

**Moisture requirements for successful development
of *Haemonchus contortus* and *Trichostrongylus
colubriformis* to third stage infective larvae**

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Summary

The overarching aim of the experiments conducted as part of this thesis was to determine the influence of moisture in the form of rainfall events (amount, timing and distribution) and soil moisture (SM) on faecal moisture (FM) and development of *H. contortus* and *T. colubriformis* to infective third stage larvae (L3).

There are 4 experimental chapters reported in this thesis, (i.e. Chapters 4-7) which were written as a series of publications. In Chapter 4, the experiments were conducted to determine the effects of rainfall timing and rainfall distribution on FM and development to L3. The results highlighted that rainfall which occurred within 2 days from faecal deposition led to higher FM and recovery of L3. The benefit of precedent rainfall for L3 development observed in this chapter highlighted the possible role of SM in regulating L3 development which was included as a treatment effect in Chapter 5.

Experiments in Chapter 5 were conducted to evaluate the effects of varying initial SM, rainfall timing and rainfall amount on FM and development to L3. The results highlighted the importance of SM in influencing the development of GIN to L3 where increasing SM increased FM and consequently recovery of L3. The importance of SM in modulating the effect of rainfall amount on L3 development was observed in this chapter. SM declined rapidly in the experimental units which raised the question of the effect of sustained SM in regulating L3 development which was included as a treatment effect in Chapter 6.

Experiments in Chapter 6 were designed to elucidate the effects of sustained SM, rainfall timing and rainfall amount on FM and development to L3. The results showed that SM is able to modulate the effects of rainfall timing and rainfall amount with increased SM acting to broaden the window of opportunity for the free-living stages to respond to post deposition rainfall to complete development to L3.

In order to validate the results of the experiments conducted in controlled climate chambers (Chapters 4-6), a field experiment was conducted to investigate the effects of

rainfall timing, rainfall amount and herbage height on translation success with grazing sheep. The results showed that initial SM of 20% alone was sufficient to support development and translation of both GIN species, as there was no effect of rainfall timing, rainfall amount and herbage height on the recovery of GIN species from grazing sheep.

These results highlighted the importance of SM as a source of moisture for development of the nematode eggs in the faecal pellets. It also underlined the importance of taking soil moisture into account when predicting the likely effects of rainfall and herbage height on development to L3 and finally in predictive epidemiological models of sheep GIN parasites.

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Publications

1. Khadijah, S., Kahn, L.P, Walkden-Brown, S.W., Bailey, J.N. and Bowers, S.F. (2013d) Development and translation of *H. contortus* and *T. colubriformis* to infective larvae are unaffected by rainfall timing, rainfall amount and herbage height under conditions of high soil moisture in the Northern Tablelands of NSW. *Veterinary Parasitology*. (Accepted).
2. Khadijah, S., Kahn, L.P., Walkden-Brown, S.W., Bailey, J.N. and Bowers, S.F. (2013c). Soil moisture modulates the effects of rainfall amount and timing on faecal moisture and development of *Haemonchus contortus* and *Trichostrongylus colubriformis* to infective third stage larvae. *Veterinary Parasitology* (Accepted 29.03.13). <http://dx.doi.org/10.1016/j.vetpar.2013.03.034>.
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