Longevity of Buried Seeds of Three *Rumex* Species over a Fourteen-year Period

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**Key Words:** *Rumex obtusifolius*, *Rumex crispus*, *Rumex longifolius*, buried seeds, germination

*Rumex obtusifolius* is one of the most troublesome weeds in sown grasslands\(^1\)\(^2\). Intensively managed grasslands are usually renovated at an interval of 5 to 7 years in Hokkaido. Infestations of *R. obtusifolius* are supported by an emergence of buried seeds at the grassland establishment\(^3\). The present study was designed to compare the longevity of seeds of three *Rumex* species buried in soil during a fourteen-year period.

**Materials and Methods**

The experiments were conducted in volcanic ash soil at Obihiro in Hokkaido from 1978 to 1992. Fruits of *R. obtusifolius* and *R. crispus* from an abandoned field and *R. longifolius* from a riverside were collected on 6th-10th September, 1978. After drying, seeds were cleaned by removing the perianth segments. Vinyl-chloride pipes (2-cm inner diameter and 5-cm long) were used to contain the seed-soil mixture. In order to avoid contamination by other seeds, soil was previously heated for 20 hours at 160°C and then sieved through 1-mm mesh. Three hundred seeds of *R. obtusifolius* and *R. crispus* and one hundred seeds of *R. longifolius* were separately mixed with about 1 g soil. A pipe was half filled with soil, the seed-soil mixture and soil again. All pipes were immersed in a water bath for one hour and then buried at a 20-cm depth in the soil on 1st December, 1978. The experimental field was managed as a lawn.

The buried pipes were dug up at intervals the following November or December. The seed-soil mixture was washed out on a 0.5-mm-mesh sieve and seeds were picked out under illumination of a red lamp. They were placed on 0.5% agar in 9-cm glass petri dishes in an incubator at temperatures of 24°C day (16 h.) and 18°C night (8 h.). The viability of sampled seeds was tested for 3 weeks under both light (2,000 lux) and dark (lapping aluminum sheet) conditions. The extent of dormant seeds was assessed by vital staining with TTC (triphenyltetrazolium chloride) solution. All treatments were replicated twice within one year and three times thereafter.

**Results and Discussion**

The viability of both *R. obtusifolius* and *R. crispus* was high during the first four years (Fig. 1); more than 85% of the seeds were germinative. In the 7th year, *R. obtusifolius* still maintained a high rate of viability (85%) in comparison with *R. crispus* (63%). In the 14th year, the viable rate was 9.9% in *R. obtusifolius* and 2.7% in *R. crispus*. The viable rate of *R. longifolius* seeds decreased linearly with 14-year-old seeds showing only 0.3% viability. The three *Rumex* species showed almost the same viability under light and dark conditions.

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The rate of dormant seeds before burial was 12.4, 5.8 and 22% in *R. obtusifolius*, *R. crispus* and *R. longifolius*, respectively, and from the 1st year to 7th year was 2.6-7.0, 3.1-4.2 and 1.8-18.4%, respectively (Fig. 1). No dormant seeds were observed in any of the three *Rumex* species in the 14th year. It is suggested that *Rumex* seed dormancy is closely related to viability.

Seeds of *R. obtusifolius* and *R. crispus* reportedly show a high viable percentage during a 4-year period\(^4,6,7\). The longevity of buried seeds of *R. crispus* is thought to be about 80 years in U.S.A.\(^1\) and about 10 years in Denmark.\(^5\) In this study, a rapid decrease in viable rate of the three *Rumex* species was observed from the 7th to the 14th year, with the low viable rates of *R. crispus* and *R. longifolius* seeds in the 14th year appearing to be almost the end of their survival period. In contrast, about 10% of *R. obtusifolius* seeds were able to survive for more than 10 years in soil.

In grassland that is intensively managed, seeds produced by infested plants may accumulate in the soil each year. Most of these seeds seem to emerge at the time of the next grassland renovation.

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**References**