SWEETPOTATO: *Ipomoea* batatas (L.) Lamarck, ‘Churakoibeni’

**Efficacy of Fluxametamide for Control of Two Sweetpotato Weevil Species, 2019**

Katsuya Ichinose†

Tropical Pest Management, Kyushu Agricultural Research Center, Makabe 820, Itoman, Okinawa 901-0336, Japan, Phone: +81-988403553, Fax: +81-988403578 and †Corresponding author, e-mail: ichis@affrc.go.jp

Section Editor: Mark R. Abney

Potato (sweet) | *Ipomoea* batatas

Sweetpotato weevils (SWC) | *Cylas* formicarius F.

West Indian sweetpotato weevil (SWE) | *Euscepes postfasciatus* (Fairmaire)

This study was performed to evaluate the efficacy of three relatively new insecticides, fluxametamide, flubendiamide, and dinotefuran, for the control of serious sweetpotato weevil pests, SWC and SWE, in an experimental farm of the Okinawa Prefectural Agricultural Research Center in Itoman on the Okinawa Island, southern Japan, in 2019. A block, 29.7 m long and 19.2 m wide, was set there and 24 ridges were made along the longer side at an interval of 0.8 m. Slips of sweetpotato cultivar ‘Churakoibeni’ were planted at a 0.3 m spacing on each ridge on 14 Jun 2019, and 36 plots of the same size, 4.8 by 3.3 m, were distributed in the block. Each plot was consisted of six ridges, on each of which 60 plants were present. Six treatments were randomly assigned to the 36 plots, six replicates in each treatment: untreated check as control and the application of chlorpyrifos (Nissan Chemical, Tokyo, Japan), cytraniliprole (FMC Chemicals, Tokyo, Japan), flubendiamide (Nihon Nohyaku, Tokyo, Japan), fluxametamide (Nissan Chemical, Tokyo, Japan), or dinotefuran (Mitsui Chemicals Agro, Tokyo, Japan). The efficacy of the latter three insecticides on the weevils was evaluated in comparison with the former three treatments, in particular focusing on the effects on the weevils. Insecticide compounds, formulations, and treatments are provided in Table 1. All insecticides except for dinotefuran are officially registered to use two to three times in one sweetpotato cultivation after planting. They were applied twice in this experiment: on 11 Aug and 5 Oct 2019. Dinotefuran can be officially used only once in one sweetpotato cultivation after planting and was applied on Oct 5 in this experiment. In these applications, chlorpyrifos in granular formulation was manually sown around the main stem of each plant on the ground and the other insecticides in liquid formulation diluted by water were sprayed by sprayers.

Since SWE naturally occurs little in sweetpotato farms in Okinawa due to the lack of their flying ability, 240 adults which had been reared on sweetpotatoes in laboratory and appeared from sweetpotato within 1 wk were released two times in each plot, equivalent to four per plant, in this experiment: 30 Jul and 9 Sept 2019. As SWC can fly over several kilometers in one flight, on the other hand, they were left to invade the experimental field naturally. Four plants were randomly selected in each plot and their whole root system was collected on 16 Nov 2019. Tubers ≥ 50 g and the rest of the root system in each plant were weighed at a precision to 0.1 g individually, and then they were dissected to collect and count all infesting weevils in all developmental stages except for egg for each species. Holes made on the root surface when adults had emerged were counted before the dissection, although the species could not have been identified. This could have made the total number of weevils in a given plant larger than the sum of SWC and SWE.

The efficacy of insecticide treatments was assessed by ANOVA and Tukey’s HSD tests (*P* = 0.05) applied on the number of weevils infesting the root and the proportion of the weight of weevil-injured roots to that of the entire root system of the plant. In these analyses, the weevil number, root weight, and injury proportion were transformed in square-root, natural logarithmic, and the root-square arcsine, respectively. All means in this report were calculated on non-transformed data (Table 2).

Weights of root yield per plant were not significantly different among treatments, although there were more than two times difference in the means, smallest in chlorpyrifos and largest in fluxametamide (Table 2). The occurrences of and tuber damage by both SWC and SWE were all significantly different among treatments. SWC detected significantly fewer in chlorpyrifos, cytraniliprole, and fluxametamide treatments than in the other treatments, among which no significant differences were detected. SWE were fewest in cytraniliprole, followed by chlorpyrifos and fluxametamide. There were no significant differences between the latter two. Although these two treatments were not significantly different in this weevil...
occurrence from untreated check, flubendiamide and dinotefuran, they were also not significantly different from cyantraniliprole. The sum of all weevils found in the root was not significantly different among chlorpyrifos, cyantraniliprole, and fluxametamide, and these three were significantly different from the rest three treatments. Tubers in fluxametamide were damaged by SWC, SWE, and both weevils significantly less than those in all the other treatments. Therefore, fluxametamide was as effective on the control of both weevil species, SWC and SWE, as chlorpyrifos and cyantraniliprole. In contrast, flubendiamide and dinotefuran were much less efficacious than these two insecticides and accordingly are not practical for the control of these two weevil species.

Table 1.

| Treatment Insecticides | Formulation | Content (%) | Dilution in water | Quantity/plot | Application frequency/ mode |
|------------------------|-------------|-------------|-------------------|---------------|-----------------------------|
| Untreated Check        | ---         | ---         | ---               | ---           | ---                         |
| Chlorpyrifos           | Granule     | 3.0         | ---               | 95.0 g        | 2/sprayed                   |
| Cyantraniliprole       | Liquid      | 10.3        | 4,000             | 4.75 liters   | 2/sprayed                   |
| Flubendiamide          | Granule     | 20.0        | 4,000             | 9.50 liters   | 2/sprayed                   |
| Fluxametamide          | Liquid      | 10.0        | 3,000             | 7.13 liters   | 2/sprayed                   |
| Dinotefuran            | Granule     | 20.0        | 2,000             | 4.75 liters   | 1/sprayed                   |

*Chlorpyrifos in granular formulation was applied, not dissolved in water.

1Chlorpyrifos is registered to apply in 60 kg per hectare. The size of plot in this study was 4.8 by 3.3 m, and 95.04 g equivalent to the officially registered dose was applied around the stem of 60 plants in the plot for this insecticide treatment.

Table 2.

| Treatment/formulation | Yield† | Weevils/plant‡ | Injury proportion (%)‡ |
|-----------------------|--------|----------------|------------------------|
|                       | g/plant| SWC     | SWE  | All | SWC | SWE  | All |
| Untreated Check       | 152.4  | 4.3a    | 7.0a | 14.2a | 32.8a | 67.4a | 88.8a |
| Chlorpyrifos          | 80.6   | 0.3b    | 1.5ab| 2.7b | 10.6ab| 34.5ab| 51.2ab|
| Cyantraniliprole      | 142.8  | 0.4b    | 0.2b | 2.7b | 19.9ab| 9.1b  | 41.3b|
| Flubendiamide         | 158.3  | 5.5a    | 3.0ab| 11.8a| 47.4a | 35.0ab| 70.5ab|
| Fluxametamide         | 189.5  | 0.06    | 2.3ab| 3.3b | 0.06  | 18.2b | 29.3b|
| Dinotefuran           | 118.1  | 0.8ab   | 6.9a | 10.8a| 18.8ab| 60.8a | 84.3a|
| PSF                   | 0.195  | <0.01   | <0.01| <0.01| <0.01 | <0.01 | <0.01|

Means within columns followed by the same letter are not significantly different; P > 0.05, Tukey’s HSD test.

†Natural logarithmically (X) transformed data used for analysis, non-transformed means shown in the table.

‡Square-root transformed data used for analysis, non-transformed means shown in the table.

§Root-square arcsine transformed data used for analysis, non-transformed means shown in the table.

This study was supported by Kyushu Agricultural Research Center.