RATES OF TERBUTHYLAZINE AND ITS MIXTURES WITH TERBUMETON FOR WEED CONTROL IN POPLAR AND WILLOW NURSERIES

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The use of a 1:1 terbuthylazine:terbumeton mixture (Caragard 25+25% WP) for weed control in poplar and willow nurseries was tested by Gilchrist (1979). Height and survival of a hybrid black poplar (*Populus x canadensis* syn. *P. x euramericana* 'Flevo') were not significantly affected by application rates between 0.5+0.5 and 6+6 kg/ha but only the 0.5+0.5 kg/ha rate was satisfactory with white poplar (*P. alba* 'BO2'), which was damaged by rates of 3+3 kg/ha and above. Hybrid tree willow (*Salix matsudana x alba* 'Aokautere' = 'NZ1002') and purple osier (*S. purpurea* 'Irette') were intermediate between the two poplars. It was not known whether the depression was caused by the terbuthylazine, the terbumeton, or both.

In France a 2:1 terbuthylazine:terbumeton mixture (Caragard Combi 33.4+16.6%) at 1.0+0.5 kg/ha is recommended for weed control at planting of poplar cuttings in soils high in clay and organic matter (Bonduelle 1985). These rates are much lower than those recommended for forestry in New Zealand. The introduction of terbuthylazine alone (Gardoprim 50% Sn) to the New Zealand market prompted this study to ascertain the optimum rates of terbuthylazine and terbumeton to balance effective weed control and herbicide tolerance in young broadleaved trees used for soil conservation and shelter.

The trial was planted on 22-23.8.89 on Manawatu sandy loam at Aokautere. Two poplar clones: a hybrid black poplar (*P. deltoides x nigra* (= *x canadensis*) 'Veronese') and a newly bred hybrid black x balsam poplar (*P. x canadensis x yunnanensis* 'NZ5007') and two willow clones: a hybrid tree willow (*S. matsudana x alba* 'Tangoio') and a shrub willow ('Irette' purple osier) were planted as 30-cm cuttings 40 cm apart within double rows 1 m apart.

The 2:1 terbuthylazine/terbumeton mixture was made up by adding one part of terbuthylazine to two parts of the 1:1 mixture. On 18.9.89 this mixture and its component formulations were applied in 2.8-m-wide plots across the rows using an "Algen" precision sprayer. The herbicides formed main plots 11.2 m wide separated from other main plots by unweeded 2.8-m-wide control plots. Thus the design was a strip-split plot with four replicates, rates being the subplot treatments within herbicide main plots crossed by 2-m-wide clonal strips. All treatments except the untreated controls were randomised within each main plot. Rates were chosen to facilitate comparisons using both common total ai. rates and common rates of terbuthylazine.

Damage was assessed on 20 October, 32 days after spraying, using the scale of Shaw and Swanson (1952) (0 = none; 10 = total). The total above-ground tree or shrub biomass per plot was weighed fresh following leaf fall at the end of the growing season. Data from the untreated controls were omitted from the analysis of variance but those from adjacent controls were used as responses to the zero rate of herbicides in regression analyses.

Weed control was good (8+) with all herbicides at all rates, and very good (9-10) at the higher rates, although summer grass (*Digitaria sanguinalis*) and Californian thistle (*Cirsium arvense*) were not well controlled.

Damage to clones was rated as moderate (3-5) to Irette and slight (up to 3) to the other three clones on average. NZ5007 was significantly less affected than the

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others. Injury was significantly greater as the application rate increased but was nowhere rated above 5. (Subsequent mortality suggests the rating may have been somewhat lenient - 5 is the lowest rating with "recovery doubtful"). At equivalent rates of total a.i., terbuthylazine alone was significantly more damaging than the mixtures. There were no significant interactions for damage.

TABLE 1: Means of poplar and willow biomass measurements (kg/4.8-m² plot)

Herbicide	Terbuthylazine (kg ai/ha)	Irette	Tangoio	Veronese	NZ5007	Mean
1:1	0	0.06	0.51	1.27	1.60	0.86
	1	1.18	4.41	5.88	11.20	5.67
	2	0.52	3.94	4.59	8.20	4.31
	3	0.14	2.21	4.13	7.56	3.51
	4	0.11	1.48	2.44	7.32	2.84
2:1	0	0.07	0.58	1.20	1.34	0.85
	12	0.98	3.12	5.88	8.60	4.64
	2	0.85	3.18	5.38	7.68	4.27
	3	0.61	1.98	3.48	8.94	3.75
	4	0.17	0.83	2.09	6.90	2.50
terbuthylazine alone	0	0.05	0.61	1.34	1.76	0.87
	2	0.62	2.34	4.32	6.38	3.41
	4	0.14	1.09	3.03	4.90	2.29
	6	0.02	0.90	0.95	5.17	1.76
	8	0.01	1.15	2.02	4.15	1.83
SEM		0.154	0.385	0.631	0.800	

In nearly every case the lowest rate of application gave the highest biomass yield (Table 1). Though the main effects of rate and clone resulted in highly significant differences in biomass yield, there was also a significant clone x rate interaction, i.e. the effect of increasing rates depended on the clone. Empirical response curves for Tangoio, Veronese, and NZ5007, which responded significantly to rate of the 1:1 mixture, were derived and these were differentiated to interpolate the rate at which maximum biomass could be expected. Growth of Irette purple osier was severely retarded by all rates and formulations. NZ5007 was the most tolerant of higher rates.

There were significant differences between herbicides in biomass yield. Overall the 1:1 mixture of terbuthylazine and terbumeton was superior to terbuthylazine alone at equivalent total ai. rates but not significantly so to the 2:1 mixture at equal rates of terbuthylazine. The 2:1 mixture was significantly better than terbuthylazine alone, possibly because, at the rates compared, it contained 25% less total ai. As with the damage assessment, terbuthylazine alone compared poorly with the 1:1 mixture when total ai. rates were equivalent but not when biomass from equal terbuthylazine rates were compared.

Predicted optimum rates for the 1:1 mixture were 1.3 kg terbuthylazine/ha for Tangoio and Veronese and 1.5 kg/ha for NZ5007. Lower rates of the 2:1 mixture could be just as effective but the saving is probably not worth the trouble of making up a mixture. Damage appears to be a function of the rate of terbuthylazine - not total ai., and therefore the rates of terbuthylazine on its own could be halved, i.e. as above for the 1:1 mixture. It was unfortunate that terbuthylazine alone was not tested at rates lower than 2.0 kg/ha in this trial.

In conclusion, terbuthylazine provided good weed control at rates between 1.0 and 1.5 kg/ha. Rates above 1.5 kg/ha were not well tolerated by representative clones of Salicaceae but there was some variation between clones in their responses. In mixtures with terbuthylazine, terbumeton caused little, if any, additional injury. Using

the main effects of rate from the data, the fitted cubic curve predicts an optimum rate of 1.4 kg terbuthylazine/ha.

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REFERENCES

- Bonduelle, P., 1985. Déherbage chimique a l'installation et entretien de boutures de peu pliers. *Afocel-Armef Informations-Forêt 3 (fasc. 273)*: 233-259.
- Gilchrist, A.N., 1979. Herbicides for soil conservation nurseries. *Proc. 32nd N.Z. Weed and Pest Control Conf.*: 284-288.
- Shaw, W.C. and Swanson, C.R., 1952. Techniques and equipment used in evaluating chemicals for their herbicidal properties. *Weeds 1*: 352-365.