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VARIATION IN SPRING RAPESEED (*Brassica napus*) FOR TOLERANCE TO THE TRIAZINE HERBICIDE, SIMAZINE USING A GROWOOL/HYDROPONICS SYSTEM.

Lack of effective weed control is a major factor limiting yields of spring rapeseed across southern Australia. No herbicides have been recommended which selectively control closely related broadleafed weed species, such as wild radish (*Raphanus raphanistrum*) without also risking damage to the Brassica crop. The development of cultivars with increased tolerance to triazine herbicides would improve herbicide selectivity and enable broadleaf weed control within the crop. Genes for triazine herbicide resistance have already been discovered in a weed biotype of *Brassica campestris* and determined to be cytoplamically inherited on chloroplast DNA. Unfortunately this resistance trait is associated with impaired photosynthetic processes, inferior seedling vigour and reduced yield potential.

Identification of nuclear genes for tolerance to the triazine herbicide, simazine and their incorporation into recommended varieties is an alternative approach. Previous screening methods to identify simazine tolerance have used a system of soil incorporated herbicide. A soil-less system using the CSR product, growool was developed to reduce the variability associated with simazine distribution in soils and to increase screening efficiency. Growool is an inert material, comparable in texture to fibreglass.

A solution of simazine (100ug/L) and nutrients (1g/L phostrogen and 1ml/L Hoagland's micronutrients) is added to growool cubes ($75x75x60mm^3$) until saturation (250ml). Seeds are planted directly into the cubes at 0.5-1.0 cm depth and thinned to ten per cube upon germination. Nutrient solution (50ml) is added again at germination , then seven days from germination cubes are transferred onto slabs of growool saturated in nutrient solution. Environmental conditions are held constant in growth rooms with 20/15 ^{0}C day/night temperatures and a 16 hour photoperiod supplied by 60watt incandescent and 400watt sodium vapour lights.

Sixty varieties of spring rapeseed (*Brassica napus*)were screened for simazine tolerance. Response to simazine was quantified by recording % survival/cube, dryweight of surviving plants at harvest (mg/plant,% control) and rating symptom development at regular intervals. Symptoms are rated on a scale from 0-10 where 0-no effect; 2-stunting; 4-chlorosis and wilting; 6-necrosis of leaf margins and wilting; 8- severe necrosis and 10-death. An index of simazine tolerance (STI) was then calculated by multiplying simazine symptom scores and score day from germination. The mean of these values was converted to a scale from 0-100 where 100 represents complete tolerance or no symptom development.

Significant correlations between these characters (Table 1) indicate that all three parameters are valid measurements of rapeseed response to simazine. The STI and % survival were most highly correlated (Figure 1) and determined as most convenient parameters.

Table 1: Correlations between the parameters percentage survival (%S), dryweight (DW) and simazine tolerance index (STI) used to quantify spring rapeseed (*Brassica napus*) response to the triazine herbicide, simazine.

REGRESSION	F-RATIO	CORRELATION COEFF.	SE
%S/STI	227.81**	0.89	17.44
DW/STI	59.80**	0.71	9.01
DW/%s	32.82**	0.60	30.95
	**P>0.01		

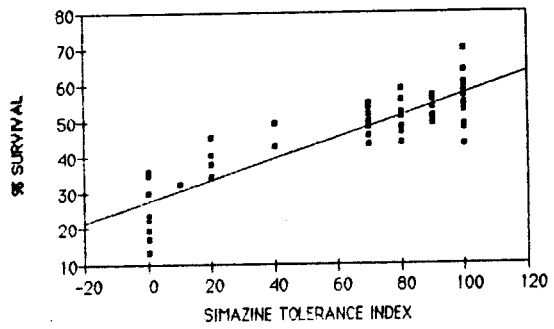

Figure 1: Regression of % survival and simazine tolerance index of *Brassica napus* 21 days from germination in growool/hydroponics simazine tolerance screening system.

Ten varieties which represented a range in reaction to simazine from susceptible to tolerant were selected and rescreened. Significant differences were found between varieties for all parameters (Table 2). Rankings of varieties from susceptible to tolerant were consistent across parameters with some exceptions. For example,surviving seedlings of the variety Bronowski were stunted and necrotic at harvest such that a high % survival at 21 days was associated with low shoot dry weight.

Using this growool/hydroponics system large numbers of plants were screened with efficient use of space and time. Significant variation for simazine tolerance was found between the *Brassica napus* varieties screened, indicating the presence of genes for simazine tolerance. Furthermore the scope of this screening method is unlimited both for screening populations for genetic studies and the number of species and herbical/heavy metal combinations for which it could be adapted.

Table 2: Analysis of *B. napus* variation in simazine tolerance recorded as simazine tolerance index (STI), % survival(%S) and shoot dryweight(DW) (mg/plt,%control).

VARIETY	%S	DW	STI
WESREO	0.0	0.0	19.72
CESKA	33.33	19.62	38.04
CHISAYA	60.00	14.88	48.60
TOWER	68.33	21.35	49.91
TARGET	73.33	20.75	47.98
BRONOWSKI	76.67	13.69	45.87
WESBROOK	80.0	67.0	54.56
MARNOO	90.0	52.28	55.52
GULLE	91.67	23.07	54.67
HAYA	100.0	87.94	61.49
F-RATIO	7.24	19.48	18.80
LSD*	31.88	17.68	7.67
			*P>0.05