Evaluation of insecticides for the management of Rough Sweetpotato Weevil (*Blosyrus asellus*) in Hawaii

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SUMMARY

Sweetpotato, *Ipomoea batatas* (Olivier), is an important staple food crop in Hawaii and critical to food security in these geographically isolated islands. Production of this crop faces a new challenge from the rough sweetpotato weevil (RSW), *Blosyrus asellus,* (Coleoptera: Curculionidae) (Fig. 1). This pest was first detected on a commercial sweetpotato farm on the island of O'ahu in 2008, with subsequent detection on the island of Hawai'i in 2014 (Heu et al. 2014). In contrast to other weevil pests of sweetpotato in Hawai'i whose immature stages (grubs) feed inside the tuber, the grubs of rough sweetpotato weevils feed on tuber surfaces, severely damaging their appearance and reducing marketability (Fig. 2). We investigated efficacy of five treatments that included four insecticides (Sevin, Belay, BotaniGard, Provado) and a control on a field trial laid out in a randomized complete block design (RCBD) with 4 replications. Insecticidal treatments showed statistically significant differences (P<0.01) in percent of all damaged storage roots (Fig. 4). Plots treated with Sevin or Belay had significantly lower percent of damaged storage roots compared to the other three treatments when plots were harvested 4.5 months after planting. A similar trend was observed when severity of the damage on the storage roots was assessed visually. Both Belay and Sevin had fewer percent of storage roots with high damage compared to other three treatments (Fig. 5). Harvesting was done relatively early compared to commercial cultivation of sweetpotato in the region because of concerns about efficacy of the treatments for prolonged duration. A second field trial has confirmed these preliminary results. Further research is planned to streamline the applications of insecticides based on the biology and life cycle of rough sweet potato weevil.

Figure 1. Adult rough sweetpotato weevil, *Blosyrus asellus* (Olivier) (Coleoptera: Curculionidae). (Photograph courtesy of Grant McQuate, USDA)

Figure 2. A: low damage by rough sweetpotato weevil (RSW). B: medium damage by RSW. C: high damage by RSW.

MATERIALS AND METHODS

Cuttings of sweetpotato cultivar 'Okinawan' were planted on 1 April 2015 at Pepe'ekeo, Hawai'i Island, in a field with a history of past RSW infestation. Each plot contained 30 cuttings spaced 1 ft (0.3 m) apart in 30-ft (9.1-m) planting beds spaced 5 feet (1.5m) apart (Fig. 2). The five treatments were repeated four times in a RCBD:

1. Belay 16 WSG
   (Clothianidin; Valent U.S.A. Corp., Walnut Creek, CA)
2. Sevin XLR Plus
   (Carbaryl; Bayer CropScience, Research Triangle Park, NC)
3. Provado 1.6 Flowable Insecticide
   (Imidacloprid; Bayer Crop Science Research Triangle Park, NC)
4. BotaniGard ES
   (*Beauveria bassiana* strain GHA; Laverlam Int'l Corp., Butte, MT)
5. Control

Belay was applied once before planting as a soil drench at the rate of 12 fl. oz./acre. Sevin was applied at the rate of 2 quarts/acre at 15, 45, 75, and 105 DAP. Provado was applied at the rate of 3.5 fl. oz. per application at 30, 60, and 90 DAP. BotaniGard, an organic bioinsecticide, was applied at the rate of 40 g/3 gal. of water per application as a soil drench on each 30-foot bed at 30, 60, and 90 DAP. All the treatments including control plots received 3 applications (at 30, 60, and 90 DAP) of Success insecticide (Spinosad; Dow AgroSciences, Indianapolis, IN) as foliar spray at the rate of 6 fl.oz./ acre per application to control sweetpotato vine borer [*Omphisa anastomosalis* (Lepidoptera: Pyralidae). Standard agronomic practices (fertization, soil amendmends) were followed similarly for all the blocks.

Blocks A and B were mechanically harvested on 26 August 2015 and blocks C and D on 27 August 2015. Harvested storage roots were washed and graded based on the standards for Hawai'i-grown sweetpotatoes (Dep. Agriculture, Div. Marketing and Consumer Services, Honolulu), regardless of RSW damage. These grades include Hawaii Fancy (Grade AA), Hawaii No. 1 (Grade A), and Hawaii No. 2 (Grade B). Storage roots unmarketable according to these standards were included in Off-Grade. Storage roots in each grade were closely examined for feeding damage by RSW and labelled as damaged or undamaged by RSW based on the presence or absence of feeding damage. Because of low yield in some grades and for meaningful statistical comparison, the first three grades were pooled into the "marketable" category and rest as "off-grade". Results were compared statistically for overall damage and for these two categories. The severity of damage was assessed visually on each tuber. These data were not statistically compared, because the number of tubers in these categories varied considerably, but graphically represented as an indication of treatment differences.

Figure 3. Agricultural technicians (left to right) Dayle Tsuha, Ryan Kaneko, Mary Kaheiki, and Eric Magno planting cuttings of variety 'Okinawan'.

RESULTS

After harvest at 4.5 months, the insecticidal treatments showed statistically significant differences (P<0.01) in percent of all damaged storage roots. Plots treated with Sevin or Belay had a significantly lower percent of damaged storage roots compared to the other three treatments (Fig. 4). There were no significant differences between the Sevin and Belay treatments. The other three treatments (Provado, BotaniGard, and control) had more than 40% of tubers affected by RSW. There were no significant differences among the control, Provado, and BotaniGard treatments (Fig. 4).

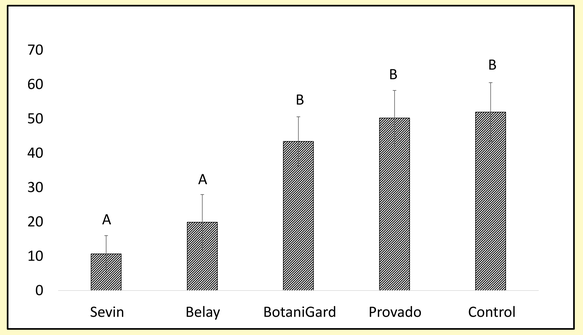

Figure 4. Percent of all storage roots with characteristic damage caused by rough sweetpotato weevil (RSW) after treatment with four insecticides and a control. Bars denoted by same letters are not significantly different.

Similar results were found when examining the percent of tubers damaged by RSW within grades (i.e., marketable or off-grade), with significant differences observed among treatments (P<0.01, P<0.01 respectively). Plots treated with Sevin or Belay had significantly lower incidence of damaged tubers (Table 1). The other three treatments had a much higher incidence of damage within those two grades and did not differ among those treatments.

Table 1. Mean ± SE of percentage of tubers damaged by RSW based on the grade of storage roots.

Treatment	RSW-damaged marketable storage roots, %	RSW-damaged off-grade storage roots, %
Sevin	10.6 ± 7.2 a	10.8 ± 4.6 a
Belay	26.2 ± 5.5 a	5.4 ± 1.6 a
BotaniGard	48.8 ± 9.5 bc	31.2 ± 7.2 b
Provado	56.8 ± 10.1 c	30.2 ± 2.1 b
Control	60.8 ± 10.1 c	25.2 ± 6.3 b

The severity of damage was assessed visually on each tuber (Figs. 2, 5). Plots treated with BotaniGard, Provado and control had more than 50% of storage roots with high damage. Plots treated with Sevin and Belay had comparatively lower incidence of highly damaged storage roots. These data were not statistically compared, because the number of tubers in these categories varied considerably. However, these data do provide an indication of the effectiveness of each treatment in controlling RSW..

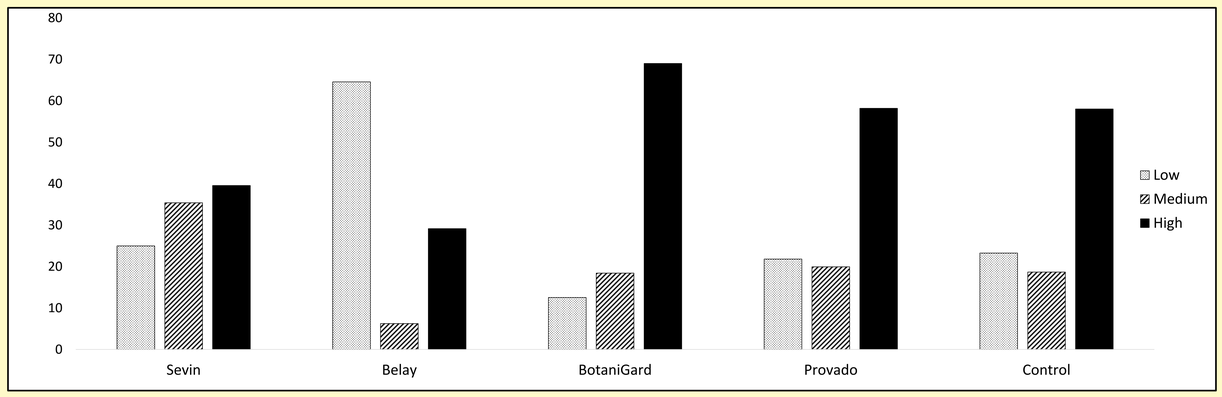

Figure 5. Percent of all storage roots having low, medium, and high amounts of RSW damage under five treatments, based on visual assessment.

CONCLUSIONS

Based on this first field trial, insecticides Sevin or Belay appear to be effective in controlling RSW. Growers might want to test these treatments to see if they are effective for RSW management under their conditions.

REFERENCES

Heu, A., D. Tsuda, S. Fukuda, C. Young, and M. Lee. 2014. New Pest Advisory. Accessed online at: http://hdoa.hawaii.gov/pi/files/2013/01/NPA-Blosyrus-MASTER.pdf.

Pulakkatu-thodi, I., S. Motomura, and S. Miyasaka. 2016. Evaluation of insecticides for the management of rough sweetpotato weevil, Blosyrus asellus (Coleoptera: Curculionidae) in Hawai`i Island. Univ. of Hawaii, Coll. Of Tropical Agr. and Human Resources, Honolulu, HI. http://www.ctahr.hawaii.edu/oc/freepubs/pdf/IP-38.pdf .

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