

Introduction

Because of wide spread glyphosate resistance, the use of contact herbicides for weed control has become more common place. Contact herbicides generally provide greater efficacy when paired with nozzles producing a smaller droplet size spectrum. This is due to the smaller droplet size distribution providing greater leaf coverage. To try to improve coverage, the use of twin fan nozzles has been broadly recommended. The objective of the study was to evaluate the efficacy of six twin-fan nozzles using three contact herbicides applied to five different plant species. Two commercial standard flat fan nozzles were used as a reference.

Materials and Methods

- A study was conducted to evaluate eight nozzles and three herbicides when applied to flax, oat, velvetleaf, common lambsquarters, and kochia. Nozzles used were the TJ60-11003, TTJ60-11003, AI3070-11003, GAT11003, TADF11003, AITTJ60-11003, XR11003, and the AIXR11003, herbicides used were carfentrazone-ethyl at 88 g a.i. ha⁻¹ with 0.25%v v⁻¹ NIS, glufosinate at 0.98 kg a.i. ha⁻¹ with 0.25%v v⁻¹ NIS and lactofen at 0.11 kg a.i. ha⁻¹ with 0.25% v v⁻¹ NIS.
- Applications were made to plants 10 to 15 cm tall. A height of 45 cm above the canopy in a spray chamber was used. The nozzles were flow rated to deliver the same amount of solution (approximate pressure was 220 kPa).
- Injury ratings were taken at 7, 14, 21, 28 d after treatment.
- After 28 d, plants were clipped at the soil surface. Plants were placed into a dryer and dry weights were recorded 7d after drying.
- The droplet spectrum for each nozzle by herbicide combination was measured in a wind tunnel, using a laser diffraction device.

Table 1. Injury ratings and dry weight of flax.

Nozzle	Carfentrazone-ethyl			Lactofen			Glufosinate		
	DAT7	DAT28	Dry matter	DAT7	DAT28	Dry matter	DAT7	DAT28	Dry matter
			reduction			reduction			reduction
			-----%-----			-----%-----			-----%-----
AI3070	33 AB	37	26	80	87 AB	89	30	20	32
AITTJ60	30 AB	36	20	84	95 AB	91	17	16	26
AIXR11003	10 C	28	29	75	74 B	74	17	30	33
GAT110-03	36 AB	44	17	77	83 AB	83	30	31	22
TADF	31 AB	35	18	79	79 AB	84	23	26	14
TJ60	43 A	45	42	90	99 A	99	28	33	20
TTJ60	43 A	45	43	87	90 AB	85	22	27	20
XR11003	23 BC	40	35	81	81 AB	73	13	23	44

Table 4. Injury ratings and dry weights of oat.

Nozzle	Carfentrazone-ethyl			Lactofen			Glufosinate			
	DAT7	DAT28	Dry matter	DAT7	DAT28	Dry matter	DAT7	DAT28	Dry matter	
			reduction			reduction			reduction	
			-----%-----			-----%-----			-----%-----	
AI3070	6	18	5	29	A	25	15	7	25	14
AITTJ60	5	24	11	26	AB	21	20	5	25	16
AIXR11003	4	21	9	18	B	20	10	5	27	21
GAT110-03	3	18	13	23	AB	27	22	9	31	22
TADF	5	22	7	21	AB	26	22	7	29	25
TJ60	6	20	3	29	A	22	17	6	30	19
TTJ60	6	24	8	24	AB	23	15	5	29	22
XR11003	5	24	15	19	B	18	9	4	26	18

Table 2. Injury ratings and dry weight for kochia.

Nozzle	Carfentrazone-ethyl			Lactofen			Glufosinate		
	DAT7	DAT28	Dry matter	DAT7	DAT28	Dry matter	DAT7	DAT28	Dry matter
			reduction			reduction			reduction
			-----%-----			-----%-----			-----%-----
AI3070	66 AB	58	64	80	76	82	8	23	-5
AITTJ60	70 A	52	53	76	60	67	11	22	10
AIXR11003	43 B	40	33	79	63	78	8	27	29
GAT110-03	68 A	54	55	85	69	81	13	17	-4
TADF	53 AB	39	30	74	63	66	11	36	33
TJ60	65 AB	62	64	79	66	82	8	19	12
TTJ60	61 AB	63	70	70	63	68	14	40	34
XR11003	59 AB	48	46	85	70	81	3	15	7

Table 5. Injury ratings and dry weight of velvetleaf.

Nozzle	Carfentrazone-ethyl			Lactofen			Glufosinate		
	DAT7	DAT28	Dry matter	DAT7	DAT28	Dry matter	DAT7	DAT28	Dry matter
			reduction			reduction			reduction
			-----%-----			-----%-----			-----%-----
AI3070	99	99	98	87	62 D	50 B	20	29	11
AITTJ60	97	99	97	88	70 CD	62 AB	22	26	14
AIXR11003	97	92	88	89	63 CD	47 B	13	25	12
GAT110-03	99	100	99	93	83 ABC	76 AB	27	27	1
TADF	85	97	90	90	79 A-D	67 AB	19	23	10
TJ60	98	100	100	93	96 A	92 A	18	22	0
TTJ60	93	97	93	92	91 AB	86 A	18	29	-9
XR11003	93	93	88	86	74 BCD	66 AB	22	26	-2

Table 3. Injury ratings and dry weight of common lambsquarters.

Nozzle	Carfentrazone-ethyl			Lactofen			Glufosinate		
	DAT7	DAT28	Dry matter	DAT7	DAT28	Dry matter	DAT7	DAT28	Dry matter
			reduction			reduction			reduction
			-----%-----			-----%-----			-----%-----
AI3070	73	60	75	40	30	34	19	17	24
AITTJ60	73	63	70	47	27	30	16	16	25
AIXR11003	67	54	62	44	27	36	13	22	32
GAT110-03	76	61	74	38	37	42	25	26	35
TADF	73	60	67	35	29	37	21	33	30
TJ60	77	67	74	56	39	41	9	17	26
TTJ60	73	68	70	51	35	55	8	21	28
XR11003	71	55	66	48	36	52	10	20	33



Figure 1. Control of oats with lactofen (0.11 kg a.i. ha⁻¹) using single fan and twin fan nozzles.



Figure 2. Control of common lambsquarters with carfentrazone-ethyl (88 g a.i. ha⁻¹) using single fan and twin fan nozzles.

Results and Conclusions

Nozzle	Water	Carfentrazone-ethyl	Lactofen	Glufosinate
AI3070-11003	XC	VC	VC	C
AITTJ60-11003	XC	XC	C	XC
AIXR11003	XC	VC	VC	VC
GAT11003	VC	VC	VC	C
TADF11003	VC	VC	VC	VC
TJ60-11003	F	F	F	F
TTJ60-11003	C	C	M	C
XR11003	F	F	M	F

- Twin nozzles did not increase or decrease control with glufosinate.
- Twin nozzles were generally more effective than single fan nozzles for control of oats with lactofen.
- Nozzle type did not influence control of common lambsquarters.
- Further research is needed to understand the complexity of nozzle selection for different chemicals.

