

Water temperature and exposure time for killing weed seed on recycled plastic containers[©]

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Seeds of many weeds, most notably creeping woodsorrel (*Oxalis corniculata*) and bittercress (*Cardamine flexuosa*), adhere to plastic containers and trays and are reintroduced into the production system when the containers and trays are reused. Some nurseries use hot water or steam for sterilizing reused containers and propagation trays. Initially, this technology was adopted as a means for eliminating pathogens. But these nurseries soon noted vast improvements in weed control. Nursery operations are using hot water or steam at temperatures ranging from 60 to 90°C, with exposure times from 15 minutes to 4 h. While they have reported increased levels of weed control using this form of sterilization, the temperature and exposure times selected were based on best guesses or to satisfy some certification processes for disease control. Therefore, the objective of this research was to determine the specific temperatures and exposure times necessary to kill creeping woodsorrel and bittercress seeds using hot water.

Initial experiments with creeping woodsorrel and bittercress were conducted separately. Glass test tubes were filled with ten seeds each, then placed into a digitally programmable hot water bath. The hot water bath was set at 60, 75, or 90°C for 1, 5, 10, 30, or 60 minutes to determine creeping woodsorrel and bittercress tolerance. There were five replicate test tubes per treatment, including a group of five control test tubes that remained at room temperature. After heat treatment, the seeds from each test tube were transferred to a Petri dish containing an agar base made using 15 g L⁻¹ granulated agar in a modified Hoagland solution (in mM: 7.5 N, 0.5 P, 3 K, 2.5 Ca, 1 Mg, 1 S, 0.071 Fe, 0.009 Mn, 0.0015 Cu, 0.0015 Zn, 0.045 B, 0.0001 Mo, 0.024 Cl, and 0.0002 Na). Petri dishes were placed in a growth chamber providing a 12-hour photoperiod and 18°C night/22°C day air temperature. After 2 weeks, weed germination in each Petri dish was tabulated.

Creeping woodsorrel treated with 60°C water had a similar germination percentage as non-heated controls. Those heated at 75°C still germinated, but at a lower percentage than the non-heated controls. None germinated when exposed at 90°C for 5 minutes or longer. Within each temperature, exposure time did not affect creeping woodsorrel germination. Similarly, bittercress were not controlled with 60°C water. Bittercress germination was reduced when treated with 75°C water, and germination decreased with increasing exposure time. Like creeping woodsorrel, none of the bittercress germinated when treated with 90°C water. For rapid exposure times of 5 minutes or less, high temperatures of at least 90°C will be needed for effective control of creeping woodsorrel and bittercress. Lower temperatures of 75 to 85°C might be effective with sufficiently long exposure time.

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