Department of Primary Industries and Regional Development
GOVERNMENT OF WESTERN AUSTRALIA

GRDC GRAINS RESEARCH & DEVELOPMENT CORPORATION

Vegetable beetle and slater monitoring using time-lapse cameras

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Key messages

- Vegetable beetle and slater activity is correlated to high relative humidity, mild temperatures and time of day, and that these conditions overlap with other crop emergence pests such as conical snails
- In contrast to snails, vegetable beetles and slater movement was not correlated with soil moisture content
- There may be a wider window of opportunity to apply chemical controls to target beetles and slaters pre-sowing especially in dry sowing situations
- Further investigation is needed into the triggers that promote feeding on green plant material to understand when vegetable beetles and slaters (and earwigs) become a management issue

Introduction

Vegetable beetles and slaters are pests of grain crops particularly at crop emergence. Both pests predominantly feed on dead plant matter and can contribute to the recycling of plant residues though in high numbers they can feed on green plant matter. The crop is most susceptible at emergence when slaters and vegetable beetles chew entire tops of emerging cotyledons or chew stems at the soil surface. These pests have been an increasing issue for grain producers in the Esperance port zone (EPZ) particularly in emerging canola and under retained stubble systems.

Time-lapse cameras and weather monitoring sensors have been used at multiple locations across the EPZ in 2019 and 2020 seasons to monitor conical snail activity. Slaters and/or vegetable beetles were also present at these sites. Using the footage from snail monitoring activities, scoring vegetable beetles and slaters was a value-add activity.

Aims

To determine environmental triggers and time of day vegetable beetles and slaters are active.

Methods

Monitoring locations

Monitoring sites were located at Scaddan and Gibson (Esperance Downs Research Station, EDRS) in 2019 and at Myrup and Scaddan in 2020.

Scoring movement and weather parameters

Vegetable beetle and slater movement was monitored using time-lapse cameras, capturing an image every minute. A score of 0 (no vegetable beetles or slaters present)

or 1 (some movement) was given to indicate pest activity in every 15 minute block. Vegetable beetles were observed to periodically appear in large 'swarms' and the time of each 'swarm' was noted. Weather parameters were logged for 1 minute every 15 minutes at each site using HOBO weather stations and sensors. These parameters were relative humidity (%), air temperature (^oC), soil temperature (^oC), leaf wetness (%), and soil water content (m^3/m^3).

Data analysis

Time of day that vegetable beetle and slaters were active was determined by calculating the average movement score of each hour (0–24) for the period between February to 31 October for data collected in 2019 and February to 30 June for data collected in 2020. A total of 26 282 observations for vegetable beetle movement were used in the analysis, and 31 094 for slaters.

Table 1. Camera locations, year/s site was monitored and presence of either vegetable beetles or slaters.

Location	Year	Vegetable beetle	Slater
EDRS	2019	Present	Absent
Scaddan	2019 and 2020	Absent	Present
Myrup	2020	Present	Present

Results and Discussion

The results from this activity show that vegetable beetle and slater activity is correlated to high relative humidity, mild temperatures and time of day, and that these conditions overlap with other crop emergence pests such as conical snails. In contrast to snails, vegetable beetles and slater movement was not correlated with soil moisture content (Table 2). Therefore, there may be a wider window of opportunity to apply chemical controls to target these pests pre-sowing especially in dry sowing situations. Whereas when baiting for snails, efficacy is improved when baits are applied immediately following rain when the soil surface is moist and there is high relative humidity overnight.

The paddock selection and positioning of cameras used for this analysis was designed with monitoring of small conical snails in mind. Time-lapse footage was only used to monitor either vegetable beetles or slaters if it was known that these pests were present in relatively high numbers. For example, at Scaddan there was known incidence of vegetable beetle but in low abundance. They weren't scored due to a high probability of false negatives. It is recommended that this activity be validated with an additional data set where cameras are positioned to specifically target vegetable beetles and slaters, in particular to target activity outside of the range of optimal conditions in this report. In addition to these pests, earwigs have been raised as an emerging crop emergence pest of canola and could be monitored in this way to improve efficacy of future chemical control options (e.g. dual active fipronil/metaldehyde baits).

This work highlights the need for further investigation into the triggers that promote feeding on green plant material to understand when vegetable beetles and slaters (and earwigs) become a management issue.

Table 2. Correlation of different weather parameters and pest movement. Relative humidity and air temperature were measured approximately 10cm above ground level
*Data for conical snail activity were collected from same footage as vegetable beetle and snails as part of the original monitoring activity and data analysis. Full report can be accessed at: https://www.agric.wa.gov.au/time-snail-baiting-coincide-maximum-snail-movement-and-snails-lay-eggs)

Pest	Relative humidity	Air temperature	Soil temperature	Leaf wetness	Soil water content
Vegetable beetle	0.302	-0.270	-0.366	0.280	-0.026
Slaters	0.188	-0.155	-0.161	0.108	-0.007
*Conical snail – Scaddan	0.57	-0.34	-0.42	0.57	0.62
*Conical snail - Myrup	0.37	-0.30	-0.26	0.47	0.58

Time of day for pest activity

Both vegetable beetles and slaters were most active at night between 1900-0400 (Figures 1 and 2).

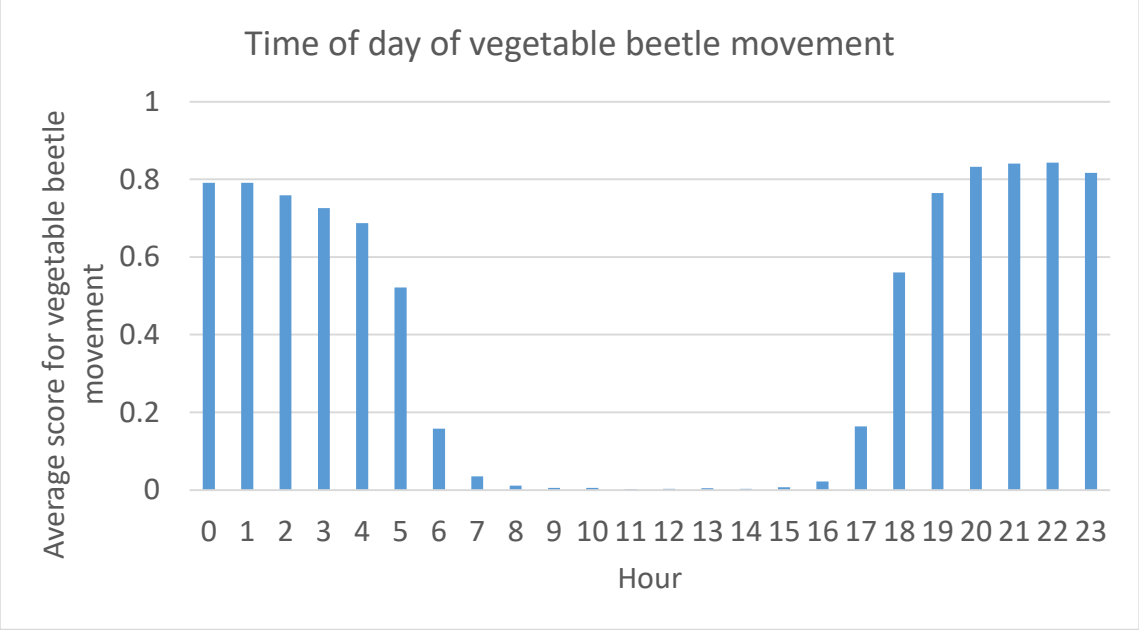

Figure 1. Vegetable beetle activity based on time of day. Average score for movement was determined by calculating the average movement score of each hour

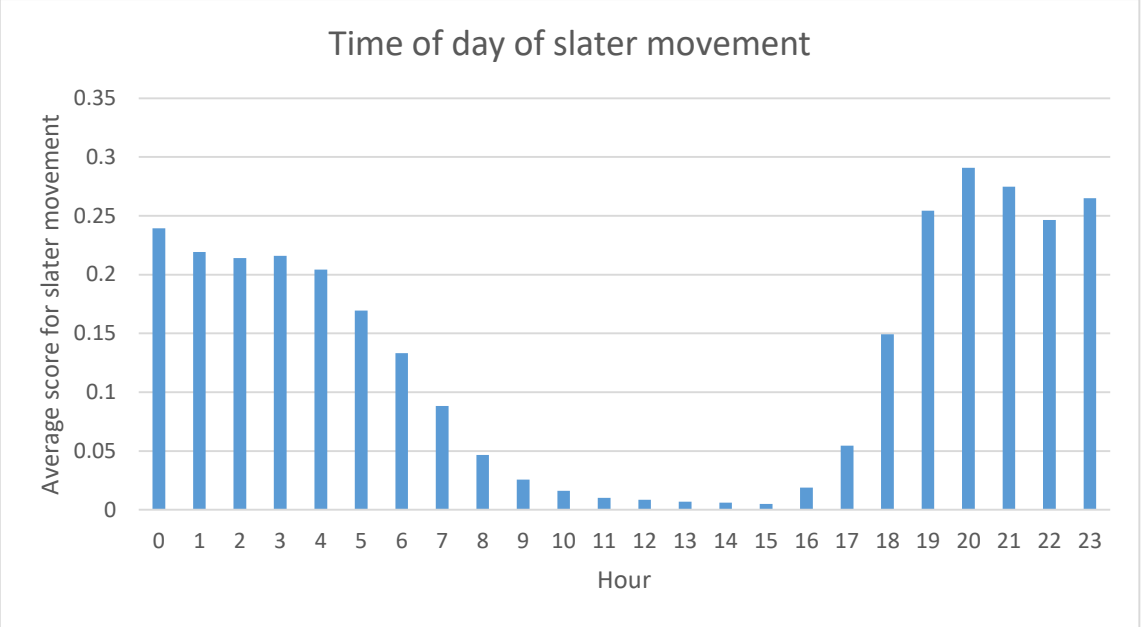

Figure 2. Slater activity based on time of day. Average score for movement was determined by calculating the average movement score of each hour

Conditions required for vegetable beetle movement

Vegetable beetles were observed to be active from 3-33ºC; however, were most active if humidity was above 60% and temperatures were 5-25ºC (Figure 3).

Vegetable beetle swarming activity was recorded at night between 1800-0700; though this behaviour was most frequently recorded between 2300-0300 (Figure 1). There were 276 data points for swarming behaviour at 2 sites, EDRS (2019) and Myrup (2020). This activity was restricted to autumn occurring at EDRS on nights of 11–16 April and 5–6 May, and at Myrup on nights of 15–16 March, 28 March, 9–12 April. This behaviour did not show the same relationship with 'normal' movement and there were obvious site differences. At Myrup swarming occurred at 22ºC and was not correlated to relative humidity. In comparison at EDRS swarming behaviour was observed only when relative humidity was 66-96% and temperatures were 12-20ºC. These observations suggest that 'swarming' is driven by other factors such as population, life cycle, time of year or location.

Conditions required for slater movement

Slaters were observed to be active when temperatures were 0-30ºC and relative humidity was above 20%. However, were most active if humidity was above 70% and temperatures were 5-18ºC (Figure 4).

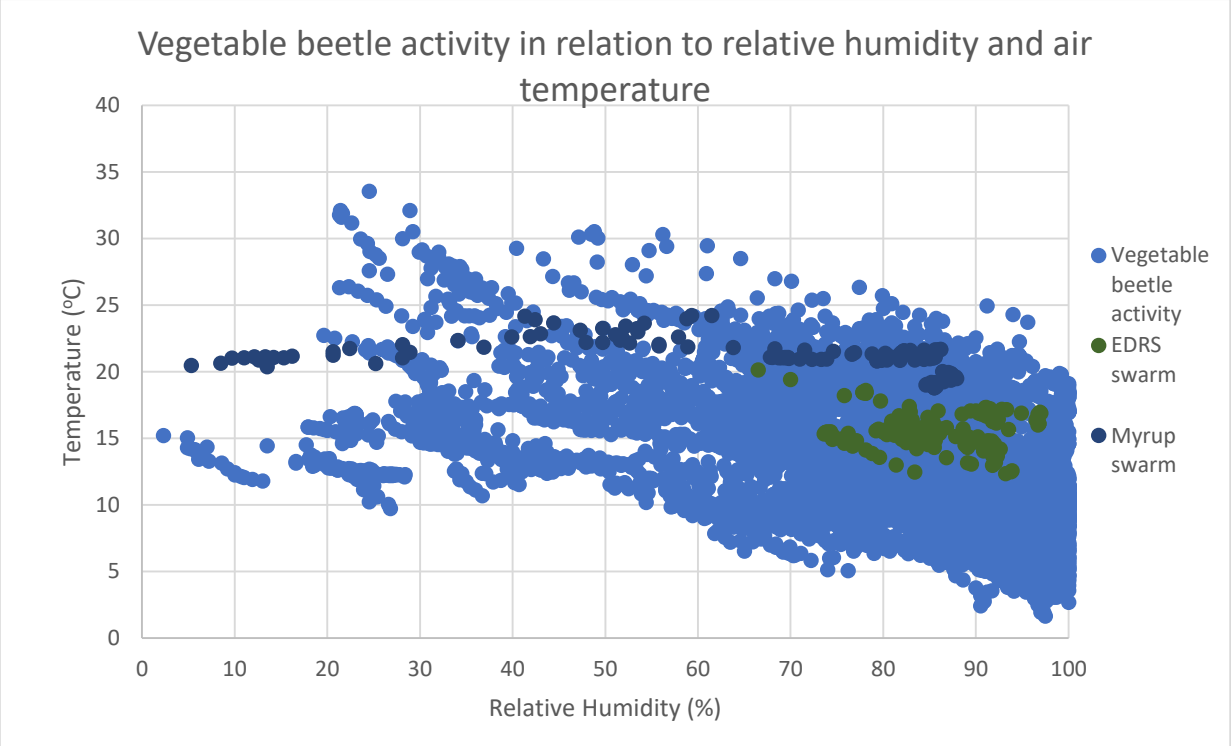

Figure 3. Relationship between vegetable beetle movement and relative humidity (%) and air temperature (°C). Each point represent a data point when any vegetable beetle movement was observed. Movement was scored either 0 (no movement) or 1 (movement).

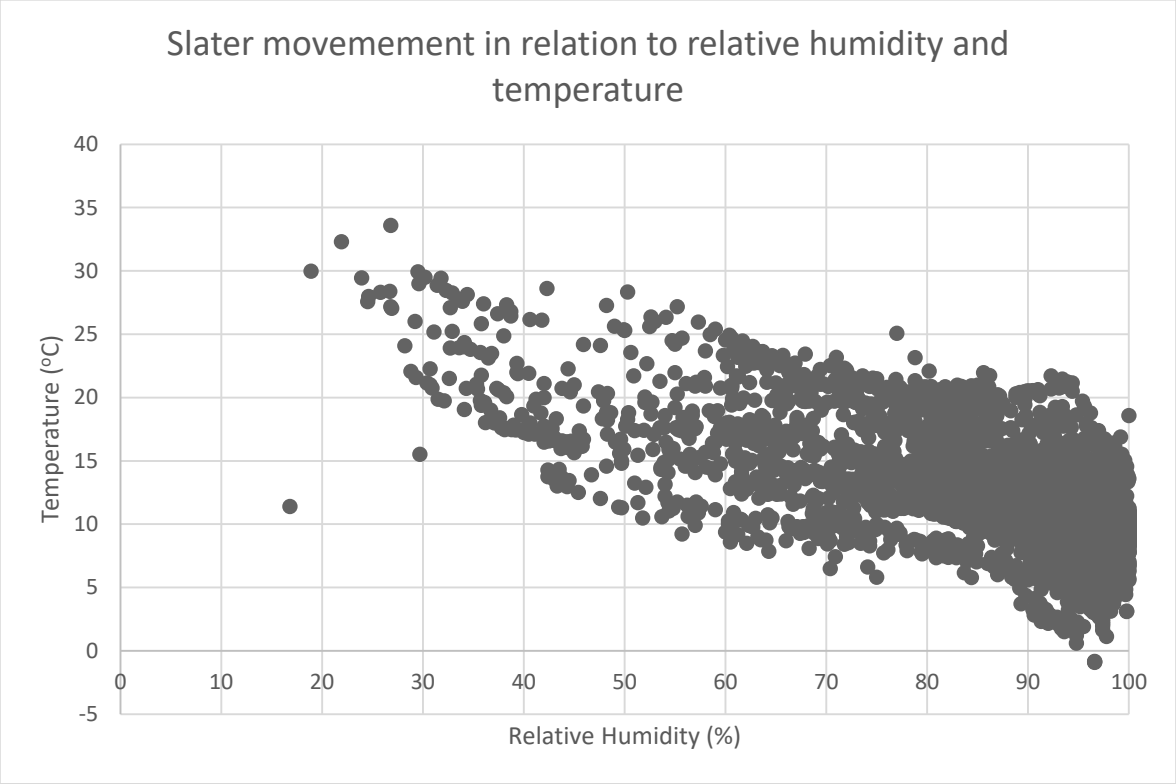

Figure 4. Relationship between slater movement and relative humidity (%) and air temperature (°C). Each point represents a data point when any slater movement was observed. Movement was scored either 0 (no movement) or 1 (movement).

Important disclaimer

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