HERBICIDAL CONTROL OF RAIN FOREST REGROWTH

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The use of modern herbicides to control jungle regrowth offers an attractive solution to a major problem in tropical high-rainfall areas. The Australian Army asked the Department of Agriculture, Stock and Fisheries of the Territory of Papua and New Guinea to test a number of herbicides under field conditions. The author, formerly agronomist at the Lowlands Agricultural Experiment Station, Keravat, laid down test plots for various substances. His conclusion is that certain herbicides do offer possibilities for long-term weed control, but the extremely high cost involved would limit their use mainly to highly-specialized areas.

AN experiment to assess the effectiveness of various herbicides against encroaching weeds on land cleared of rain-forest was laid down during April, 1958. The main object of the trial was to determine whether regrowth and invading weeds appearing after clearing of rain-forest areas for the construction of airfields, military installations, industrial sites and so on, could be controlled by the application of chemicals. The herbicides chosen are relatively safe to use and are not a fire hazard.

The trial area was first cleared of primary bush during 1953. The resulting secondary growth was felled and burnt in late 1957 and the test plots, 20 feet square, with three-foot strips between plots, were marked out. During April, 1958, the plots were topped to two feet high, or scalped to two inches high, depending on the treatment to be applied.

The herbicides used and their rates of application per plot of 400 square feet were :—

Polybor Chlorate	32, 16, 8 lb.
Concentrated Borascu	80, 40, 20 lb.
Ureabor	14, 7, 3½ lb.
Ammate	16, 8, 4 lb.
T.C.A.	6, 3, 1½ lb.
C.M.U.	2, 1, ½ lb.

Ureabor and Concentrated Borascu were applied dry. T.C.A. was applied as a solution and C.M.U. as a suspension, in water, through a watering can. Polybor chlorate and Ammate were applied in solution through a knapsack sprayer. The Ammate and Polybor Chlorate were applied to " topped " plots, and the others to " scalped " plots (where the chemicals were required to be applied in solution or suspension, three gallons of water per plot were used. Three gallons were found to be sufficient to give an even cover over the 400-square-foot plot). Each treatment had two replications and two " scalped " and two " topped " untreated pilots were included.

The dominant species on the trial area at the time of application of the herbicides were kunai grass (*Imperata cylindrica*), couch grass (*Cynodon dactylon*), two other grass species (*Paspalum and Sorghum*), bracken fern (*Pteridium* sp.), *Passiflora* sp., a Solanaceous shrub and several tree species (the burning of the trial area reduced the tree density as compared with the surrounding secondary bush, but some trees survived the burning and some tree seedlings have since appeared on some of the experimental plots).

The total rainfall for the six months of the trial period of 3,911 points was well distributed, with rain falling on 84 days of the 176 days of the trial period. The average daily maximum and minimum temperatures in degrees Fahrenheit were :—

	Maximum	Minimum
April	88	72
May	88	72
June	88	71
July	84	71
August	86	71
September	89	71

PLATE 1.—*Herbicide applications at three days, six weeks and six months. (A) Polybor Chlorate, medium rate; (B) Concentrated Borascu, medium rate; (C) Ureabor, medium rate.*

Observations of the effects of the herbicides were made three days, one week, two weeks, four weeks, six weeks, 12 weeks and six months after the application of the herbicides.

EFFECTS OF THE HERBICIDES

Polybor Chlorate

Polybor Chlorate showed a rapid and severe effect, particularly at the medium and high rates of application. However, regrowth commenced after three to four weeks and even though the herbicide was still active after eight weeks the low- and medium-rate plots were re-invaded by weeds. After three months, there was a little regrowth on the high-rate plots. After six months, the control of weeds on all the Polybor chlorate plots was poor.

Concentrated Borascu

The initial effect was slower than for Polybor Chlorate, but after three months the herbicide was still active, particularly on the medium- and high-rate plots. At the low rate of application there was a large amount of regrowth after four weeks and even though the kunai regrowth became scorched there was a dense population of weeds after three months. There was little regrowth on the medium- and high-rate plots after three months, but after six months the weed control was only fair.

Ureabor

The initial effect was not severe, and regrowth was apparent on all plots after four weeks. However, this regrowth was weak and the herbicide was still active. At three months the overall effect was similar to that shown by Concentrated Borascu, but generally the effect was more severe. At nine months the weed control on the high-rate plots was very good, on the medium-rate plots fair and on the low-rate plots poor.

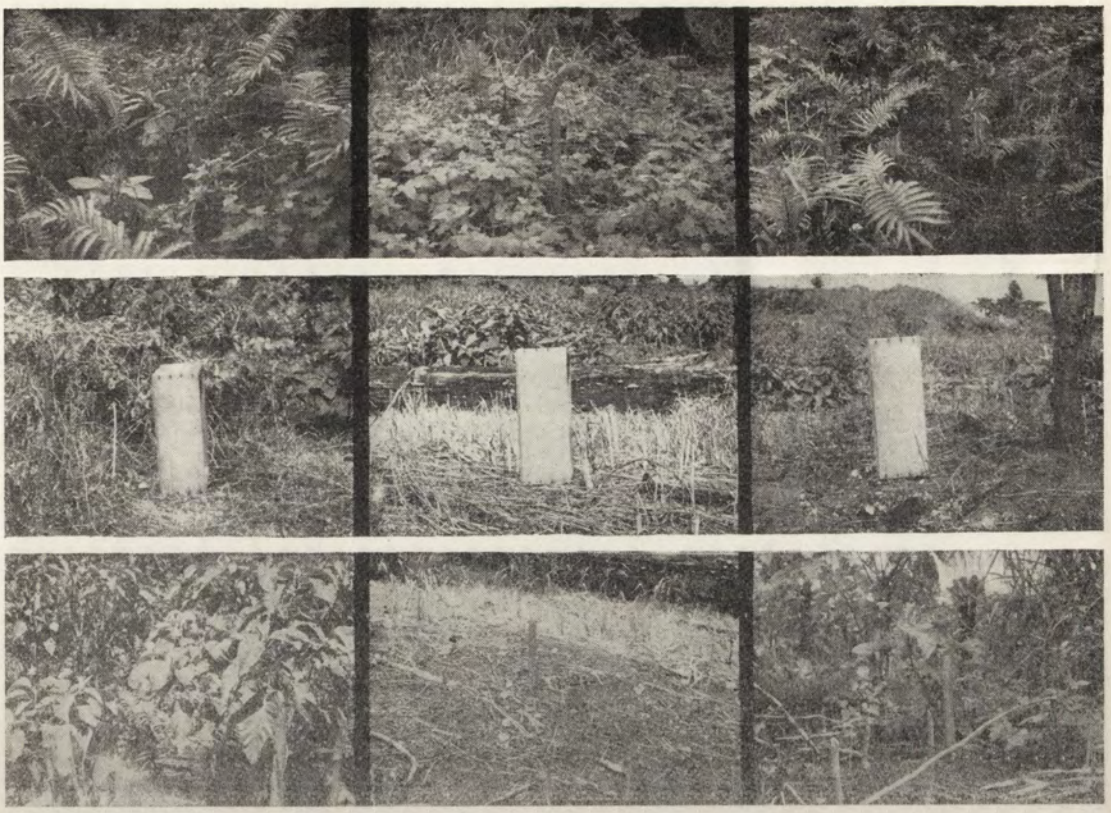

PLATE 2.—*Herbicide applications at three days, six weeks and six months. (A) Ammate, medium rate; (B) C.M.U., medium rate; (C) T.C.A., medium rate.*

Ammate

There was a rapid and severe effect, particularly at the medium and high rates of application. After three months, regrowth on the low-rate plots had reached a density comparable with that of the control plots and there was a large amount of regrowth on the medium- and high-rate plots. After six months the weed control on all plots was very poor.

C.M.U.

At all rates of application, the initial effect was slow, with some regrowth appearing at four weeks. However, the herbicide was still active and the regrowth was weak on all plots six weeks after application. After three months, the weed control on all plots was very good with very little regrowth. After six months the weed control on the medium- and high-rate plots was still very good.

T.C.A.

The initial effect was rapid, but some regrowth appeared on all plots four weeks after application of the herbicide. The regrowth increased rapidly on the low- and medium-rate plots and after three months there was a dense weed cover. At the high rate, the weed cover was not dense but was vigorous. After six months the weed control on the high-rate plots was fair and on the medium- and low rate plots poor.

Conclusions

Polybor Chlorate, Ammate and T.C.A. were not persistent. Concentrated Borascu gave only fair control. Ureabor, at the high rate of application and C.M.U. at high and medium rates have all proved persistent and given very good weed control for the six-month trial period. It is possible that Ureabor, at the medium rate of

PLATE 3.—*Control area during tests, at three days, six weeks and six months after commencement of trial. This area had been scalped at the start of the tests.*

application, and C.M.U. at the low rate of application, followed by spot treatments of regrowth would prove as effective as, and more economical than, the higher rates of application.

TECHNICAL INFORMATION ON HERBICIDES

Polybor Chlorate

A general weedkiller, usually applied in solution through a sprayer or watering can. This weedkiller contains :—

Sodium Pentaborate, 58 per cent.

Sodium Tetraborate, 15 per cent.

Sodium Chlorate, 25 per cent.

Spreading Agent, 2 per cent.

This herbicide is non-selective (i.e., it is toxic to all vegetation), it is fast-acting and has a residual effect at high rates of application.

Concentrated Borascu

A general weedkiller which is applied dry, by hand, or by use of a mechanical spreader. It is a sodium borate ore. It is toxic to all vegetation and has a marked residual effect, particularly at high rates of application.

Ureabor

A general weedkiller which is applied dry, by hand, or by use of a mechanical spreader. It is a granular complex of sodium borates and substituted urea (3-p-chlorophenyl, 1-1, dimethylurea). It is toxic to all vegetation and has a marked residual effect.

Ammate

This is a non-selective weed and brush killer containing 80 per cent. ammonium sulphate and 20 per cent. inert ingredients. It is soluble in water and is usually applied to vegetation as a spray. It gives a rapid kill when applied at recommended concentrations, but has limited persistence as a soil sterilizer.

T.C.A.

This chemical (trichloroacetic acid) is sold commercially (as the sodium salt) under various names. At high rates of application it acts as a soil sterilizer, but it is readily leached from the soil and under high-rainfall conditions it is not markedly persistent.

C.M.U. [or Monuron—3-(p-chlorophenyl) -1, 1,-dimethylurea.]

This chemical is one of a range of highly phytotoxic, persistent herbicides, known as the substituted ureas. It is only sparingly soluble in water and is normally applied as a fine powder suspension.

Treatment costs

Approximate Costs per Acre at Medium Rate.

Polybor Chlorate	£130
Concentrated Borascu	£127
Ureabor	Not known
Ammate	£152
T.C.A.	£65
C.M.U.	£218

These costs are based on figures supplied by distributors of the herbicides used in the trial. The costs per acre are very high, but it must be borne in mind that these herbicides are generally applied " intensively " to control weeds for uses such as to reduce fire risks, to allow for more efficient use of storage space, or to clear road verges and so increase the visibility of vehicle drivers.