

Accumulation of nitrate in silybum marianum

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Concentrations of nitrate toxic to grazing stock may accumulate in plants under high soil nitrogen level, low light intensity, low soil water availability and high temperatures or after application of phenoxyacetic herbicides (1). Variegated thistle (*Salybum marianum*) is one of several common plants in Tasmania capable of accumulating toxic levels of nitrate (1). No quantitative data is available on either the etiology of, or the effect of phenoxyacetic herbicides on, nitrate accumulation in *S. marianum*. The experiment reported is the first in a series designed to investigate these features of *S. marianum* biology.

Methods

S. marianum plants were grown individually in 20 cm diameter pots in 50/50 peat/sand mix (pH adjusted to 6.0) in a glasshouse from seed sown on 9.10.83. Plants were grown under either 100, 75, or 50% of full incident light for the whole trial period or under 100% light until 7 days prior to harvest when they were placed under 75 or 50%. Pots received 250 ml of Long Ashton solution (2) two times per week until 9.11.83 and four times per week thereafter. KyO_3 and $Ca(NO_3)_2$ were varied to provide nitrate levels of 9, 15 or 21 mequiv L. Top growth was harvested on 13.12.83, 8 weeks after emergence, dried at 80°C and analysed for NO_3^- (3). The experiment was a factorial with 3 replicates.

Results and Discussion

Table 1 Concentration of nitrate in *S. marianum* plants (ppm NO_3^- dry wt. basis)

Applied NO_3^- (mequiv L ⁻¹)	100% light	75% light		50% light	
		Whole trial	7 days	Whole trial	7 days
9	22581	54126	39279	96313	33032
15	51735	94555	76331	126286	85078
21	75866	115662	94131	130124	109584
LSD (P = 0.05) : 27264					

Plant NO_3^- level increased with increasing applied NO_3^- and in shade (Table 1). Plants under 50% light for the whole trial period had significantly higher NO_3^- levels than those under 75% light at the lower applied NO_3^- levels. Where light was reduced by 50% for 7 days prior to harvest, plant NO_3^- increased significantly in the 15 and 21 mequiv L⁻¹ applied NO_3^- treatments but a 25% light reduction for the same period had no significant effect.

A plant concentration of 9200 ppm NO_3^- on a dry weight basis is considered the toxicity threshold level for ruminants (1). The above data show that this level can be readily exceeded by *S. marianum* plants growing in shade and/or in medium to high fertility soils. Prolonged heavy cloud cover could also increase NO_3^- content to highly toxic levels.

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