

USE OF PRE-EMERGENCE HERBICIDES IN NAVY BEANS

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SUMMARY

Amiben was used safely but 2, 4-D, 2, 4-DES and linuron were seriously phytotoxic.

I. INTRODUCTION

In the South Burnett district of south-eastern Queensland pre-emergence herbicide treatments are used successfully on a commercial scale by peanut growers and could prove valuable to the navy bean industry, particularly with increased production of erect varieties suitable for direct heading but possibly with poor smothering properties.

The purpose of the investigation described here was to determine the effect of various pre-emergence herbicide treatments on navy bean crop yield, crop population and weed population. The treatments were the more successful of a large range of herbicides evaluated in an observation trial the previous year.

The investigation was not intended as a comprehensive study of pre-emergence herbicide usage in navy beans. The intention was rather to assess by means of a few promising treatments the technical and economic practicability of pre-emergence herbicide practice in navy beans and from this assessment decide whether further more detailed studies were justified.

II. MATERIALS AND METHODS

A field experiment was established early in 1964 near Kumbia, in the South Burnett district, on red basaltic clay loam "scrub" soil in a typical situation for navy bean production.

Seed of an erect type of navy bean was planted with conventional equipment and the herbicide treatments were applied as band sprays 14 in. wide, using spraying attachments mounted on the planter. The herbicide treatments were regarded as supplementary to mechanical weed control in the growing crop. One inter-row cultivation was necessary during the growing season.

Planting was delayed by unfavourable weather. A heavy population of weed seedlings which developed during the period of delay was destroyed mechanically before planting. An infestation of annual grasses in the growing crop had been expected but grass growth was in fact negligible, probably because little ungerminated seed remained near the soil surface. The weed infestation, which consisted almost entirely of *Commelina benghalensis* (air-weed or wandering Jew), an introduced species which has become naturalized in the South Burnett district, was not typical. This weed seeds readily and uprooted plants have the ability to survive for long periods. Because of this latter property inter-row cultivation is often only moderately effective, particularly during showery weather.

The treatments were as follows:

1. Untreated.
2. Hand-weeded.
3. 2, 4-D amine as "Di-weed 50", 50% w/v, 2 lb. a.e./ac.
4. 2, 4-DES as "Sesone", 64.4% w/w, 2 lb a.e./ac.
5. Amiben (Agserv sample), 24% w/v, 2 lb a.e./ac.
6. Monsanto CP 31675, 12% emulsifiable concentrate, 2 lb a.i./ac.
7. Geigy G 36393, 25% emulsifiable concentrate, 2 lb a.i./ac.
8. Linuron as "Lorox", 50% w/w, 2 lb a.i./ac.

The above dosages relate to acreage of sprayed ground. The spray volume was 28.5 gal per acre of sprayed ground.

The hand-weeded treatment was intended to maintain a weed-free condition for the entire growing season.

III. RESULTS

The results of the experiment are shown in Table 1.

IV. DISCUSSION

Effect of weed competition on yield.—A highly significant difference in the population of *Commelina benghalensis* between hand-weeded and untreated controls did not significantly affect yield. Seven plants of *Commelina benghalensis* species to 24 ft of row is therefore not a competitive infestation.

Effect of herbicide treatments on crop yield and population.—As the weed population did not significantly affect yield, any differences were almost entirely due to herbicidal action.

TABLE 1

RESULTS OF PRE-EMERGENCE TREATMENTS

Treatment	Mean Yield of Beans (lb/ac)	Reduction in Yield (%)	Mean No. of Navy Bean Plants Per Harvested Area	Reduction in Crop Plant Population (%)	Mean No. of Commelina Plants in 24 ft of Row	Increase in Commelina Population (%)	Mean Weight of 100 Seeds (g)
A. Hand-weeded	1,418	—	391	—	0.8	—	18.3
B. Untreated	1,359	4.2	376	3.8	7.3	814*	17.9
C. Amiben	1,269	10.5	364	6.9	3.8	376	17.6
D. G36393	1,144	19.3*	287	26.6*	4.8	500†	18.0
E. Linuron	1,022	27.9*	325	16.9†	8.5	964*	18.6
F. 2,4-D	911	35.7*	311	20.4*	7.6	850*	17.6
G. 2,4-DES	892	38.0*	295	24.3*	10.4	1,200*	17.6
H. CP31675	588	48.0*	258	34.0*	3.6	350	19.4

Significant differences

Mean yield: A \gg D,E,F,G,H; B,C \gg E,F,G,H; B>D; D \gg G,H; D>F; E,F,G \gg H.

Mean no. of navy bean plants: A \gg D,F,G,H; A>E; B,C \gg D,G,H; B>E,F; C>F; E \gg H.

Mean no. of Commelina plants: B,E,F,G \gg A; D>A; E>H; G \gg H; G>C,D.

* Difference from treatment A significant at 1% level.

† Difference from treatment A significant at 5% level.

Amiben was the only herbicide not to reduce yield significantly. The remaining herbicides reduced both yield and crop plant population significantly and the effect on population was evidently the most harmful aspect of the herbicidal action. Reduction in crop vigour would have accounted for most of the remaining effect on yield, and in the case of 2,4-D and 2,4-DES reduced seed size may have been a contributing factor. Reduction in vigour could have been otherwise expressed as fewer pods per plant or fewer seeds per pod, but no records of these variables were made.

Effect of herbicide treatments on the population of Commelina benghalensis.—No treatment significantly reduced weed population in relation to the untreated control. The populations in the 2,4-D, 2,4-DES and linuron plots were in fact greater than in the untreated control. The only treatments in which the populations were not significantly greater than the hand-weeded controls were amiben and CP 31675, and these herbicides are worth further investigation for specific control of this weed. *Commelina benghalensis* does not appear to be a very easy species to control with pre-emergence sprays.

Effect of herbicide treatments on seed size.—The differences which were recorded were not very great and little importance should be attached to them. In five treatments the seed weight was less than the hand-weeded control and this could have been caused either by herbicidal action or by the presence of weeds. CP 31675 increased the weight of seed. This treatment modified the habit of individual plants by seriously reducing the stand and delaying maturity.

Further investigations.—This experiment demonstrated that at least one herbicide (amiben) is safe with navy beans and in the presence of a severe infestation of susceptible weeds its use could be advantageous. Amiben and other recently developed herbicides should be evaluated further in navy beans in the presence of a wider range of weed species. 2,4-D, 2,4-DES, CP 31675, G 36393 and linuron are seriously phytotoxic to navy beans and should be excluded from future investigations.

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