

The use of *in-situ* deployments to examine the success of water quality mitigation measures on a watercress farm

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Introduction

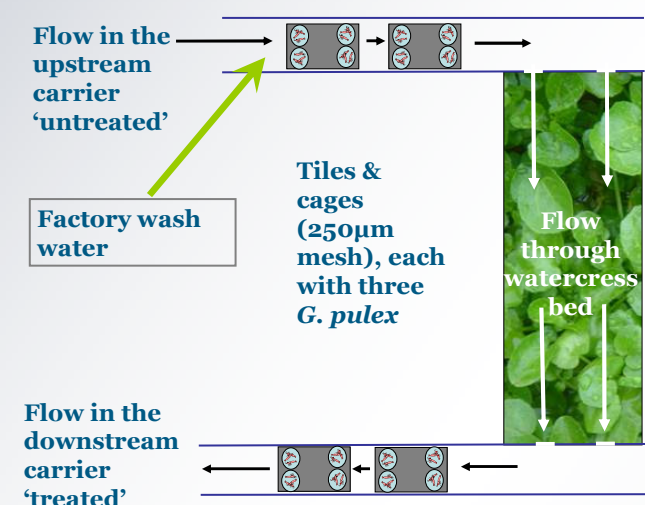
Watercress has long been believed to affect macroinvertebrate communities in chalk streams [1]. Harvesting and washing watercress damages plant tissues and releases isothiocyanates which are potential toxicants to *Gammarus pulex* (L.) [2].



Gammarus pulex pair

This study examined whether impacts on *G. pulex* of watercress farm factory wash water could be mitigated by treating via recirculation through the watercress beds.

Method



Cages deployed in carrier below watercress bed

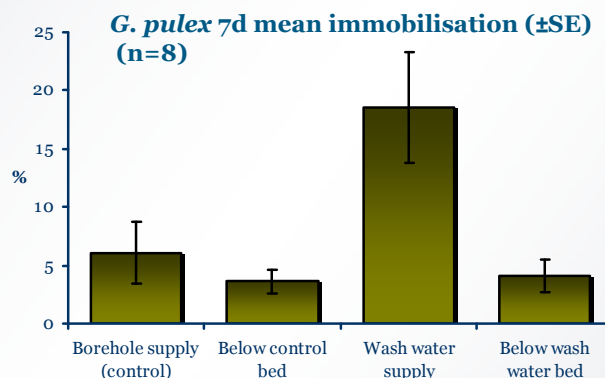
Deployments of caged *G. pulex* [3] were made in water carrier channels in peak growing season on two consecutive years. Borehole water only fed beds were used as controls. A 7-day immobilisation endpoint was recorded.

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Results

Immobilisation (as % of total organisms deployed) was greatest in the wash water supply on 6 out of 8 occasions.



One way ANOVA with pairwise multiple comparisons (Holm-Sidak Method) was used to compare effects at each location (see table below).

| Comparison | Significant Difference? |
|------------|-------------------------|
| 1 vs. 2 | Yes (p=0.010) |
| 3 vs. 4 | No (p=0.335) |
| 1 vs. 4 | Yes (p=0.043) |
| 2 vs. 3 | No (p=0.811) |

Two way ANOVA on ranks with pairwise multiple comparisons was used to compare the response between and within sites. It revealed a statistically significant difference between responses of organisms in the wash water supply carrier to those in the carrier below the bed on 4 out of 8 test occasions.

Conclusions

Impact to *G. pulex* was variable, but overall reduced to levels comparable to controls after the factory wash water had been fed back through a watercress bed.

Re-direction of watercress wash water through the watercress beds prior to discharge to the receiving water is a positive treatment/measure.

Recent biological surveys [4] of the receiving water at the farm indicate that macroinvertebrate communities are recovering.

References

- [1] Newman RM *et al* (1992) The watercress glucosinolate-myrosinase system: a feeding deterrent to caddisflies, snails and amphipods, *Oecologia*, **92**, 1-7
- [2] Lambdon PW, Hassall M (2001) Do plant toxins impose constraints on herbivores? An investigation using compartmental analysis, *Oikos*, **93**, 168-176
- [3] Maltby L *et al* (1990) Field deployment of a scope for growth assay involving *Gammarus pulex*, a freshwater benthic invertebrate, *Ecotoxicology and Environmental Safety*, **19**, 292-300
- [4] ENVIRON (2008) Invertebrate Monitoring 2008, The Bourne Rivulet St Mary Bourne Hampshire, Report prepared for Vitacress Salads Ltd, Contract No 68-C13337