas is that of fragmentation of land. Government policy is aimed at consolidating holdings where possible, and reorganising them where necessary. There is also at the present day, the general tendency to a greater degree of specialisation in crop production. Intensification of land use, re-organisation of land, and specialisation in cropping all present their own problems of weed control - problems likely to be solved by the use of selective herbicides necessitated by ever-increasing labour costs.

Another aspect of herbicide use is the part they can play in soil moisture conservation (Shaw and Parker 1956). It is a well-known fact that available soil moisture is often the most important limiting factor in crop production in the tropics and sub-tropics. Herbicides as a means of weed control can reduce mechanical weed control measures, thus minimising water looses particularly those due to evaporation.

Where mechanical weed control measures prove detrimental to soil structure, then again herbicides may be used in weed control. A point to be remembered however, is that methods of cultivation embodying the ideals of temperate countries to give clean weeding, may encourage erosion, causing the removal of precious fertile top-soil and loss of soil structure. It is here that selective herbicides can prove to be of great use in destroying or controlling different weed species at different times. As an example we have the selective control of grass weeds leaving the softer weeds as a ground cover, in the rubber plantations of Malaya.

Up to the present time the ability of herbicides to control weeds has mainly been measured in terms of increase or decrease in yield of the crop. This is only satisfactory as a short-term policy, but considering cropping as a long-term policy, it becomes increasingly important that we measure the effect of herbicides e.g. in terms of control of the weeds themselves. This has been done quite extensively in several temperate countries and allows recommendations to be made for control of specific weeds.

The study of the effect of herbicides on specific weeds of importance seems a logical follow-up from studying crop tolerance to herbicides. Attention was drawn to the importance of this aspect by Pfeiffer (1957) at the first East African Weed Control Conference when he said, "The practical application of herbicides and research on this subject has jumped far ahead of basic research. However, it is surprising to see how little work is done on certain basic aspects such as the ecology of the important weeds."

Another factor of increasing importance supporting this approach is the evolution of weeds resistant to herbicides. This problem was briefly

discussed by Pfeiffer and Zeller (1953) and more fully by Harper (1956). In Hawaii for example, with the continued use of herbicides for weed control in sugar cane, it has become evident that individuals within several species are developing tolerance to certain herbicides. A 2, 4-D tolerant strain of Commelina diffusa was encountered in 1954, and resulted in the normal plantation weed control practice being considered unsatisfactory (Mc Call 1954). In another instance, a clone of Cynodon dactylon was found with a much greater tolerance to dalapon than other strains, while Mc Call's suspicion in 1954 as to the development of resistance to 2, 4-D in the weed Erechtites hieracifolia was later confirmed (Hawaii 1957).

Considerable work has been done on crop tolerance to particular herbicides, and it was decided to find the effect of two of the more important selective herbicides viz. 2, 4-D and dalapon (2, 2-Dichloro-propionic Acid), on some tropical weeds of arable land.