Using microwaves for the control of slugs and snails.

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Key messages

Small pointed snails were much harder to kill than slugs or common garden snails with microwaves.

With current technology there is good potential to control the larger snails and slugs with microwaves and limited potential for economic control of the small pointed snail.

Large slugs were easier to control than small slugs.

Aims

To determine the dose of microwave radiation required to kill small pointed snails (*Prietocella barbara*), black keeled slugs (*Milax gagates*) and common garden snails (*Helix aspersa*).

Method

Small pointed snails, black keeled slugs or common garden snails were placed in a petri dish and exposed to microwave radiation generated by a domestic 800 watt conventional or 1200 watt inverter microwave oven. These were run at full power for the snails and at 20% power using the inverter oven for the slugs because the time at full power was too short to be accurately measured. The results were all converted to the equivalent times for an 800 watt microwave oven at full power. The weight of the specimens and final temperatures, using an infra-red thermometer, were recorded. The number of individuals that died within 24 hours of treatment was used as the measure of efficacy. The times of exposure were 0, 1, 2, 4, 8, 16, 32 and 64 seconds initially and other times were interspersed to improve the accuracy of the measurement at around the time that was close to the lethal dose for 50% of the specimens (the LD_{50}).

Results

The dose response for microwave radiation on black keeled slugs (BKS) and common garden snails (CGS) was the same whilst small pointed snails (SPS) were much more tolerant to the radiation (see figure 1).

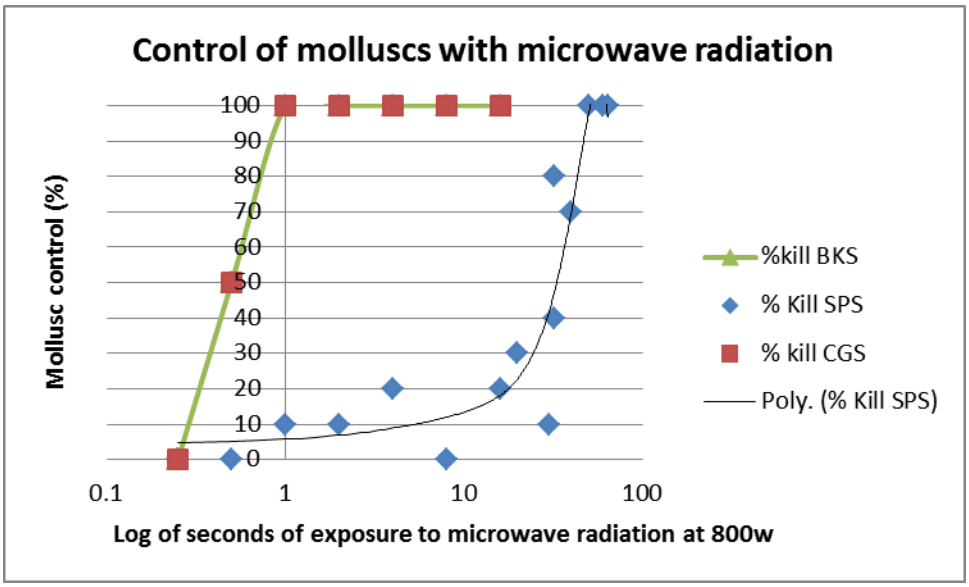

Figure 1: The dose response curve for microwave radiation on various molluscs. (BKS = Black keeled slugs, SPS = Small pointed snails, CGS = Common garden snails, Poly = the fitted polynomial curve.)

For slugs there was a correlation between the size of the slug and the time taken for control. . Bigger slugs were affected by the microwave process to a larger extent than smaller ones. At 0.5 seconds of exposure the average weight of slugs that survived was 0.53g whereas those that died was 1.19g. This may help to explain why the very

light small pointed snails with an average weight of only 0.067g are more tolerant to radiation by having a smaller “radar profile”. However, the common garden snail had an average weight of 4.13g compared to the average weight of slugs at 0.87g and had the same dose response curve.

For the slugs and common garden snails the 100% control normally occurred before the body temperatures exceeded 40^{o}C indicating that it is not heat per se killing them. For the small conical snails high temperatures were recorded when complete control occurred but there was significant deaths at recorded temperatures around 40^{o}C.

Conclusion

Black keeled slugs and common garden snails were equally sensitive to microwave radiation. Small pointed snails were much more tolerant than the previous species. Based on previous research by Moore *et al* (2015), selective control of slugs and common garden snails should be possible with microwave radiation as the doses required to kill these species had little effect on weed seeds. For small pointed snails the doses required for control were long and similar to those for required to kill weed seeds. This is likely to make microwave treatment uneconomical for broad acre control of small pointed snails but potentially useful for slugs and the larger snails with current technology.

Key words

Black keeled slug, common garden snail, control, eradication, *Helix aspersa*, Lolium rigidum, magnetron, microwave, *Milax gagates Prietocella barbara*, microwave, small pointed snail, snails, survival.

Acknowledgments

Meg Slattery for technical assistance. The research undertaken as part of this project is made possible by the significant contributions of growers and the support of the GRDC’s Regional Cropping Solutions Network, the authors would like to thank them for their continued support.

GRDC Project Number: DAW00251

Paper reviewed by S. Micic and S. Peltzer.