USES OF 2, 4, 5-T ON HEVEA

PRELIMINARY NOTE

An interim experimental report is made for the benefit of the planting industry on the uses of 2, 4, 5-trichlorophenoxyacetic acid as (i) a defoliant, by aerial spraying; (ii) a weedkiller; (iii) a yield stimulant; (iv) a tree poison.

The group of selective systemic herbicides comprises substances which, on application, become absorbed into the system of a plant and are thus conveyed to its various parts. The death of a susceptible plant may then ensue. These compounds are growth regulating substances. According to the way in which they are applied, various specific results may be anticipated, and we are working on the possibilities for the rubber planting industry.

Following the general success of 2, 4-D (2, 4-dichlorophenoxyacetic acid) in agriculture, much attention has been given to such substances as might fall into this class of systemic herbicides, and of these 2, 4, 5-trichlorophenoxyacetic acid (2, 4, 5-T) has recently proved of special interest. It has been reported to be particularly efficacious in the control of bush covers and woody plants on farms. Our own investigations are at an interim stage, but results are of sufficient promise to justify a preliminary note on progress to date, and on possible applications.

I. USE AS A DEFOLIANT

In the course of assessment trials commenced in 1950, the purpose of which was to select a herbicide suitable for the defoliation of rubber trees when applied from the air, the value of 2, 4, 5-trichlorophenoxyacetic acid was established.

Early experiments were carried out with water soluble and dispersible formulations—sodium salt and ester—which were applied to twelve months old seedlings in the field. The n-butyl ester, in water dispersible form, although giving no better defoliation than the sodium salt, did prove itself herbicidally more effective. Following application, leaf injury was visible after one day; by the fifth day all leaves were affected; after nine days there was bleeding of the stems and extensive dieback. Refoliation in the ester treated area was slight and the plants which did survive produced no new leaves within a month of treatment. The sodium salt, on the other hand, appeared to affect refoliation little and dieback was confined to shoot tips only.

A comparison was made between the sodium salt, the water dispersible n-butyl ester, and the n-butyl ester in a light oil. The latter at 0.3 lb acid equivalent per acre gave

significantly better results than either the sodium salt at 5 lb or the water dispersible ester at 5 lb acid equivalent per acre, the applied volume being the same for each. Moreover, for aerial application in the tropics oil formulations avoid losses due to evaporation.

At a concentration of 2 per cent the n-butyl ester in diesel oil, applied to year old seedlings at the rate of 5 gallons per acre, defoliated and kept the plants leafless until they died 4 months later. When applied to young seedlings in the course of a concentration assessment it was found possible to kill plants with as little as one millilitre per plant of an eighth per cent concentration of the n-butyl ester.

The non-volatile beta-butoxyethyl ester has proved less effective than the n-butyl ester.

Before undertaking large scale aerial spraying field trials an application of 2 per cent n-butyl ester to mature trees with ground equipment gave satisfactory defoliation followed by extensive dieback. During 1952, and again this year, just short of 400 acres of mature rubber have been sprayed from the air with the n-butyl ester at varying concentrations in diesel oil, all at the rate of one gallon per acre. Nearly complete defoliation and dieback to a greater or lesser degree resulted.

The value of 2, 4, 5-T has been clearly established for the defoliation of mature rubber trees. Aerial spraying may also find application for tree poisoning, using 2, 4, 5-T at increased concentrations.

II. USE AS WEEDKILLERS

Over the last three years various 2, 4, 5-T derivatives have been used in weedkilling trials at R.R.I. Experiment Station. The sodium salt and the butyl ester have been used separately and in mixtures with other herbicides. Many of the tests have been made using a mixture of 2, 4, 5-T (butyl ester) and 2, 4-D (ethyl ester), which is available under the name of Trioxone, and it is not possible exactly to assess the contribution from each ester in the mixture.

In other countries, derivatives of 2, 4, 5-T have been used principally as 'brush' herbicides for killing shrubs and herbs of broad leaved plant species; the failure of this type of hormone weedkiller to destroy lalang was as expected.

Bracken (*Gleichenia linearis*), *Mikania scandens*, and Siam weed (*Eupatorium odoratum*) have been killed by spraying with Trioxone solution (0.1 to 0.25 per cent strength). Trioxone in oil/water emulsion is more effective against Siam weed than the aqueous spray.

In course of large scale spraying operations to clear roadsides, using dilute aqueous solutions of Trioxone and sodium trichloracetate, the drift of spray on to rubber trees has caused defoliation, especially of young rubber seedlings.

Partial killing of sensitive plant (*Mimosa pudica*) and of a common climbing fern (*Lygodium flexuosum*) has been achieved by spraying with 0.66 per cent Trioxone solution in water.

III. USE AS A YIELD STIMULANT

The efficacy of 2, 4, 5-trichlorophenoxyacetic acid and its derivatives as a yield stimulant to rubber trees has been well demonstrated in our experiments, as shown in the following example. Illegitimate seedlings of clones Pilmoor A44, B50, B58 and of mixed MAP clones planted in December 1931 in Field 14E of the R.R.I. Experiment Station and tapped on the half spiral alternate daily system (S/2.d/2.100%) were used to compare with untreated controls the efficacy as yield stimulants of a proprietary mixture which we have designated as mixture A, 2, 4-dichlorophenoxyacetic acid (2, 4-D) and 2, 4, 5-trichlorophenoxyacetic acid (2, 4, 5-T).

The first application of the treatments on a newly opened panel of first renewal bark was made in November 1952 on a three inch strip of lightly scraped bark below the tapping cut. The sodium salts of 2, 4-D and 2, 4, 5-T were used at a 1 per cent concentration as emulsions in commercial palm oil and the results for the first six months, presented in TABLE I as mean monthly yields of dry rubber in grams per tree per tapping, and secondly as a percentage (in italics) of the control, show the superiority of 2, 4, 5-T as a yield stimulant in this trial.

TABLE I: COMPARATIVE YIELDS UNDER DIFFERENT TREATMENTS APPLIED NOVEMBER 1952

Month	*Controls 100%*	*Mixture A*	*2, 4-D (sodium)*	*2, 4, 5-T (sodium)*
Mean pre-treatment	26.5	25.0 (*94*)	34.2 (*129*)	30.3 (*114*)
1st month	31.6	70.0 (*222*)	72.0 (*228*)	67.8 (*215*)
2nd month	29.3	49.5 (*169*)	51.9 (*177*)	54.4 (*186*)
3rd month	28.7	40.4 (*141*)	38.8 (*135*)	50.0 (*174*)
4th month	24.9	26.0 (*104*)	29.3 (*118*)	41.9 (*168*)
5th month	23.2	27.4 (*118*)	24.7 (*106*)	37.4 (*161*)
6th month	26.6	27.3 (*103*)	27.6 (*104*)	38.1 (*143*)
Mean over six months	27.3	40.1 (*147*)	40.7 (*149*)	48.2 (*177*)

Even better results were obtained by substituting the normal butyl ester of 2, 4, 5-T for the sodium salt, as a one per cent dilution in palm oil, in the second application of the treatments to bark below the cut, as shown in TABLE II.

TABLE II: COMPARATIVE YIELDS UNDER DIFFERENT TREATMENTS APPLIED MAY 1953

Month	*Controls 100%*	*Mixture A*	*2, 4-D (n-butyl)*	*2, 4, 5-T (n-butyl)*
1st Month	26.7	56.9 (*213*)	54.1 (*213*)	75.6 (*283*)
2nd Month	26.9	37.9 (*141*)	42.3 (*157*)	57.2 (*213*)
3rd Month	26.2	29.9 (*114*)	34.8 (*133*)	43.7 (*167*)
4th Month	25.3	29.5 (*117*)	29.0 (*115*)	33.6 (*133*)
Mean over four months	26.3	38.6 (*147*)	40.1 (*152*)	52.5 (*200*)

IV. USE AS A TREE POISON

We have in the past tested as tree poisons a wide range of chemicals less dangerous to man or animal than sodium arsenite, the most effective tree poison known, and which could be used on estates and smallholdings unable to comply with the requirements of the Poisons (Sodium Arsenite) Ordinance 1949.

Experiments are now in progress on the poisoning of old rubber trees by the frill girdling and ringbarking methods, using 2, 4, 5-T and derivatives. Early results have shown good promise of the butyl ester of 2, 4, 5-T and the water soluble amine of 2, 4, 5-T when applied, at concentrations ranging from 1 to 10 per cent and at the rate of about one gallon to 50 trees, to a ringbarked portion of the main stem 9 to 12 inches in width.

If this early promise is realised our quest for an effective tree poison which could be used without legal restrictions will have been successful.

November 1953