EFFECT OF NITROGEN AND BORON ON WEED CONTROL IN BRASSICAS

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There are very few options for controlling weeds in fodder brassicas if farmers have not prepared the seed bed with the pre-plant soil-incorporated herbicide trifluralin. Post emergence herbicides commercially available for control of broad-leaved weeds are limited to dicamba, and clopyralid (O'Connor 1993), but label claims warn that these compounds may damage the brassica crop and only provide suppression of more mature weeds.

Because brassicas have large horizontal leaves, there is a potential for foliar applied fertilisers to be absorbed to stimulate the growth of the crop, more so than that of the weeds, which in turn could suppress the effect of weed competition. Brassicas respond to nitrogen (N) (Ministry of Agriculture and Fisheries and Food, 1988), and can tolerate doses of boron (B) more than most other plants (Umesh *et al.* 1985), probably including some broadleaf weed species. The competitive effects of grass weeds could also be weakened as toxicity in grasses is reported to occur at lower B concentrations than in other plants (Sherrell 1983; Oram 1959; Jones 1972). Therefore, N and B were evaluated for their effect on weed suppression.

A bioassay using individually potted 5-leaved swedes cv. Doon Major was conducted to ascertain the combination of N and B which give the fastest growth. Five replicates of 16 treatments; all combinations of a 1:1 solution of ammonium nitrate (35% N) plus urea (46% N) at 0, 20, 40, 80 N kg/ha, and boric acid (21% B) at 0, 0.1, 0.2, 0.4 B kg/ha, were applied with or without 2 g/litre of a non-ionic organo-silicone co-polymer surfactant silwet-M (Pulse) to give a total of 32 treatments. Pulse was added to the formulation as it improves stomata infiltration of fertilisers (Stevens and Zabkiewicz 1990). The formulations were applied using a modified Oxford sprayer with T-jet 8002 nozzles at 175 kPa in 200 litres water/ha. Dry matter of individual plants was measured after the plants had been stored in the glasshouse at 18-22°C for 6 weeks after spraying. Herbage yields were 7.4, 8.6, 9.8 and 10.3 (SED_(df=124) = 0.33) g/plant with increasing rates of N, respectively. These were independent ($P > 0.05$) of the yields for increasing rates of B; 9.4, 9.4, 8.8 and 8.5 (SED_(df=124) = 0.33) g/plant, respectively.

Since the highest yield increase per unit N occurred with 40 kg N/ha (60 mg herbage/kg N) and the highest rate of B before a significant ($P < 0.05$) yield reduction was detected was 0.2 kg B/ha, the combination of 40 kg N/ha and 0.2 kg B/ha was selected for the field evaluation. Though no effect was observed from the surfactant in the bioassay, Pulse was included in the formulation in case B toxicity was enhanced in weeds under field conditions. The N/B formulation (pH = 6.6) consisted of 99.8 kg/ha commercial grade ammonium nitrate and urea (1:1) and borax, with Pulse at 2 ml/litre spray mix.

There were three treatments replicated six times, consisting of an untreated control, and a single application of the N/B formulation applied either on 24 December 1993 when brassicas had 2-3 leaves 10 cm long (early application), or on 7 January 1994 when the brassicas had 6-8 leaves (late application). Plots were 20 x 4 m. To assess the effect of the N/B formulation in the presence and absence of conventional herbicide weed control, the split-plot treatments of no herbicide, and 1.2 kg/ha trifluralin (Treflan EC) were applied to half of each main plot (10 x 4 m split plots) on cultivated soil 1 day prior to sowing. The soil was chain harrowed within 2 hours of spraying to incorporate the herbicide. A mix of the swede cultivars, Calder and Sensation, was sown on 15

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November 1993 into a flat seed bed at 0.50 kg/ha in 0.3 m row spacings using a Duncan grain seed drill. To control grass weeds, haloxyfop (Gallant 10EC) was applied at 500 g/ha to the trifluralin sub plots on 20 December 1993. Both the N/B formulation and the herbicides were applied in 200 litres water/ha using a sprayer at 175 kPa pressure with T-jet 8002 nozzles.

Shoot and root dry matter yields were estimated by multiplying the wet weights of swedes harvested from a 2 x 4 m quadrat by the portion of solids contained in a 500-700 g subsample which had been oven dried to a constant weight. Total weed dry matter was estimated in a similar manner after the swedes had been removed from the same sample area, but the area sampled ranged from 2-8 m² depending on the amount and uniformity of weed infestation.

There was no evidence of an effect from any application of the N/B solution on swedes or weeds, either in the presence or absence of the trifluralin plus haloxyfop herbicides (Table 1). Herbicide suppression of weeds, which included fathen (*Chenopodium album* agg.), couch (*Elytrigia repens*), oats (*Avena sativa*), fumitory (*Fumaria* sp.), polygonum (*Polygonum* sp.), black nightshade (*Solanum nigrum*), and mallow (*Malva* sp.), resulted in both higher top and bulb yields. This increase was apparently due to a combination of a higher number of bulbs and a greater individual bulb weight. No significant interactions ($P > 0.05$) were observed between the N/B formulation and herbicide.

TABLE 1: Effects of N and B, and herbicide treatment on swede and weed yield.

Treatment	Swedes				Weeds kg dm/ha
	Shoots kg dm/ha	Roots			
		No./ha (000)	g dm/bulb	kg dm/ha	
Main plot					
Untreated	3442	37.3	51.4	1944	3848
N and B early	3148	39.2	59.4	2277	3989
N and B late	3756	44.1	48.6	2295	4273
SED _(df= 10)	492.0	6.83	7.49	454.6	569.4
Split plot					
No herbicide	2986	34.1	46.4	1518	4832
Herbicide	3911	46.3	59.9	2827	3241
SED _(df= 15)	320.4	2.19	4.62	211.8	451.9

The lack of N/B response in swedes suggest the technique is not suitable as a form of weed control. However, retention of the nutrients applied within the water rate and surfactant concentration used may have been poor, causing run-off of the spray solution before the nutrients could be taken up by the swede leaves through the stomata (Stevens and Zabkiewicz 1990). In this case, the nitrogen would become bound up in the soil organic matter or be utilised by microbial activity in the decomposition of the dead matter. Using lower spray volumes of 50 litres/ha may improve spray retention. Under conditions in this trial, foliar applications of N and B formulation for the purpose of suppressing weeds by stimulating the growth of the brassicas canopy, does not appear promising.

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