

SOUTH AFRICAN SUGAR INDUSTRY
AGRONOMISTS' ASSOCIATION

Code : HW 204/80

Cat. No.: 1227

TITLE: POST-EMERGENCE PHYTOTOXICITY TRIAL IN TRAYS

1. Particulars of the project

This crop : Plant cane
Site : Mount Edgecombe
Region : N. Coast Coastal
Soil systems : Berea/Umzinto Coast Lowlands
Series : Clansthal/Shorrocks
Design : Randomised blocks
Variety : NCo 376
Fertilizer : N P K
 Sand 411 78 411
 Clay 244 43 244

Soil analysis:

	pH	Silt%	Sand%	Clay%	O.M.%	CEC
Sand	8,3	-	98	2	0,05	3,1
Clay	6,9	12	38	50	1,03	28,0

	ppm				
	P	K	Ca	Mg	Na
Sand	33	48	428	20	26
Clay	30	225	1800	220	

Dates: Sprayed 27/2/81

 Harvested 13/4/81

Water regime: Hand watered

2. Objectives:

To test promising new herbicides, herbicide mixtures and herbicide formulations for their phytotoxic effect on plant cane grown in trays.

3. Treatments

	<u>Rate in kg or ℓ ai/ha</u>	<u>Rate in kg or ℓ prod/ha</u>
1. Diuron + Velpar L	2,0 + 0,45	2,5 + 2,0
2. Diuron + 2,4-D + S (Agral 90)	2,0 + 1,44	2,5 + 2,0
3. Bimate + Certrol DS	3,0 + 0,875	4,0 + 1,25
4. Bimate + paraquat	3,0 + 0,2	4,0 + 1,0
5. Bimate + S (Agral 90)	3,0	4,0
6. Bimate + Rev 9	3,0 + ?	4,0 + 3,0
7. Dopax	3,5	7,0
8. Dopax + paraquat	3,5 + 0,3	7,0 + 1,5
9. Dual + ametryne	2,0 + 1,5	2,75 + 3
10. Dual + ametryne paraquat	2,0 + 1,5 + 0,3	2,75 + 3,0 + 1,5
11. Diuron 75 SC	2,4	3,2
12. Diuron 80 WP	2,4	3,0
13. Certrol DS*	1,05	1,5
14. Brominal DS*	1,09	1,5
15. Bladex Plus + Tronic	4,5	9,0
16. Bladex Plus + Rev 9	4,5	9,0 + 3,0
17. Ametryne + Velpar	2,0 + 0,45	3,0 + 0,5
18. Ametryne + Velpar	1,5 + 0,675	3 + 0,75
19. Diuron + Velpar	2,0 + 0,45	2,5 + 0,5
20. Control	-	-

*Certrol DS contains 600 g ae/ℓ of 2,4-D iso-octyl ester and 100 g ae/ℓ of ioxynil octanoate

*Brominal DS contains 575 g ae/ℓ of 2,4-D iso-octyl ester and 150 g ae/ℓ of bromoxynil octanoate

Note on Treatments

- Application : Gas operated knapsack sprayer fitted with a Sprayer Systems 8004-E fanjet.
- Output : 680 l/ha. (pressure 150 kPa, speed 1 m/s, swath 0,5 m, area sprayed twice).
- Timing : Post-emergence of cane.
- Cane growth at spraying : See Results.
- Conditions at spraying : Warm to hot and clear.
- Spraying date : 27/2/81.

4. Experimental

- Design : Randomised blocks
- Procedure : Single eyed cane setts were chopped and planted at 5 cm depth at a rate of 14 setts per tray. All setts were dipped in Benlate fungicide at a rate of 0,75 g/l. Fertilizer and nematicide (in sand only) were placed at the same depth as setts. Subsequently each tray was thinned to 10 setts per tray by discarding weak or ungerminated setts.

Shoot heights and counts were taken during the experimental period and the foliage mass was recorded at harvest which occurred 45 days after spraying.

5. Results

1. Mean visual ratings of leaf scorch and chlorosis taken 21 days after spraying are presented in Table 1. Also included are ratings of the amount of dead material and leaf symptoms 41 days after spraying. All ratings are based on a linear 1 - 9 scale where 1 = no effect, and 9 = dead.
2. Mean crop measurements taken at spraying and at harvest are presented in Table 2.
3. Yield results from cane in sand trays are presented in Table 3.
4. Yield results from cane in clay trays are presented in Table 4.

TABLE 1: Mean visual ratings** of chlorosis and necrosis and degree of dead material and leaf scorch on two dates after spraying

Treatment	Sand				Clay			
	T + 21 days		T + 41 days		T + 21 days		T + 41 days	
	Chlor	Nec	*D.M.	Scorch	Chlor	Nec	D.M.	Scorch
Control	3,3	2,7	2,0	2,3	1,8	2,3	2,3	1,7
Diuron + Velpar	<u>4,7</u>	3,3	<u>3,5</u>	<u>3,5</u>	<u>3,1</u>	2	2	<u>4,7</u>
Diuron + Velpar L	<u>5,3</u>	<u>4,7</u>	<u>3</u>	<u>4</u>	<u>3,3</u>	2	2,5	<u>4,2</u>
Diuron + 2,4-D + S	2,7	2,2	2,2	2,3	2,1	2	2,2	2
Bimate + Certrol DS	3	2,7	2,3	2,8	<u>2,5</u>	2	2,3	<u>2,5</u>
Bimate + paraquat	2,3	<u>4,7</u>	<u>3,8</u>	1,3	1,3	<u>5</u>	<u>4,8</u>	1,5
Bimate + S	<u>4</u>	3	2,7	2,8	<u>3,1</u>	2	2,5	<u>3,5</u>
Bimate + Rev 9	<u>4,3</u>	2,7	2,5	<u>3,3</u>	<u>2,6</u>	1,8	2,8	2,5
Dopax	2,3	2	2	2,5	1,8	2	2,7	1,8
Dopax + paraquat	1,3	<u>4,3</u>	<u>3,7</u>	1,2	1,3	<u>5,3</u>	<u>5</u>	<u>1,3</u>
Dual + ametryne	1,7	2,3	2	2,2	1,6	2	2,7	2,3
Dual+ametryne+paraquat	1,7	<u>4,3</u>	<u>3,5</u>	1,5	1,5	<u>5,3</u>	<u>4,2</u>	1,5
Diuron 75 SC	3,3	2,7	2,2	2,5	2,3	2	2,3	1,8
Diuron 80WP	3,5	3	<u>2,8</u>	2,5	1,9	2	2,2	1,8
Certrol DS	2,2	2,3	2	2,3	2,4	2,3	2,8	1,7
Brominal DS	1,7	2,3	2	1,8	2,4	2	2,5	1,7
Bladex Plus + Tronic	3,7	<u>6,5</u>	<u>4,5</u>	2,5	2	2	2	<u>3</u>
Bladex Plus + Rev 9	<u>4</u>	<u>4</u>	<u>3,5</u>	2,5	<u>2,8</u>	2	2	<u>3,3</u>
Ametryne + Valpar	<u>4,3</u>	<u>4,3</u>	<u>3</u>	<u>3</u>	<u>2,6</u>	1,5	2,2	<u>4,2</u>
Ametryne + Velpar	<u>5</u>	<u>5,3</u>	<u>4,5</u>	2,8	<u>4,5</u>	2	2	<u>5,5</u>

* = degree of dead material present

** = ratings

— = figures underlined are more than 0,7 units greater than control

TABLE 2: Mean crop characteristics at spraying and at harvest

Treatments	Sand				Clay			
	Shoot length		Shoot popln.		Shoot length		Shoot popln.	
	*(cm)	A	B	C	*(cm)	A	B	C
Control	10,2	9,4	9,7	30,5	8,0	3,3	9,5	12,0
Diuron + Velpar	10,0	2,9	10	14,5	8,3	1,8	9,2	9,8
Diuron + Velpar L	10,2	3,1	9,5	13,5	7,7	2,7	9,8	10,8
Diuron + 2,4-D + S	10,2	7,5	9,8	30,3	8,8	3,1	9,5	11,5
Bimate + Certrol DS	9,8	5,1	9,3	27,0	8,7	3,4	9,5	11,3
Bimate + paraquat	10,5	4,7	9,5	26,5	8,7	2,4	9,5	13,7
Bimate + S	10,2	5,4	9,7	25,5	9,8	2,6	9,7	11,0
Bimate + Rev 9	10,5	4,7	9,3	23,2	9,2	3,0	9,7	11,3
Dopax	9,8	7,6	10	36,7	8,7	2,6	9,8	11,7
Dopax + paraquat	10,2	7,3	9,3	35,2	9	2,3	10,2	15,5
Dual + ametryne	10,3	8,2	10,7	37,3	9	2,7	9,8	11,8
Dual+ametryne+paraquat	10,7	6,1	9,8	35,8	8,8	2,3	9,5	14,3
Diuron 75SC	10,5	6,3	9,5	27,3	7,5	3,5	10	11,0
Diuron 80WP	10	6,8	9,3	22,8	9	2,8	9,5	9,5
Certrol DS	9,7	9,8	9,5	31,6	8,2	3,2	10,2	11,0
Brominal DS	10,0	10,3	9,2	31,8	8,5	3,6	9,8	13,3
Bladex Plus + Tronic	9,0	4,0	8,7	15,6	8,8	3,4	9,8	10,8
Bladex Plus + Rev 9	9,2	4,8	9,3	19,1	9,2	3,2	9,7	10,2
Ametryne + Velpar	9,7	4,4	9,7	24,4	8,8	2,2	9,5	10,2
Ametryne + Velpar	10,2	2,9	9,3	14,1	8,3	0,7	10,2	10,7

A = change in shoot length from spray to harvest
 B = number of germinated setts at spraying
 C = number of tillers and shoots at harvest
 * = shoot length at spraying

Table 3: Yield results from cane grown in sandy soil

Treatments	Foliage mass				Shoot length		Shoot population	
	Fresh		Dry		(cm)	% Cont	No.	% Cont
	(g)	% Cont	(g)	% Cont				
Control	304	100	62,8	100	19,6	100	30,5	100
Diuron + Velpar	<u>124*</u>	<u>40,8</u>	<u>24,7*</u>	<u>39,4</u>	<u>12,9*</u>	<u>65,8</u>	<u>14,5*</u>	<u>47,5</u>
Diuron + Velpar	<u>114*</u>	<u>37,6</u>	<u>23,0*</u>	<u>36,7</u>	<u>13,3*</u>	<u>67,7</u>	<u>13,5*</u>	<u>44,3</u>
Diuron + 2,4-D + S	<u>242</u>	<u>79,8</u>	<u>50,0</u>	<u>79,6</u>	<u>17,7</u>	<u>90,3</u>	<u>30,3</u>	<u>99,5</u>
Bimate + Certrol DS	<u>191*</u>	<u>62,7</u>	<u>39,7*</u>	<u>63,3</u>	<u>14,9*</u>	<u>76,2</u>	<u>27,0</u>	<u>88,5</u>
Bimate + paraquat	<u>163*</u>	<u>53,8</u>	<u>36,4*</u>	<u>58,0</u>	<u>15,2*</u>	<u>77,7</u>	<u>26,5</u>	<u>87,0</u>
Bimate + S	<u>186*</u>	<u>61,1</u>	<u>37,8*</u>	<u>60,3</u>	<u>15,6*</u>	<u>79,7</u>	<u>25,5</u>	<u>83,6</u>
Bimate + Rev 9	<u>174*</u>	<u>57,3</u>	<u>35,2*</u>	<u>56,0</u>	<u>15,2*</u>	<u>77,7</u>	<u>23,2</u>	<u>76,0</u>
Dopax	<u>289</u>	<u>95,0</u>	<u>62,9</u>	<u>100,2</u>	<u>17,4</u>	<u>89,0</u>	<u>36,7</u>	<u>120,2</u>
Dopax 1 paraquat	<u>217*</u>	<u>71,4</u>	<u>48,4</u>	<u>77,1</u>	<u>17,5</u>	<u>89,2</u>	<u>35,2</u>	<u>115,3</u>
Dual + ametryne	<u>249</u>	<u>81,9</u>	<u>52,7</u>	<u>84,0</u>	<u>18,5</u>	<u>94,3</u>	<u>37,3</u>	<u>122,4</u>
Dual+ametryne+paraquat	<u>222*</u>	<u>72,9</u>	<u>49,9</u>	<u>79,5</u>	<u>16,8*</u>	<u>85,5</u>	<u>35,8</u>	<u>117,3</u>
Diuron 75 SC	<u>232*</u>	<u>76,3</u>	<u>47,4</u>	<u>75,5</u>	<u>16,8*</u>	<u>85,6</u>	<u>27,3</u>	<u>89,6</u>
Diuron 80 WP	<u>211*</u>	<u>69,4</u>	<u>42,4*</u>	<u>67,6</u>	<u>16,8*</u>	<u>85,6</u>	<u>22,8*</u>	<u>74,9</u>
Certrol DS	<u>299</u>	<u>98,3</u>	<u>64,7</u>	<u>103,2</u>	<u>19,5</u>	<u>99,4</u>	<u>31,6</u>	<u>103,5</u>
Brominal DS	<u>304</u>	<u>100,1</u>	<u>64,9</u>	<u>103,4</u>	<u>20,3</u>	<u>103,3</u>	<u>31,8</u>	<u>104,4</u>
Bladex Plus + Tronic	<u>107*</u>	<u>35,3</u>	<u>21,8*</u>	<u>34,7</u>	<u>13,0*</u>	<u>66,0</u>	<u>15,6*</u>	<u>51,1</u>
Bladex Plus + Rev 9	<u>126*</u>	<u>41,4</u>	<u>25,8*</u>	<u>41,1</u>	<u>14,0*</u>	<u>71,4</u>	<u>19,1*</u>	<u>62,7</u>
Ametryne + Velpar	<u>184*</u>	<u>60,5</u>	<u>38,9*</u>	<u>61,9</u>	<u>14,1*</u>	<u>72,1</u>	<u>24,4*</u>	<u>79,9</u>
Ametryne + Velpar	<u>106*</u>	<u>34,9</u>	<u>21,3*</u>	<u>33,9</u>	<u>13,1*</u>	<u>66,8</u>	<u>14,1*</u>	<u>46,2</u>
CV%	21,7		23,8		9,7		18,6	
LSD (0,05)	50,35	17	11,63	19	1,797	18	5,584	9
LSD (0,05)	66,91		15,46		2,388		7,421	

— = significance at the 5% level

* = significance at the 1% level

TABLE 4: Yield results from cane grown in clay soil

Treatments	Foliage mass				Shoot length		Shoot population	
	Fresh		Dry		(cm)	% Cont	No.	% Cont
	(g)	% Cont	(g)	% Cont				
Control	137	100	30,9	100	11,3	100	12,0	100
Diuron + Velpar	<u>112</u>	<u>81,7</u>	<u>24,9*</u>	<u>74,3</u>	10,1	89,2	9,8	81,9
Diuron + Velpar L	116	<u>84,9</u>	<u>24,0</u>	<u>77,9</u>	10,4	92,5	10,8	90,3
Diuron + 2,4-D + S	142	103,5	31,6	102,4	11,9	105,0	11,5	95,8
Bimate + Certrol DS	141	102,7	31,8	103,1	12,1	107,4	11,3	94,4
Bimate + paraquat	129	93,9	29,6	96,0	11,1	98,1	13,7	113,9
Bimate + S	153	112,1	36,6	118,7	12,4	109,9	11,0	91,7
Bimate + Rev 9	150	109,6	35,3	114,4	12,2	107,7	11,3	94,4
Dopax	153	111,6	36,1	117,0	11,3	99,7	11,7	97,2
Dopax + paraquat	144	105,2	33,2	107,4	11,3	99,7	15,5	129,2
Dual + ametryne	155	113,4	35,8	115,9	11,7	103,2	11,8	98,6
Dual+ametryne+paraquat	131	95,4	31,6	102,4	11,1	98,2	14,3	119,4
Diuron 75 SC	138	101,1	31,8	103,0	11,0	97,6	11,0	91,7
Diuron 80 WP	135	98,3	31,8	103,0	11,8	104,7	9,5	79,8
Certrol DS	138	101,0	32,6	105,6	11,4	100,9	11,0	91,7
Brominal DS	156	114,3	35,8	115,9	12,1	107,1	13,3	111,1
Bladex Plus + Tronic	126	92,2	27,3	88,3	12,2	107,7	10,8	90,3
Bladex Plus + Rev 9	128	93,4	27,2	88,0	12,4	109,7	10,2	84,7
Ametryne + Velpar	123	89,8	25,6	83,0	11,0	97,4	10,2	84,7
Ametryne + Velpar	<u>87*</u>	<u>63,2</u>	<u>18,0*</u>	<u>58,5</u>	<u>9,0</u>	<u>79,9</u>	10,7	88,9
CV%	13,7		16,2		10,2		22,1	
LSD (0,05)	21,15	15	5,651	18	1,336	12	2,926	24
LSD (0,05)	28,09		7,505		1,774		3,886	

— = significance at the 5% level

—* = significance at the 1% level

6. Comments

Visual ratings

1. Some stress symptoms in the form of orange to brown colouring of the lower leaves were present in all trays including the unsprayed control, although cane growth in the unsprayed trays was excellent.
2. Treatments which caused no greater symptoms of leaf scorch than unsprayed control pots were:-

Diuron + 2,4-D + S, Bimate + Certrol DS, Dopax, Dual + ametryne, Diuron 75 SC, Diuron 80WP, Certrol DS and Brominal DS.
3. Treatments which included paraquat showed early leaf scorch but the effects were growing out at the time of harvest. No additional effect of other chemicals in the combinations was detected.
4. Sand trays indicate that Velpar L may be slightly more severe than Velpar powder. In combination with ametryne Velpar was no worse than diuron + Velpar at equivalent rates. The higher rate of Velpar did produce more severe symptoms in sand and clay pots.
5. Bimate caused some effect on cane foliage in combination with Reverseal 9 or surfactant but not in mixtures with Certrol DS. The addition of Reverseal 9 was no worse than the standard surfactant.
6. Bladex Plus with Tronic and Reverseal 9 caused some effect on cane foliage. No marked difference was apparent except in sand where some trays with Bladex Plus + Tronic became waterlogged and the symptoms may have been exaggerated.

Crop measurements

1. All treatments reduced shoot elongation and tiller production except Certrol DS and Brominal DS which had no effect and all all Dual and Dopax treatments which tended to stimulate tiller production in sand trays. In clay trays tiller production was stimulated by paraquat treatments.
2. The effects of treatments were relatively very severe in sand and Velpar combinations were worst followed by Bladex Plus combinations, then Bimate combinations, diuron formulations and the standard diuron + 2,4-D + S.
3. Generally different formulations of the same herbicide and different mixtures of the same herbicide were very similar in their effects. Differences were far greater between different herbicides.

4. Ametryne + Velpar was safer than diuron + Velpar at equivalent rates.
5. Differences in clay were far less marked and this may be due to the slower rate of growth in clay pots.

Yield results

A. sandy soil

1. All treatments except Certrol DS, Brominal DS and Dopax reduced plant material mass to a statistically significant degree.
2. The most severe treatments were Velpar combinations, and Bladex Plus combinations. Bimate combinations were slightly less severe while diuron formulations and Dual and Dopax mixtures were still less severe and similar to the standard diuron + 2,4-D + S.
3. Again differences between treatments were generally far more severe than differences between formulations or mixtures with the same herbicide.
4. Paraquat in combination with Bimate tended to cause lower yields compared with other Bimate mixtures but this did not reach a level of statistical significance.
5. Ametryne + Velpar was safer than diuron + Velpar at equivalent rates.

B. clay soil

1. Only ametryne + Velpar at the high rate and diuron + Velpar (powder) decreased yields in clay to a statistically significant extent. The yield depression by diuron + Velpar L also approached a statistically significant level.
2. Generally cane growth was slower in clay pots and differences may not have been able to develop to the same extent.
3. Generally yields from mixtures with the same chemicals or with different formulations were very similar. (Bladex Plus treatments, diuron formulations).
4. Brominal DS tended to be better than Certrol DS, paraquat with Bimate tended to be worse than other Bimate mixtures, and paraquat with Dopax or Dual + ametryne tended to be worse than Dopax and Dual + ametryne alone.
5. Most treatments in clay yielded better than control (n.s.). Cane in some trays had been noticeably greener than in unsprayed control trays.
6. Paraquat treatments and the Brominal DS treatment appeared to stimulate tillering.

7. Conclusions

1. Velpar L is no different from Velpar 90 soluble powder.
2. Diuron 75 SC is no different from diuron 80 WP.
3. Tronic and Reverseal 9 showed no difference as additives to Bladex Plus.
4. Agral 90 surfactant and Reverseal 9 showed no difference as additives to Bimate.
5. Dopax tended to affect cane slightly less than Dual + ametryne in sandy soil (n.s.) but no difference occurred in clay soil. The addition of paraquat to each of these caused no difference in sandy soil but tended to reduce yields in clay soil (n.s.). There was no difference between the two combinations however.
6. Brominal DS did not affect cane growth and was no different from Certrol DS in sand but tended to be slightly better in clay soil (n.s.).
7. Ametryne + Velpar showed less effects on cane than diuron + Velpar at equivalent rates in both soil types.
8. In general treatments affected cane growth to a greater or lesser extent in sand and clay but differences between formulations of the same herbicide or treatments including the same herbicide and different additives were minimal in comparison.

PETT/HDN
18 May 1981