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G R. W Meadly
Department of Agriculture

G A. Pearce
Department of Agriculture

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SOME CHEMICAL TRIALS WITH DOUBLEGEE

(*Emex Australis*)

By G. R. W. MEADLY, M.Sc., Officer in Charge, Weeds and Seeds Branch,
and G. A. PEARCE, B.Sc. (Agric.), Botanist.

THERE is no more troublesome weed in Western Australia than doublegee. Besides its competitive and smothering effect on crop and pasture, the spiny fruits penetrate the hoofs of stock causing lameness. It is a quick-growing annual which forms seeds at an early stage of growth and rapidly develops a strong tap-root. Dormant seeds will continue to germinate for a number of years and a succession of germinations often occur in the one season. The seedlings are capable of surviving adverse conditions and making rapid recovery.

The hormone-like weedkillers have given such spectacular results with wild turnip and wild radish that their use for the control of doublegees is often under discussion. The habit of the plant, and the fact that it is an annual, gave reason to believe that it would be susceptible to moderate rates of application and trials were commenced by the Department when the chemicals first became available several years ago. Unfortunately the doublegee belied its appearance and results have not been very encouraging.

Farmers have claimed varying degrees of success with the use of different 2,4-D formulations and some of our trials have caused a marked suppression of growth and given partial control. After many detailed investigations extending over several years, however, we are unable to recommend a treatment that is likely to give consistent results and destroy a high proportion of the plants. This does not mean that in some cases spraying is not warranted in order to reduce the competitive factor of the weed, but even with the most effective treatments many seeds mature to supplement the reserve remaining in the soil.

Although our work has been largely negative it has answered many questions and the experiments are described in order to place on record the basic work which has been done, as doublegee is a problem in places other than Western Australia.

It is not intended to discontinue experimental work against this weed as there is every chance that a formulation will be produced having a greater lethal effect and penetrating capacity. There is some evidence that two sprayings a few weeks apart are more effective than the single application and a trial to investigate this aspect is now in progress.

Results with Dinoc (30 per cent. sodium dinitro-ortho-Cresylate) have already been recorded*. A high degree of control of seedling doublegees was obtained by spraying with a solution of Dinoc in water in the proportion of 1:100 by volume. Two pounds of sulphate of ammonia was added to each 100 gallons of solution. In the case of small plants, satisfactory results were obtained with applications of 100 gallons per acre and although cereals were "tipped" to a certain extent no permanent injury was caused.

This method has been used for the control of doublegees in cereal test rows at Research Stations but is scarcely practicable for extensive areas for two reasons. Firstly, the cost of chemical exceeds 30s. per acre and secondly, high volumes must be applied, calling for large quantities of water and making low volume equipment unsuitable for application.

Other chemicals such as sodium chlorate and arsenic pentoxide can be used for

*"Recent Trials with Selective Weedkillers"—G. R. W. Meadly, Journal of Agriculture, Western Australia, Vol. XXIV, No. 1, March, 1947.

the destruction of small patches of doublegees but are not selective in action and destroy other herbage.

Since the advent of hormone-like herbicides a number of trials have been undertaken with doublegees growing in pasture and in crop. The results of some have been assessed by visual observation while others including those referred to below have been based on plant counts made on replicated plots.

Trial 1—Northam.—The amine salt, ethyl ester and butoxy-ethanol ester were applied to doublegee in a poor subterranean clover pasture at the rates shown in Table 1.

TABLE 1.

Treatment No.	Type of chemical.	Ounces acid equivalent per acre.	Water gallons per acre.	Percentage Control.
1	2,4-D amine	6	4	4
2	2,4-D amine	6	8	5
3	2,4-D amine	12	4	5
4	2,4-D amine	12	8	5
5	2,4-D amine	16	4	7
6	2,4-D amine	16	8	7
7	2,4-D ester	6	4	4
8	2,4-D ester	6	8	5
9	2,4-D ester	12	4	8
10	2,4-D ester	12	8	16
11	2,4-D L.V. ester	6	4	8
12	2,4-D L.V. ester	6	8	12
13	2,4-D L.V. ester	12	4	20
14	2,4-D L.V. ester	12	8	20
15	Control

The doublegee plants ranged in size from 2 in. in diameter with only cotyledon leaves, up to 4 to 6 in. in diameter. Spraying was carried out in cool and cloudy weather and 30 points of rain fell during the night following application. The figures in the control column are the percentage of plants killed. A high proportion of those present were affected to a greater or lesser extent but later recovered.

Trial 2—Beverley.—The chemicals included in this trial were the amine and ethyl ester of 2,4-D. Each was applied at rates of 8, 16 and 24 ounces of acid equivalent in eight gallons of water per acre. The doublegees were uniform in size and 2 to 3 in. in diameter and were grow-

ing on land cropped the previous year. The weather was cold and clear and no rain fell for several days after spraying.

Although the growth of the doublegees was suppressed to a certain extent on all plots, the maximum control was 10 per cent. with 24 oz. acid equivalent of ester per acre. Table 2 summarises the results.

TABLE 2.

Treatment No.	Type of chemical	Ounces acid equivalent per acre.	Water gallons per acre.	Percentage control.
1	2,4-D amine	8	8	0
2	2,4-D amine	16	8	2
3	2,4-D amine	24	8	5
4	2,4-D ester	8	8	2
5	2,4-D ester	16	8	5
6	2,4-D ester	24	8	10
7	Control

Trial 3.—The amine salt and ethyl ester were applied to doublegees in a crop of oats at Merredin. Each chemical was used at 4, 8 and 16 oz. acid equivalent in both 4 and 8 gallons of water per acre. Unfortunately the time of application was delayed, the crop being up to 18 in. high and some of the doublegees more than one foot across. The weather was fine and no rain fell for several days after spraying. No treatment gave a significant degree of control but the experiment proved that the spraying of doublegees at an advanced stage of growth should not be considered.

Trial 4.—An aerial spraying trial was undertaken at Mingenew with the amine, ethyl ester and butoxyethanol (low volatility) ester of 2,4-D according to the following table:—

TABLE 3.

Treatment No.	Type of chemical.	Ounces of acid equivalent per acre.	Water gallons per acre.	Percentage Control.
1	2,4-D amine	4	2	8
2	2,4-D ester	4	2	12
3	2,4-D L.V. ester	4	2	12
4	2,4-D L.V. ester	6	2	20

The experimental area was sown to wheat and each plot consisted of 18 acres. The doublegees ranged in size from small seedlings to plants 6 to 8 in. across. The weather was ideal for aerial application being fine and mild with little wind. Shortly after treatment a high proportion of the doublegees showed formative effects, but mostly recovered. The percentage of plants killed is shown in the right-hand column of Table 3.

REACTION OF DOUBLEGEES TO 2,4-D

Within a few days of spraying with 2,4-D doublegee plants usually show formative effects, these being most pronounced in the case of seedlings. The leaves tend to twist and become more erect and a swelling develops at the base of the stem. A splitting of the runners is a characteristic symptom,

and the growth of the weed is generally depressed. Malformation and proliferation of floral parts also occurs.

Even with rates as low as 4 oz. acid equivalent per acre some of the smaller plants usually succumb. The degree of effect on the remainder is variable. The growth of some is scarcely interrupted while others, although showing obvious injury, make renewed growth from terminal growing points. Plants affected more severely form shoots from near the base of the stem. Those which recover produce a number of normal viable seeds.

SUMMARY AND CONCLUSIONS

Various formulations of 2,4-D used at a wide range of acid equivalent levels have not proved really effective against doublegees and could not be considered as a

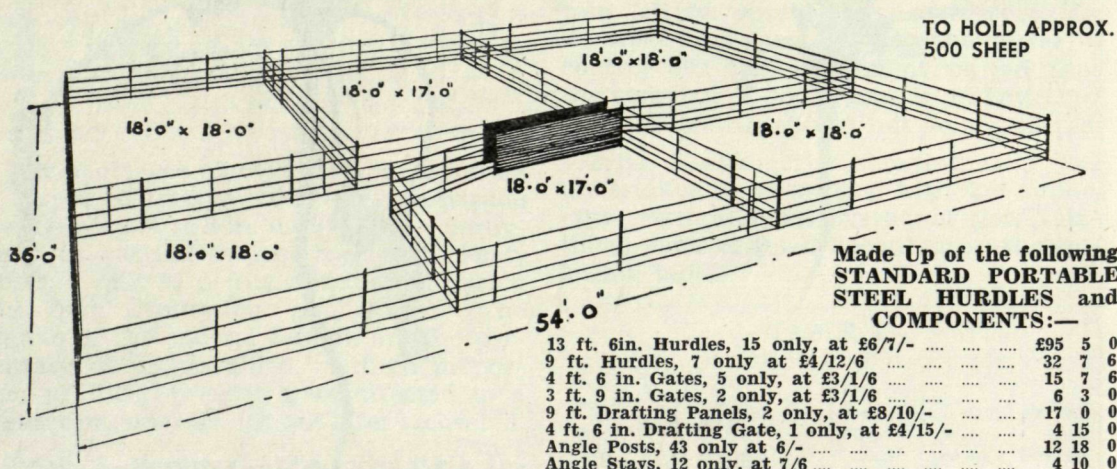


A normal doublegee plant on the right compared with a plant affected with 2, 4-D. Although the sprayed plant has received a check in growth and the characteristic swelling is present, it has not been killed.

The volume of solution applied does not appear to be an important factor as was suggested at one stage. Reducing the

Chemicals of the growth regulating or hormone-like group are continually being tested for herbicidal properties and it is possible that a formulation will be prepared that will prove effective against doublegees.

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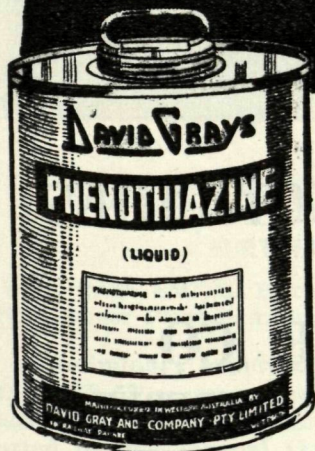
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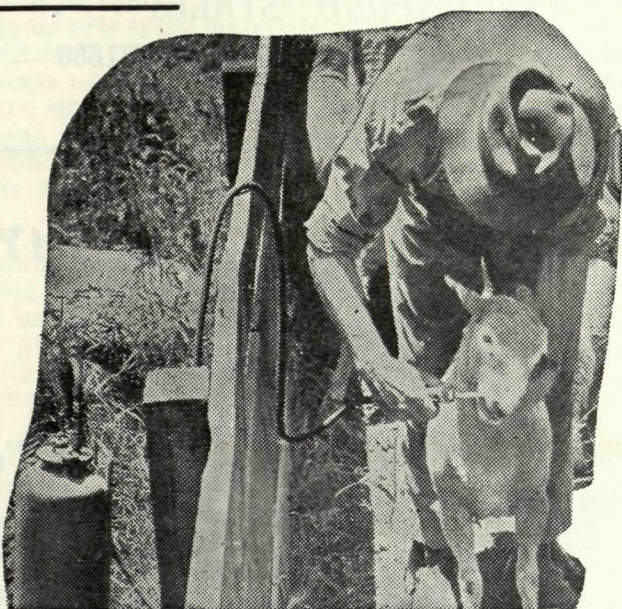
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