EVALUATION OF BUTYLATE FOR GRASS WEED CONTROL IN MAIZE AND SWEETCORN

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Summary

Preliminary field experiments with butylate applied as a pre-plant soil-incorporated treatment at 2 to 4 lb per acre, indicate that the chemical will control most major annual grass weeds in maize. Little variation in performance was recorded on soils with organic matter levels ranging from 4.4 to 7.2% and crop selectivity was satisfactory at 2 × recommended rates of application. Butylate used alone and in mixtures with atrazine, pre-plant soil incorporated, or used as a split application treatment with atrazine applied post-emergence, proved effective over both annual broadleaf weeds and grasses.

INTRODUCTION

ANNUAL GRASS WEEDS such as barnyard grass (*Echinochloa crus-galli*), summer grass (*Digitaria sanguinalis*), witchgrass (*Panicum* spp.), bristle grass (*Setaria* spp.) and crowfoot grass (*Eleusine indica*) have become a major problem in the Waikato, Bay of Plenty, Poverty Bay and Hawke's Bay, where maize has been grown on the same ground for two or more consecutive seasons. The problem has been accentuated by repeated use of atrazine over a number of seasons. While the chemical has provided excellent control of broadleaf weeds, it has shown limitations in the control of some annual grasses (Thompson, 1962; Gregory and Weiss, 1963; Woon, 1970) which have often flourished owing to the lack of any competition. In latter years, propachlor has been developed for the control of annual grass weeds in maize, but lack of rainfall following application has sometimes been a limiting factor in obtaining best results (Cumberland *et al.*, 1970).

Linuron has also been used as a post-emergent directed treatment for annual grass weed control, but has not gained wide acceptance owing to the need for special application equipment.

Preliminary work with butylate for annual grass weed control in maize has shown that the chemical does not have the major limitations listed above. However, its use does introduce two new factors—the need for correct soil incorporation and a more direct relationship between soil organic matter levels and herbicidal activity.

With the foregoing in mind, the following trial work was initiated.

EXPERIMENTAL

Three trials were laid on a randomized block design with 5 replicates per treatment. Plots consisted of 4×30 in. rows, 20 ft long. All treatments were applied with a modified Oxford precision sprayer at 30 lb/sq.in. and 2 mph in 30 gal of water per acre. Soil incorporation of butylate was carried out within 30 min of spray application by the following means:

Trial 1: Three passes of a tine cultivator followed by a roller.

Trial 2: One cultivation with a rotary hoe set to cut 3 in. deep.

Trial 3: Two passes at right-angles to each other with discs set to cut 5 in. deep.

All maize and sweet corn crops were planted from between 2 and 48 hours following incorporation of butylate.

Post-emergent treatments were applied 21 to 28 days after planting, with the exception of linuron, which was applied as a directed spray when the crop reached 12 to 14 in. high. All post-emergent treatments included a non-ionic surfactant at the rate of 0.5% v/v of the spray mix. A list of treatments appears in Tables 1 to 3 (all rates in lb active ingredient per acre).

Yields were taken by harvesting the two centre rows in each plot and are expressed in subsequent tables as bushels of grain per acre, corrected to 15% moisture content.

Weed assessments were made monthly throughout the duration of the trials and the mean of ratings taken between November and January appears in the tables. The European system was used for scoring percentage weed control and percentage weed cover on a 1 to 9 scale. (In terms of weed control, 1 = 100% weed control, 9 = 0% weed control; in reference to percentage weed cover, 1 = 0% ground cover, while 9 = 100% ground covered by weeds.)

RESULTS

Results are given in Tables 1 to 3.

TABLE 1: GRASS WEED CONTROL AND CROP YIELD
ASSESSMENT—TRIAL No. 1 HASTINGS
(Soil type Hastings silt loam; 6.1% organic matter)

<i>Treatment</i> (lb)	<i>Barnyard</i> <i>Grass</i>	<i>Bristle</i> <i>Grass</i>	<i>Weed Cover</i> <i>Incl. BL</i> <i>Weeds</i>	<i>Mean</i> <i>Yield</i> (bu/ac)
butylate 3 ppsi	2	1	3.2	156
butylate 4 ppsi	1	1	2.5	158
butylate 6 ppsi	1	1	2.3	167
butylate 4 ppsi/atrazine 1.6 ppsi	1	1	1.2	157
butylate 4 ppsi/atrazine 1.6 post-em.	1	1	2.7	159
atrazine 2.4 post-em.	4	7	2.2	155
Untreated	9	9	7.2	143

TABLE 2: GRASS WEED CONTROL AND CROP YIELD
ASSESSMENT—TRIAL No. 2, CLEVEDON, SOUTH AUCKLAND
(Soil type, alluvial silt loam; 4.4% organic matter)

Treatment (lb)			Weed Cover		Mean Yield (bu/ac)
	Summer Grass	Crowfoot Grass	Incl. BL Weeds		
butylate 3 ppsi		1	2	4.6	122
butylate 4.5 ppsi		1	1	3.9	129
butylate 6 ppsi		1	1	3.0	137
butylate 3 ppsi/atrazine					
1.5 post-em.		1	1	1.1	134
atrazine 3 post-em.		5	6	2.5	128
linuron 2 directed post-em.		3	7	2.3	119
Untreated		9	9	9	56

TABLE 3: GRASS WEED CONTROL AND CROP YIELD
ASSESSMENT—TRIAL No. 3, OHINEWAI, WAIKATO
(Soil type Te Kowhai silt loam; 7.2% organic matter)

Treatment (lb)			Weed Cover		Mean Yield (bu/ac)
	Summer Grass	Witch- Grass	Incl. BL Weeds		
butylate 2 ppsi		2	1	6.0	94
butylate 4 ppsi		1	1	5.2	118
butylate 2 ppsi/atrazine					
1.5 post-em.		1	1	1.3	146
atrazine 3 post-em		4	5	3.7	137
Untreated		9	9	9	23

DISCUSSION

Results obtained with butylate were consistent on each of the three trial sites and provided satisfactory control of all major annual grass weed species at rates of 2 to 6 lb. In trial Nos. 1 and 2, plots treated with the highest rate of butylate (6 lb) also returned the highest yields at harvest which indicated good selectivity towards the crop and also demonstrated the marked effect that very early weed control has on ultimate maize yield. Broadleaf weeds were well controlled initially but invariably resistant species gradually dominated most butylate plots as evidenced in the column headed "Weed Cover Incl. BL Weeds" in Tables 1, 2 and 3. While atrazine did not provide very good annual grass weed control, it clearly afforded the best control of broadleaf weeds. The mixture of butylate (3 lb) plus atrazine (1.5 lb) either both soil-incorporated or as a split treatment pre- and post-emergent gave the most consistent grass and broadleaf weed control and the latter treatment could be seriously considered in the future, as a practical commercial treatment. In order to evaluate butylate for the control of annual grass weeds in maize under practical field conditions, a total of 16 observational trials were carried out on commercial crops in Gisborne, Hawke's Bay, Bay of Plenty, and the Waikato, using unreplicated 1 acre plots.

Results on silt loams, volcanic loams and clay loams were all satisfactory, while four trials on peat type soils produced very variable results.

Incorporation equipment used included tandem discs, tine harrows, dutch harrows, rotary hoes, and a rotatiller, all operating at depths of between 2 and 5 in. In two cases, where only one cut with tandem discs was made, long strips of weed growth occurred, indicating the need for cross discing at right-angles to the first cut. With all other methods of soil incorporation, control of annual grass weeds was most satisfactory. Rainfall or lack of it, following the application of butylate, did not appear to affect any results obtained with the chemical. On eleven of the field trial sites, some 0.20 to 3.72 in. of rain fell within 10 days of application, while on five sites no significant rainfall occurred from between 10 and 24 days, following the application of butylate.

CONCLUSIONS

Where annual grass weeds have become a problem in maize growing areas and rainfall is unreliable, butylate (3 lb) should be considered as a combination treatment with atrazine (1.5). The butylate should be incorporated in the soil to a depth of 2 to 4 in. with a rotary hoe or two cuts made in different directions with discs, or a cultivator, including tine harrows, travelling at 6 to 8 mph. Application to peat type soils should be avoided. Atrazine should be applied as a post-emergent treatment when the weeds are at the first true leaf stage and the addition of a non-ionic surfactant (0.5% v/v) is recommended.

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