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THE REACTION OF SOME ARABLE AND FORAGE CROPS UPON APPLICATION OF PHENOXYBUTYRIC ACIDS

by

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Introduction

Undoubtedly one of the most important papers, presented at the 2nd British Weed Control Conference in 1954, was one of Prof. Wain (1), concerning the herbicidal activity and selectivity of phenoxybutyric acids. The selectivity of these compounds depends on the enzymatic breakdown of the phenoxybutyric acids in plants. Only those plants are susceptible in which these substituted phenoxybutyric acids are broken down to the corresponding substituted phenoxyacetic acids. So Wain (1) demonstrated that Clover spp. were not susceptible, but Cirsium arvense, Urtica urens and Chenopodium album could easily be killed by 0.1 % solutions.

Although these laboratory experiments offer promising aspects for weed control in agriculture, horticulture etc., so is further researchwork in the field necessary before practical recommendations can be made. In this country investigations started in the spring of 1955 and were made possible by May and Baker's Ltd. kindly sending samples.

In one year no definite information concerning the susceptibility of crops and weeds can be expected. The aim of our fieldwork went in two directions:

1) The testing of MCPB and 2,4-DB in forage crops (white and red clover), as recommended in Wain's paper (1).
2) The testing of these compounds in crops, known as susceptible for dinitro's and substituted phenoxyacetic acids as: sugarbeets, runner-beans, lupines, seed-poppies etc.

Since the yield-production of a crop is most important for a farmer, a number of experiments was taken with the aim to determine the yield, as for instance in sugarbeets, runner-beans and lupines. Moreover in other experiments observations were made concerning the susceptibility of weeds, as Cirsium arvense, Sinapis arvensis and Tussilago farfara etc.

Methods of application

The compounds, MCPB and 2.4-DB, were applied with a small handsprayer (1 liter volume) or a knapsacksprayer (volume: 16 liter) in 89 gallons/acre.

Results

a. Runner-beans

While Wain (1) observed that runner-beans are susceptible to MCPB and 2.4-DB, so these herbicides were applied in only 0.1 % solution.

The beans were planted at May, 11 and the herbicides were applied on June, 8. At different dates damage to the crop was observed. Up till July, 7 severe growth effects could be observed. Later on in the season, however, the beans were growing normal and the yield was only seriously affected by 2.4-DB, causing a yield reduction of ± 11 %. In table I the results are summarized. A low figure means that damage is serious.

Table I

treatment	damage to crop		yield in pounds/acre
	17-6-'55	7-7-'55	
Untreated	9	8	2710
0.1 % 2.4-DB	5	4-	2460
0.1 % MCPB	5	5½	2760

From these figures can be concluded that MCPB seems promising. However, the crop is so seriously affected in growth, that a farmer would not like to apply such a compound.

b. Lupine

As runner-beans, lupines are very susceptible for dinitro's, sprayed post-emergence, and MCPA and 2.4-D. It was well worth trying the susceptibility of this crop for MCPB and 2.4-DB. From observations it appeared that the crop is seriously affected by the substituted phenoxybutyric acids. Moreover the compounds caused a severe yield reduction. The seed yield of the untreated plots and the 0.1 % MCPB treated plots were respectively: 960 and 854 pounds/acre.

c. Sugarbeets

The beets are not harvested as yet, but the crop was seriously affected by MCPB and 2.4-DB as was expected. The growth effects in all these crops were similar to those of MCPA and 2.4-D.

d. Forage crops

The reaction of the crop was observed and also the density. The figures, recorded in table II, give an estimate of the damage done to the crop. A low figure means that the crop is seriously damaged. It is evident from these figures, that MCPB or 2.4-DB do not damage the white and red clover, but the lucerne is slightly affected. The butyric acids, however, are not so harmful to lucerne as the MCPA. Also white and red clover are heavily damaged by MCPA.

From other experiments, just laid out a few weeks ago in forage crops, undersown in cereals in the spring of 1955, it is evident, that white and red clover are not damaged heavily, even when 0.4 % is applied.

Table II

Crop	Compound	Conc. in %	Damage to the crop 21-7-'55	29-7-'55
White Clover	MCPB	0.05	7½	7½
	"	0.1	7	7
	2.4-DB	0.05	7½	8½
	"	0.1	7	8½
	MCPA	0.1	3	3
	Untreated	-	8½	9
Red Clover	MCPB	0.05	7	8½
	"	0.1	7	8
	2.4-DB	0.05	7½	8½
	"	0.1	6½	8
	MCPA	0.1	4	4
	Untreated	-	7	9
Lucerne	MCPB	0.05	7	7½
	"	0.1	4½	4½
	2.4-DB	0.05	7	8½
	"	0.1	5	6
	MCPA	0.05	5½	5½
	"	0.1	3	2½
	Untreated	-	9	9

In clovers no growth malformations could be observed. Regrowth, however, is slower. The reason is, perhaps, the rapid breakdown of MCPB and 2.4-DB in the soil by micro-organisms to the toxic compounds MCPA and 2.4-D.

e. Seed-poppy

The compounds were also tested in seed-poppy. 0.05 % and 0.1 % MCPB and 2.4-DB did not seem to affect the crop very severely. The growth was reduced with about 10 % in the lower concentrations.

Reactions of weeds

In some experiments weeds were abundant, so for instance Sinapis arvensis, Cirsium arvense and Tussilago farfara in the experiments in clovers and lucerne. Sinapis arvensis was already flowering when these crops were sprayed. As could be expected Sinapis arvensis was not killed by 1 p/acre MCPB or 2.4-DB. This is in accordance with the results obtained with MCPA and 2.4-D. It is wellknown that annual weeds are more resistent against growth regulators during the flowering stage. The compounds should be sprayed before the flowering of the annual weeds.

In a new set of experiments, laid out in September 1955, could be observed that Cirsium arvense is seriously affected by about 1 - 2 p/acre MCPB and 2.4-DB and Tussilago farfara by about 4 p/acre MCPB and 2.4-DB.

Conclusion

Further experiments concerning the possibility of application of 2.4-DB and MCPB in forage crops as a main crop as well as undersown in cereals and some other crops are advisable.

(1) WAIN, R.L.: Mode of action of herbicides: Selective weed control - some new developments at Wye.
Proc. British Weed Control Conference 1954, p. 311-320.

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