HERBICIDE TOLERANCE OF SALTLAND PASTURES

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AIM

To find herbicide options that may be safe to use in saltland pasture systems wherein a farmer can maintain the productive capacity of his saltland by controlling his weeds. Trials also aim to explore weed control options during saltbush germination.

BACKGROUND

One of the major constraints to the widespread adoption of saltbush-based saltland pastures has been the lack of cheap and reliable methods for establishing the plants by seed. Seeding methods have not been revisited until only recently since the 'niche seeder' was developed in the 1970's. By removing bracteoles and priming the seed in water or dilute solutions of plant growth regulators (gibberellic acid, kinetin and salicylic acid), improved saltbush establishment has been demonstrated.

However, the saltbush seed is only small and contains little stored energy, resulting in poor seedling vigor when germinating. Weed competition became a major limitation for the success of the 'niche' seeding technology. Weeds can exacerbate moisture deficiencies, which in an already osmotically challenging (saline) environment, this becomes a more imperative issue.

The lack of agronomic knowledge that allows a farmer to 'farm' his saltland along with his other land types could be limiting whole farm productivity. There are a range of weeds that a farmer may like to control in his saltland. Slender iceplant appears to be one of the most obvious in the Northern Agricultural Region, given it may contribute to poor pasture establishment and some stock poisoning.

If iceplant was to be controlled, it is suspected that some mild saltland could be returned to production or existing saltland production could be improved. Herbicide options exist to control slender iceplant in cereal, lupin and canola crops. However these herbicides do not cater for pasture situations, nor do we know if they are safe to use over saltbush and bluebush.

To improve the establishment and maintain profitable saltland pastures, a range of agronomic tools must be developed.

The purpose of this herbicide tolerance work is three fold, and includes;
a) Developing weed control regimes suitable for establishing bluebush and saltbush by seed.
b) Developing weed control regimes suitable for establishing bluebush and saltbush by seedlings.
c) Developing weed management options for established saltland pasture systems.

TRIAL 1: PRE-EMERGENT HERBICIDE TOLERANCE OF GERMINATING OLDMAN, RIVER SALTBUSH & BLUEBUSH

Site	Site 1	Site 2
Property	Ian Tubby, Gutha	UWA, Greenhouse
Plot size & replication	3m x 6m x 3 reps	13 treatment pots x 4 reps
Soil type	Red-brown loamy earths, over laterite, over granite	Gingin red sand (5% clay)
Oldman (*Atriplex nummularia*) Seed Treatment	Not treated	Bracteoles removed
River (*Atriplex amnicola*) Seed Treatment	Not treated	Bracteoles removed & gibberelic acid
Bluebush (*Maireana brevifolia*) Seed Treatment	Not treated	Bracteoles removed & gibberelic acid (no results)
Spraying & Sowing Date	3/7/07	8/8/07
Paddock Rotation	2006 = Oats	-
Growing Season Rainfall	95mm	-

RESULTS: SITE 1, IAN TUBBY – GUTHA

Table 1: Summary of herbicide effects on germinating oldman saltbush, river saltbush and bluebush, as a percentage of the number of plants germinating in the control plots. Herbicides were ranked in order of least damaging to most damaging.

Group	Herbicide Treatments	Germination							Cost ($/Ha) GST exc.
		Bluebush	Rank 1	Old Man Saltbush (%)	Rank 2	River Saltbush (%)	Rank 3	Rank 1+2+3	
D	2L Pendimethalin (330 g/L) *	77%	1	76	1	84	1	3	13.00
D	1L Trifluralin (480 g/L) *	72%	2	73	2	82	2	4	5.94
J	1kg 2,2-DPA (740 g/kg) *	66%	3	56	4	48	4	11	11.48
D	2L Trifluralin (480 g/L) *	35%	7	51	5	52	3	15	11.88
D	1L Pendimethalin (330 g/L) *	42%	6	40	6	37	5	17	6.50
C	2L Simazine (500 g/L)	34%	8	68	3	29	6	17	11.54
K	500ml S-Metolachlor (960 g/L)	61%	4	36	7	19	7	18	13.47
J	2kg 2,2-DPA (740 g/kg) *	55%	5	15	9	18	8	22	22.96
K	750ml Propyzamide (500 g/L)	15%	9	18	8	16	9	26	33.00
K	1500ml Propyzamide (500 g/L)	4%	10	7	10	5	10	30	66.00
B	25g Flumetsulam (800 g/kg)	3%	11	7	10	0	11	32	16.80
C	15g Chlorsulfuron (750 g/kg)	0%	12	0	12	0	11	35	1.05

* Herbicide treatments incorporated by sowing (IBS)

RESULTS: SITE 2, POT TRIAL – UWA GREENHOUSE

Table 2: Summary of herbicide effects on germinating oldman and river saltbush germination as a percentage of the number of plants germinating in the control pots. Herbicides were ranked in order of least damaging to most damaging.

Group	Herbicide Treatments	Germination					
		Oldman saltbush (%)	Rank 1	River saltbush (%)	Rank 2	Ranks 1 + 2	Cost ($/Ha) GST exc.
J	2,2 DPA (2 kg/ha) (Propon®)	100	1	34	2	3	22.96
J	Oxyfluorfen (250 ml/ha) (Goal®)	56	2	36	1	3	8.25
D	Trifluralin (1L/ha)*	47	4	25	4	8	5.94
D	Oryzalin (2 L/ha) (Surflan®)*	41	6	33	3	9	162.8
D	Oryzalin (1 L/ha) (Surflan®)*	47	3	17	7	10	81.40
J	2,2 DPA (4 kg/ha) (Propon®)	43	5	19	6	11	45.92
G	Oxyfluorfen (500 ml/ha) (Goal®)	31	8	20	5	13	16.50
D	Trifluralin (2 L/ha)*	36	7	9	8	15	11.88
B	Flumetsulam (25 g/ha) (Broadstrike®)	9	10	8	9	19	16.80
D	Pendimethalin (1L/ha) (Stomp®)*	9	9	0	11	20	6.50
K	S-Metolachlor (1L/ha) (Dual Gold®)*	0	11	3	10	21	13.47
K	Propyzamide (1.5 kg/ha) (Kerb®)*	0	11	0	11	22	66.00
D	Pendimethalin (2 L/ha) (Stomp®)*	0	11	0	11	22	13.00

* Herbicide treatments incorporated by sowing (IBS)

TRIAL 2: POST-EMERGENT HERBICIDE TOLERANCE OF SMALL-LEAVED BLUEBUSH (*MAIREANA BREVIFOLIA*)

Property	Ian Tubby, Gutha
Plot size & replication	3m x 40m x 3 reps
Soil type	Red loamy earths over red-brown alluvium hardpan
Spraying Date	28/8/07
Paddock Rotation	Mature bluebush for more than 20yrs
Growing Season Rainfall	95mm

RESULTS

Table 3: Herbicide damage of mature bluebush, as a percentage of biomass reduction, compared to the control plot, visually rated on 19th October 2007.

Grp.	Herbicide Treatments	Common Product Name (e.g.)	% Bluebush Damage	Cost ($/ha)
B	5g Metsulfuron-Methyl (600 g/Kg)	Ally®	3	0.55
B	15g Chlorsulfuron (750 g/Kg)	Glean®	8	1.05
B	25g Triasulfuron (750 g/Kg)	Logran®	8	2.75
B	7g Metosulam (750 g/Kg)	Eclipse®	5	8.33
B	25g Flumetsulam (800 g/Kg)	Broadstrike®	0	16.80
C	1L Atrazine (500 g/L)	Atrazine	70	5.88
C	2L Simazine (500 g/L)	Simazine	36	11.54
C	800ml Terbutryn (500 g/L)	Igran®	60	17.60
C	1L Diuron (500 g/L)	Diuron	95	8.66
D	2L Pendimethalin (330 g/L)	Stomp®	15	13.00
F	250ml Diflufenican (500 g/L)	Brodal®	5	18.00
G	500ml Oxyfluorfen (240 g/L)	Goal®	8	16.50
I	800ml 2,4-D amine (625 g/L)	Amicide®	100	4.67
I	320ml Dicamba (500 g/L)	Kamba®	98	11.54
I	300ml Clopyralid (330 g/L)	Lontrel®	5	16.50

COMMENTS

a) Developing weed control regimes suitable for establishing bluebush and saltbush by <u>seed.</u>

Table 1 and 2 indicate varying trial results between the glasshouse pots and the field situation. Herbicides appeared generally more damaging in the pots compared to similar treatments used in the field. This may be due to low soil clay and organic matter content in the pots and possibly also reduced herbicide activation in the drought affected field.

Overall trial results indicate that Goal®, trifluralin and 2,2-DPA, could possibly be used when germinating oldman and river saltbush. These could be useful for controlling grasses and Goal® would also be useful for controlling slender iceplant. There is reasonable likelihood of developing and registering, pre-emergent grass controlling herbicides in germinating saltbush. Table 1 and 2 has indicated a possible fit for Goal®, trifluralin and 2,2-DPA.

Stomp® at 2 L/ha ranked highest in the field trial and could be useful for controlling ryegrass and slender iceplant, while germinating saltbush. Pot trials indicated that Stomp® at 2 L/ha was actually damaging. Data in Table 1 and 2 represent only one trial, thus none of the herbicides mentioned are recommended, nor are any herbicides registered for this use.

However, the likelihood of finding a single broadleaf, pre-emergent herbicide is slim in this situation. Simazine, Kerb®, Broadstrike® and Glean® were damaging to germinating saltbushes. Common pre-emergent, broadleaf herbicides, are known to be generally damaging to most broadleaf plants, and even in the crops that they are registered. Tolerances to these herbicides is generally a factor of high seed starch reserves, strategic seed placement or escape mechanisms (tap roots). Saltbush seeds are small and must be sown near the surface.

Common annual grasses and agricultural broadleafs (ryegrass, capeweed, medic and double gee) would not be expected to germinate after mid July (assuming an average break). Standard farmer practice of "pasture topping" the paddock at or before flowering in the previous year, followed by one or more knock down applications around the seasons break, remain the best practice.

b) Developing weed control regimes suitable for establishing bluebush and saltbush by <u>seedlings.</u>

Dry seasonal conditions, prevented trials from going ahead on young halophyte seedlings. The results presented in Table 3 are from herbicide treatments over well established, mature bluebush.

Results from Table 3 could indicate that a wide range of broadleaf herbicide options may be used for the planted halophyte seedlings. Stomp® at 2 L/ha would appear promising as a grass and slender iceplant control, as would Goal® up to 500 mL/ha. Broadstrike® at 25 g/ha also appeared to be well tolerated by mature bluebush, however further work is required here.

c) Developing weed management options for established saltland pasture systems.

As mentioned above, a wide range of herbicide options may exist for safe use on mature halophyte forage shrubs. From only one trial, Table 3 results would indicate Ally®, Glean®, Logran® may be safe to use on mature bluebush, which would be useful in controlling slender iceplant. However caution should be taken as SU products are known "root pruners", are damaging to other saltland species and are not registered for this use.

Brodal® and Broadstrike® would also be useful in controlling slender iceplant in bluebush, but best control is achieved if they are used before iceplant emergence. Broadstrike® is perhaps the most exciting herbicide option as it appears to also reduce roly poly (*Salsola spp.*) pre-emergent. Broadstrike® is registered for post-emergent control of a range of broad leaved weeds including doublegee.

The commonly used broadleaf herbicides such as dicamba, 2,4-D amine, atrazine, diuron and Igran®, cause severe damage to well established, mature bluebush. This may also be the case for oldman and river saltbush, thus would not be useful in the management of weeds in saltland pasture systems. Further work is required here to find suitable options for herbicide registrations.

CONCLUSIONS

- Standard farmer practice of 'pasture topping' in the previous year, followed by a knock down around the seasons break, remain the best practice before sowing saltbush or bluebush by seed.
- Trifluralin, Stomp®, Goal® and 2,2-DPA may be the best options for weed control while sowing saltbush and bluebush by seed. More work is required here, especially in the field.
- Post-emergent herbicide tolerance of oldman and river saltbush remains unknown.
- Dicamba, 2,4-D amine, atrazine, diuron and Igran® cause severe damage to mature bluebush. More work is required here to determine the tolerance of other saltland species.
- Stomp®, Goal® and Broadstrike® may be the most useful when controlling slender iceplant in the inter-rows of established saltbush systems, allowing for legume pastures to regenerate or be sown.
- There are no herbicides currently registered for weed control in bluebush or saltbush. Further trial work is required to obtain herbicide registrations.

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