SEED GERMINATION OF HOREHOUND

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Horehound (*Marrubium vulgare* L.) is a perennial plant from the mint (*Lamiaceae*) family. It is a major weed problem in mixed farming areas of South Australia and Victoria (Carter 1990). In New Zealand, horehound is common on sheep camps and waste places and can invade lucerne pastures. Horehound reproduces by seeds which are enclosed in a persistent calyx. Seed dispersal is by water or animals as the calyx attaches to wool, reducing its quality (Parsons and Cuthbertson 1992).

Seeds of horehound have a dormancy which can be broken by several environmental factors (Stritzke 1975). The present report summarises the results of a series of experiments looking at this aspect of the plant's life cycle as a pre-requisite to establishing effective chemical and non-chemical control strategies.

Horehound seeds were harvested in 1986 and were kept dry at room temperature. Experiments described here were carried out in 1993. In all experiments seeds were surface sterilised with 10% bleach solution and 25 seeds were placed on sterilised double filter paper in a petri dish. In the first experiment concentrated sulphuric acid was used for periods of 2, 5 or 10 minutes for seed scarification, followed by surface washing under running water. In the second experiment non-scarified seeds were placed on filter papers moistened with either deionized water (untreated control) or potassium nitrate solution of appropriate concentration. Seeds were kept at 4°C for periods of 0, 3 or 6 weeks after which they were placed in incubators with 24 h light at either 25°C constant temperature or 25/5°C alternating temperature on a 12 h cycle. Germinated seeds were counted and removed at weekly intervals and analysis of variance performed on the data. Experiments had four replicates and were repeated at least once.

Soaking horehound seed in sulphuric acid for 2 minutes did not promote germination and longer periods reduced germination (Figure 1). Scarification for 10 minutes in most cases resulted in imbibed cotyledons coming out of the seed coat but there was no radicle growth.

The second experiment showed that germination of untreated seed was generally better at 25°C constant temperature compared to an alternating temperature of 25/5°C (Table 1). Chilling periods of 3 or 6 weeks increased the number of germinated seeds at both temperature regimes and this effect was more pronounced with incubation time. Potassium nitrate at 50 mM was inhibitory to seed germination in all treatment combinations. At 10 mM, potassium nitrate reduced the germination at 25°C but increased the final number of germinated seeds at 25/5°C.

It appears that horehound seeds do not have a hard seed coat as scarification with sulphuric acid did not enhance germination. Therefore seed dormancy is likely to involve other mechanisms. The positive effect of cold seed storage found in this study is consistent with the reports by Stritzke (1975) and Young and Evans (1986). Enhancement of germination by 10 mM nitrate occurred only at the alternating temperature regime where germination of untreated seeds was relatively low. It seems that both nitrate and temperature regime play a role in breaking the dormancy.

The study has led to the following conclusions:

1. Horehound seeds have a long dormancy period. The majority of seeds harvested in 1986 are still dormant.
2. Temperature regime and nitrate availability have interacting effects on seed germination.
3. Cool moist storage of 3 to 6 weeks was stimulatory to seed germination.

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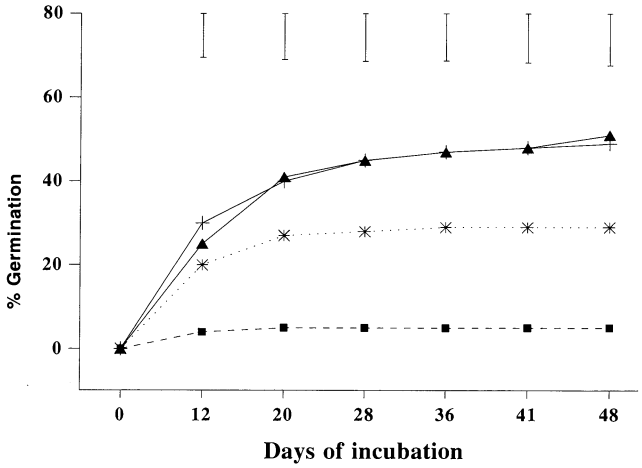

Figure 1: **Effect of different periods of scarification with sulphuric acid on seed germination of horehound at 25°C. Error bars are $LSD_{0.05}$.**

TABLE 1: **Effect of different chilling periods and nitrate concentrations on germination percentage of horehound seed incubated at two temperature regimes.**

Temperature regime	Chilling period (weeks)	Nitrate (mM)	Days of incubation 12	20	28	36	41	48
25°C constant	0	0	32	44	54	56	60	65
	3	0	49	84	87	89	91	91
		10	18	31	35	38	41	43
		50	2	2	2	2	2	2
	6	0	17	60	72	84	87	87
		10	26	43	48	60	63	66
		50	0	0	0	0	0	0
25/5°C	0	0	8	13	22	26	26	26
alternating	3	0	4	12	22	36	38	39
		10	3	15	28	50	62	67
		50	0	0	2	9	9	9
	6	0	0	5	21	37	53	61
		10	3	16	35	55	71	86
		50	0	3	5	9	10	10
$LSD_{0.05}$			7.7	12.7	12.1	12.5	12.2	12.3

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