

**SOUTH AFRICAN SUGAR INDUSTRY  
AGRONOMISTS' ASSOCIATION**

Code : HW215  
Cat. No: 1345

**Title: PHYTOTOXICITY OF HERBICIDES AT THREE GROWTH STAGES**

**1. Particulars of the project:**

<p><b>This crop</b> : Plant cane</p> <p><b>Site</b> : Shakaskraal F Stn</p> <p><b>Region</b> : N Coast Coastal</p> <p><b>Soil system</b> : Umzinto/C lowlands</p> <p><b>Soil set/series</b> : Longlands/Waldene</p> <p><b>Design</b> : Random blocks + split plots</p> <p><b>Variety</b> : NCo 376</p> <p><b>Fertilizer</b> :    <b>N</b>    <b>P</b>    <b>K</b></p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%;">In furrow</td> <td style="width: 10%; text-align: center;">15</td> <td style="width: 10%; text-align: center;">49</td> <td style="width: 10%; text-align: center;">125</td> </tr> <tr> <td>Topdressing</td> <td style="text-align: center;">75</td> <td style="text-align: center;">-</td> <td style="text-align: center;">125</td> </tr> <tr> <td style="text-align: right;">Total</td> <td style="border-top: 1px solid black; text-align: center;">90</td> <td style="border-top: 1px solid black; text-align: center;">49</td> <td style="border-top: 1px solid black; text-align: center;">250</td> </tr> </table> <p><b>Date sprayed</b> : 24.1.82</p>	In furrow	15	49	125	Topdressing	75	-	125	Total	90	49	250	<p><b>Soil analysis:</b>    Date: 15.6.81</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 10%;"><b>pH</b></td> <td style="width: 10%;"><b>OM%</b></td> <td style="width: 10%;"><b>CEC</b></td> <td style="width: 10%;"><b>CLAY%</b></td> <td style="width: 10%;"><b>SILT%</b></td> <td colspan="3" style="text-align: center;"><b>SAND %</b></td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td style="text-align: center;">Fine</td> <td style="text-align: center;">Med</td> <td style="text-align: center;">Coarse</td> </tr> <tr> <td>5,9</td> <td>1,65</td> <td>8,1</td> <td>13</td> <td>11</td> <td style="text-align: center;">60</td> <td style="text-align: center;">13</td> <td style="text-align: center;">3</td> </tr> </table> <p style="text-align: center;">ppm</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 25%;"></td> <td style="width: 10%; text-align: center;">P</td> <td style="width: 10%; text-align: center;">K</td> <td style="width: 10%; text-align: center;">Ca</td> <td style="width: 10%; text-align: center;">Mg</td> </tr> <tr> <td></td> <td style="text-align: center;">23</td> <td style="text-align: center;">34</td> <td style="text-align: center;">416</td> <td style="text-align: center;">98</td> </tr> </table> <p><b>Age</b> : 18,0 months</p> <p><b>Dates</b> : 16.11.81-2.6.83</p> <p><b>Rainfall</b> : 1 519 mm    <b>LTM:</b> 1 556 mm</p> <p><b>Irrigation:</b> 356 mm</p> <p><b>Total</b> : 1 875 mm</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%;"><b>Planting date</b></td> <td style="width: 30%;"><b>Total moisture</b></td> <td style="width: 40%;"><b>LTM Rainfall</b></td> </tr> <tr> <td>16.11.81</td> <td style="text-align: center;">1 519</td> <td style="text-align: center;">1 556</td> </tr> <tr> <td>30.11.81</td> <td style="text-align: center;">1 387</td> <td style="text-align: center;">1 506</td> </tr> <tr> <td>14.12.81</td> <td style="text-align: center;">1 373</td> <td style="text-align: center;">1 456</td> </tr> </table>	<b>pH</b>	<b>OM%</b>	<b>CEC</b>	<b>CLAY%</b>	<b>SILT%</b>	<b>SAND %</b>								Fine	Med	Coarse	5,9	1,65	8,1	13	11	60	13	3		P	K	Ca	Mg		23	34	416	98	<b>Planting date</b>	<b>Total moisture</b>	<b>LTM Rainfall</b>	16.11.81	1 519	1 556	30.11.81	1 387	1 506	14.12.81	1 373	1 456
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**2. Objectives:**

To test a range of herbicide combinations for their phytotoxic effects on plant cane at three different stages of growth.

**3. Treatments:**

**Sub-Plot**

Chemicals	Rate in kg or ai or ae/ha
1. Control	-
2. Diuron + 2,4-D + S	4,0 + 2,88
3. Dual + ametryne + paraquat	4,0 + 2,0 + 0,4
4. Velpar	1,35

**Whole plot**

Cane growth stages	Stalk length (cm)	Stalk No. (1000/ha)	Leaf height (cm)	Leaf No.*
A	11,0	62	38	3-5
B	14,0	104	50	5-6
C	18,0	110	68	7-8

\* Number of unfurled leaves per shoot

**4. Experimental:**

NCo 376 cane was planted on three different dates at two week intervals.

41 days after the third planting date, treatments were applied to all plots. Application details follow:

Applicator : CP<sub>3</sub> knapsack sprayer  
 Nozzle : TK5 Spraying Systems floodjet  
 Output : 294 l/ha

**Conditions:**

General : Overcast and humid with a light to moderate breeze. Dew on cane foliage during application of treatments to first replication only.

Temperature °C 8 am : 23,0  
 2 pm : 28,3  
 Rel. humidity % 8 am : 76  
 2 pm : 74  
 Sunshine hours : 10,9  
 Rainfall (mm):  
 On the day of spray : 0  
 Days to first rain : 1  
 Amount of first rain : 3,4  
 Within 2 weeks of spray: 7,6

**5. Results:**

**Table 1: Leaf scorch and stunting ratings taken 2 weeks after spraying**  
 Leaf scorch 1-9 scale: 1= no effect 9= 100% scorch (log scale based on EWRC). Stunting 1-5 scale: 1= very poor 5= very good growth (linear scale)

Treatments	Cane growth stages					
	A		B		C	
	Leaf scorch	Stunt- ing	Leaf scorch	Stunt- ing	Leaf scorch	Stunt- ing
Control (unsprayed)	1	5	1	5	1	5
Diuron + 2,4-D + S	2,1	3,8	2,3	3	2	4,3
Dual + ametryne + paraquat	3,5	3,8	4,8	2,9	6,3	3,4
Velpar	4,5	3,4	4,3	3,3	5,5	4,3

### Comments

Obvious symptoms of leaf scorch were apparent from all treatments soon after spraying. Dual + ametryne + paraquat was worst on older cane whilst Velpar was worst on the youngest cane. Both these treatments were considerably worse than diuron + 2,4-D + S.

All visual symptoms disappeared in time.

Stunting was apparent from all treatments at all stages of cane growth but was most obvious on cane at the medium stage of growth.

**Table 2: Crop measurements taken 2 weeks and 3, 6 and 12 months after spraying**

Treatments		Crop measurements							
Growth stage (leaf height) (cm)	Chemicals	Stalk length (m)				Stalk popn(1000/ha)			
		2wks	3	6	12	2wks	3	6	12
A (38)	Control (unsprayed)	0,18	0,60	0,88	1,56	77	157	133	118
	Diuron + 2,4-D + S	0,17	0,57	0,88	1,54	77	167	136	121
	Dual+ametryne+paraquat	0,16	0,58	0,88	1,52	68	171	131	119
	Velpar	0,15	0,53	0,85	1,55	69	162	132	117
B (50)	Control (unsprayed)	0,24	0,70	1,00	1,65	91	162	137	124
	Diuron + 2,4-D + S	0,20	0,60	0,94	1,62	112	165	149	123
	Dual+ametryne+paraquat	0,17	0,56	0,92	1,62	87	175	139	129
	Velpar	0,19	0,64	0,97	1,65	96	160	149	120
C (68)	Control (unsprayed)	0,25	0,73	0,98	1,61	89	133	118	111
	Diuron + 2,4-D + S	0,24	0,75	0,98	1,61	133	155	155	123
	Dual+ametryne+paraquat	0,22	0,62	0,89	1,53	107	158	139	120
	Velpar	0,22	0,71	0,94	1,59	101	156	143	124

### Comments

#### • Stalk length

Stalk length reductions were caused by all treatments on all stages of growth but effects were most severe on medium stage cane. All evidence disappeared within six to twelve months after spraying except in the case of Dual + ametryne + paraquat on the oldest cane.

In all cases Velpar and Dual + ametryne + paraquat were worse than diuron + 2,4-D + S. Velpar was most severe on young cane while Dual + ametryne + paraquat was most severe on older cane.

#### • Stalk population

Populations were marginally reduced by Velpar and Dual + ametryne + paraquat on the youngest cane at an early stage. No differences were apparent after 6 months.

In medium sized cane diuron + 2,4-D + S stimulated tiller production at a very early age but this was no longer evident after 3 months.

In larger cane tiller production seemed to be stimulated by all treatments with diuron + 2,4-D + S having the greatest effect. These differences were still evident after 12 months.

**Table 3: Yield data and crop measurements at harvest**

Treatments			Yield			Measurements	
Growth stage	Chemicals	Rate in kg or l ai or ae/ha	Cane t/ha	Suc t/ha	Ers % cane	Stalk length (m)	Stalk popln (1000/ha)
A	Control (unsprayed)	-	95,9	13,8	13,07	2,04	127
	Diuron + 2,4-D + S	4,0 + 2,88	96,5	14,4	13,66	2,03	128
	Dual+ametryne+paraquat	4,0 + 2,0 + 0,4	95,0	14,0	13,57	1,97	130
	Velpar	1,35	91,3	13,5	13,55	2,06	124
B	Control (unsprayed)	-	98,1	14,3	13,31	2,05	129
	Diuron + 2,4-D + S	4,0 + 2,88	99,2	14,4	13,35	2,07	131
	Dual+ametryne+paraquat	4,0 + 2,0 + 0,4	102,8	15,2	13,59	2,04	133
	Velpar	1,35	95,1	13,9	13,33	2,06	129
C	Control (unsprayed)	-	87,9	12,9	13,47	2,01	128
	Diuron + 2,4-D + S	4,0 + 2,88	87,4	12,2	12,65	1,97	133
	Dual+ametryne+paraquat	4,0 + 2,0 + 0,4	83,0	12,1	13,30	1,94	126
	Velpar	1,35	86,7	12,7	13,34	1,96	131
CV %			9,3	9,7	2,0	-	4,6
LSD(0,05) sub-plots in same			12,69	1,916	0,967	-	8,634
LSD(0,01) whole plots			17,16	2,591	1,308	-	11,7

#### Comments

There is no statistical evidence of any differences in yield between treatments at any growth stage.

Differences between growth stages or cane age were, however, statistically significant.

A 94,7 tons cane/ha

B 98,8

C 86,3

LSD at P = 0,05 = 7,169

Elongation rate of stalks was slower in earlier planted cane than later planted cane. Rainfall and irrigation applied or received within two weeks of each planting date were:

A planted 14 Dec 1981 - 59 mm (yield = 95 t cane/ha)

B planted 30 Nov 1981 - 15 mm (yield = 99 t cane/ha)

C planted 16 Nov 1981 - 111 mm (yield = 86 t cane/ha)

It is possible that the excessive rainfall after 16 November planting on these shallow poorly drained soils affected growth adversely.