DINITRAMINE : A NEW INCORPORATED HERBICIDE FOR PEAS, BEANS AND FIELD BRASSICAS

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Summary

Results from thirty-one trials over three seasons' use of dinitramine pre-plant soil incorporated herbicide are presented. Excellent broad spectrum weed control was obtained with good crop tolerance in peas, French beans, soyabeans and field brassicas. Susceptibility of 24 weed species are listed and various methods of soil incorporation are discussed.

INTRODUCTION

In recent years there has been a worldwide upsurge in the use of pre-plant soil incorporated herbicides in cropping agriculture. These herbicides offer the farmer several important advantages over post emergence treatments:—

(a) Reduced weed competition during the important seedling establishment phase of the crop.

(b) Incorporation of the herbicide reduces dependence on rainfall for maximum effectiveness.

(c) Herbicides can be applied and incorporated in one operation as an integral part of the final seedbed preparation.

(d) When adverse weather conditions prevail prepared seedbeds treated with soil incorporated herbicides are protected from weed seed germinations which might otherwise occur before sowing is possible.

(e) Herbicide application prior to sowing reduces potential crop yield losses from soil compaction with wheeled vehicles used in post emergence spray treatments.

While these advantages accrue to the user of pre-plant incorporated herbicides he will only benefit if their performance matches alternative herbicides as regards spectrum of weed control, duration of control, crop selectivity and convenience of application.

Dinitramine is a phenylene diamine herbicide formerly identified as USB 3584 which was introduced for evaluation under New Zealand conditions in 1971. In chemical structure it resembles the growing number of soil incorporated herbicides known as the substituted dinitroanilines whose chemical and physical properties have been described by Weber and Monaco (1972).

This paper reports results from 31 field trials in which dinitramine's spectrum of weed control was observed. Four trials on crops including field brassicas, peas, French beans and soyabeans are also reported.

MATERIALS and METHODS

Trial locations and treatment conditions are summarised in Table 2. Plot sizes ranged from 4 x 5 m to 6 x 10 m. Spray treatments were applied in a volume equivalent of 200 to 250 litres/ha with a precision sprayer; incorporation generally followed within eight hours. Various incorporation techniques were employed using "Rola-tillers", "Dutch" harrows, tyne harrows, discs and rotary hoes. Single and multiple incorporations (both parallel and at right angles) were also compared.

RESULTS

Results of dinitramine weed control from observation of thirty-one trials are summarised in Table 1. For simplicity data has been expressed in terms of dinitramine application rates for a minimum of 70% weed control.

Typical weed control and crop tolerance results from seven garden pea, six French bean and eight field brassica trials are summarised in Table 2.

TABLE 1: WEED SUSCEPTIBILITY TO DINITRAMINE

Mean rates of dinitramine giving not less than 70% weed control
Summarised from 31 field trials in 1971-74

Abbreviation	*Botanical name*	*Common name*	*dinitramine rate kg/ha*
*A. fat	*Avena fatua*	wild oats	0.375-0.5
A. ret	*Amaranthus retroflexus A. hybridus*	redroot	0.75
C. alb	*Chenopodium album* agg	fathen	0.24-0.5
C. bur	*Capsella bursa-pastoris*	shepherd's purse	0.375
C. did	*Coronopus didymus*	twincress	1.0
*C. dio	*Cotula dioica*	cotula dioica	1.5
C. hol	*Cerastium holosteoides*	mouse-eared chickweed	0.5-0.75
D. san	*Digitaria sanguinalis*	summergrass	0.375
D. str	*Datura stramonium*	thornapple	1.0
*E. cic	*Erodium cicutarium*	storksbill	0.375-0.5
E. crus	*Echinocloa crus-galli*	barnyard grass	0.25-0.5
G. par	*Galinsoga parviflora*	galinsoga	1.0-1.5
H. rad	*Hypochaeris radicata*	catsear	0.75-1.0
P. ann	*Poa annua*	poa annua	0.25-0.5
P. avi	*Polygonum aviculare*	wireweed	0.375-0.5
P. per	*Polygonum persicaria*	willow weed	0.5
*P. con	*Polygonum convolvulus*	cornbind	0.5-1.0
R. ace	*Rumex acetosella*	sorrel	0.75
S. arv	*Spergula arvensis*	spurrey	0.25
S. med	*Stellaria media*	chickweed	0.25
S. nig	*Solanum nigrum* complex	nightshade	0.75
*S. off	*Sisymbrium officinale*	hedge mustard	0.5-0.75
Ve ar	*Veronica arvensis*	speedwell	0.5
Vl ar	*Viola arvensis*	field pansy	0.375-0.5
X. spi	*Xanthium spinosum*	Bathurst burr	0.75-1.0

* Indicates results requiring further confirmation

DISCUSSION and CONCLUSIONS

Excellent broad spectrum weed control has been obtained with dinitramine under a wide variety of incorporation techniques. In general dinitramine (0.25 to 0.5 kg/ha) has given equivalent broadleaf weed control to trifluralin (1 kg/ha) while retaining the excellent grass weed activity shared by other substituted dinitroanilines. Of particular importance is the greater susceptibility of nightshade to dinitramine than to the standard trifluralin. This is in agreement with recent trial results from Europe. (Shorrocks pers. com.)

...row				Intermediate Rola-tiller 1					Moist Rola-tiller 1				
3	3	12	12	6	6	6	9	9	4	4	4	9	9
WC %	WC reduction	WC	Yield	WC %redn	CT	Yield	CT	Yield	WC % redn.	WC	CT 0-10 Scale	WC % redn.	Yield Peas
P.per	S.arv	Total	Chou	Total	Plants /m	Swede	Plants /m	Turnip	S.nig	Total		Total	
76	100	61	128	49	19.7	154	15	116	—	—	—	—	—
86	100	61	129	65	23.7	124	15.5	139	—	—	—	—	—
57	100	64	132	85	21.3	127	18.5	208	75	74	9.6	77	113
86	100	72	140	90	10.5	51	21	139	—	—	—		
—	—	—	—						74	74	8.9	90	118
—	—	—	—						74	75	9.1	90	103
72	100	49	120	65	19.8	117	14.5	141	21	43	10	63	110
—	—	—	—						—	—	—	—	—

Excellent broad spectrum weed control and crop tolerance has been obtained with dinitramine (0.5 to 0.75 kg/ha) on French bean, soyabean and garden pea crops (Table 2). Similar good tolerance and weed control has been obtained in commercial applications of dinitramine to these crops (Woon, Forgie, pers. com.)

Root and leaf brassica crops show differences in tolerance to dinitramine, the former tending to be less tolerant (Table 2). Stand densities of leaf brassicas were not affected (Trial 218) and neither significant yield differences nor visual crop suppression could be determined. Tolerance of turnips to dinitramine varied (data from Trial 380 only shown) where in Canterbury there were significant differences (1%) in stand density with some rates of dinitramine 0.6 to 0.8 kg/ha while in Taranaki similar treatments affected neither density nor yield. However acceptable control of the important weeds infesting brassicas is achieved with dinitramine 0.25 to 0.375 kg/ha (Trial 218 and Table 1) allowing a satisfactory margin of crop safety. The yield data presented for trial 380 was collected before crop maturity and therefore full root development. Results of treatments with dinitramine on root brassicas in the United Kingdom show that while stand density may be reduced crop yield has been increased by compensatory root development (Shorrocks pers. com.).

In this trial series dinitramine has been well tolerated by a wide range of other crops. These included field peas, asparagus, lucerne, Azuki beans, transplant tomatoes, carrots, white lupins and safflower. Further trials to confirm rates for field usage on these crops are warranted.

Dinitramine has performed well under a wide variety of soil types and incorporation techniques. Best results have been obtained with thorough shallow (5 cm maximum) incorporation achievable with one pass using a "rola tiller" at 9 to 12 km/h or with 2 passes (preferably at right angles diagonally) with "Dutch" harrows. Incorporation can be delayed for up to 24 hours after spraying without affecting weed control. This is probably due to its relatively low volatility (Weber and Monaco 1972). The use of disc cultivators for incorporation of dinitramine has been found to give less reliable results, due to the difficulty in accurately controlling cultivation depth. Incorporation to depths greater than 5 cm has resulted in poorer weed control probably on account of over dilution of herbicide by soil mixing.

No gross differences in dinitramine activity have been observed over a range of soil organic matter levels from 4 to 14%. In one trial with a soil organic matter of 21% some reduction in dinitramine effectiveness was observed. Further studies are necessary to clarify soil organic matter effect on herbicidal activity.

While dinitramine has given good residual weed control (e.g. Trials 097 and 218) persistence in soil is not normally expected to limit crop rotations. Dinitramine breakdown in the soil is steady and less than 10% remains after 80 to 120 days (Shorrocks pers. com.). However where crops such as short rotation ryegrass, or cereals follow crops treated with dinitramine (0.5 to 0.75 kg/ha) some carry-over effects may occur. Deep ploughing and thorough cultivation will minimise residue effects.

Dinitramine performance has been reliable over a wide range of soil moisture levels at and following treatment but further study of moisture effect is warranted.

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REFERENCES

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