Protecting windrows with caffeine

GREG BUTLER, SANTFA R&D

Caffeine will clear snails off canola windrows, but much more work is needed before registration of this methodology could be considered.

Snails can cause no-end of problems at harvest time. High numbers can negate all the hard work that goes into growing a crop; complicating and slowing harvest and resulting in having loads of grains, legumes or oilseeds rejected due to snail contamination. In some cases, crops cannot be harvested at all because there are so many snails in the paddock.

SANTFA has responded to the increasingly difficult snail-related problems being encountered by growers by researching innovative options for snail management or control. These options include the use of caffeine in several different applications.

In the most recent trials, caffeine solutions were applied to canola windrows to determine whether or not snails could be shifted off windrows to make the harvesting job easier.

Three application rates were tested during November 2011 on canola windrows near Kadina:

- **Moderate rate**

  The moderate rate was the amount of active ingredient considered to be affordable for most growers if bought in commercial quantities at current prices.

  Affordability is likely to vary with factors such as the source of the active ingredient, price structures and the benefits of controlling snail populations.

- **High rate**
  (10 times the moderate rate)

  The high rate was set at what was considered to be the very upper limit of perceived affordability, with significant snail problems required to justify the substantial cost of this treatment.

- **Ultra-high rate**
  (25 times the moderate rate)

  This rate was considered to be unaffordable for most growers but was included to determine what was technically possible.

The treatments were applied to 25-metre lengths of snail-invested windrows using a calibrated hand boom and snail numbers monitored over the following two weeks. All treatments were replicated.

Results

Snails were displaced from the windrow in all treatments, with the higher rates providing better displacement for longer periods than the lower rates (Figure 1).

The moderate rate gave detectable displacement for about two days.

The high rate gave satisfactory displacement for several days (Figure 2).

Windrows treated with the ultra-high rate were still clean after 10 days (Figure 3).

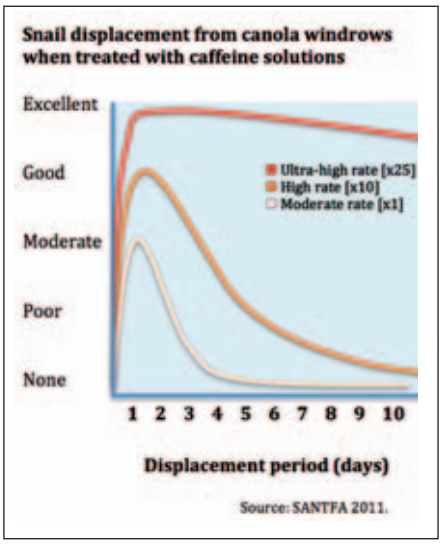

FIGURE 1: HIGH RATES PROVIDE BETTER DISPLACEMENT FOR LONGER PERIODS THAN LOW RATES.

Discussion

Caffeine will displace snails from canola windrows and therefore offers a potential pathway to easier harvesting of snail-invested windrows. However, it is not registered for this purpose and there are still many questions to be resolved with respect to the practicality, affordability and safety of applying caffeine in this way.

Environmental conditions at and after application may influence the results of using caffeine in this way. When the trial treatments were applied (at 11 a.m. on a warm sunny day), all the snails were inactive and sealed onto the canola. Two nights after application there was misting rain on the trial site, which activated the snails. Conditions that mobilise snails and expose them to the caffeine could be an important factor, but heavy rain may wash the caffeine away. Further work to determine the effect of application timing and environmental conditions is required.

The treatments didn't kill enough snails to have caffeine considered as an effective control (killing) method when used in this way. At this stage, using caffeine in this manner is limited to being a potential harvest aid.

Spraying so close to harvest raises the issue of Minimum Residue Limits (MRL). There would appear to be few grounds for concern about MRL's when caffeine is sprayed well before harvest, but spraying the day before harvest may not be acceptable for all canola markets. Residue testing is planned.

FIGURE 2: AN UNTREATED CANOLA WINDROW (LEFT) AND A TREATED CANOLA WINDROW (RIGHT) TWO DAYS AFTER APPLICATION OF THE HIGH RATE OF CAFFEINE.

FIGURE 3 (RIGHT): UNTREATED CANOLA (LEFT) AND TREATED CANOLA (RIGHT) A WEEK AFTER APPLICATION OF THE ULTRA-HIGH RATE. SNAILS COLLECTED FROM THE GROUND UNDER THE TREATED WINDROWS WERE ASSESSED FOR CONDITION. ALMOST ALL SNAILS WERE VISIBLY AFFECTED, WITH SEVERAL DEAD OR DYING. WHEN COLLECTED SNAILS WERE COOLED AND PROVIDED WITH WATER, MOST REVIVED.

Bait

In other trials, snails have taken caffeine bait in the form of raspberry jelly made with apple juice instead of water, with 10% caffeine added.

In early baiting trials snails refused to take caffeine powder mixed with dry food sources, presumably because of the strong anti-feeding character of caffeine.

The raspberry-apple jelly was presented in a non-choice feeding trial in which the snails in the trial had nothing else to eat but the jelly bait. Those that fed over the two-day trial died quickly (Figure 4).

It is unlikely that a jelly-based bait will become commercially available, but the results of this trial show that the anti-feeding character of caffeine can be overcome, which suggests there could be potential for development of a lethal late-season bait with caffeine as the active ingredient.

These results, which will be discussed in more detail at the 2012 SANTFA conference, have been forwarded to the GRDC to compliment an earlier report sent in 2010.

We hope to secure research funding to further this work.

FIGURE 4: DEAD SNAILS WITH REMNANTS OF THE RASPBERRY-APPLE CAFFEINE BAIT.

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