Evaluation of Foliar Insecticides for the Control of Sweetpotato Whitefly in Zinnia, 2017*

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Section Editor: Carlos Bogran

Zinnia sp. | Zinnia elegans
Sweetpotato whitefly | Bemisia tabaci Genn.

We compared cyantraniliprole with cyclaniliprole, flonicamid, and their combination, applied foliarly, against sweetpotato whitefly on Zinnia under greenhouse conditions. Plants were individually grown in 4” diameter pots and were 12 wk and approximately 6” tall at the start of the study. Plants were maintained inside cylinder cages (12” diameter Lexan polycarbonate), ventilated on the sides, and lid with thrips-proof mesh. Plants were infested with adult whiteflies (two females/plant) 57 days prior to spraying and contained a moderate-to-heavy-mixed stage infestation. The study was a RCB design with six replicates (nine treatments) and blocked by bench within a single greenhouse bay. There were three plants per cage/replicate. Plants were watered every 2–3 days and liquid fertilized biweekly (Peter’s Excel Cal-Mag Special 15-5-15 at 50 ppm N). Treatments were applied 26 May via a hand-held spray bottle delivering a relatively fine mist at close to run-off. Plants were sprayed once per cardinal direction, applying 8 ml per square foot (89 gal/acre). All plants were treated twice to manage spider mites (Shuttle O at 9 fl oz/100 gal on 12 May and Floramite SC at 6 fl oz/100 gal on 2 June). For sampling, a mid-stem leaf randomly selected per plant was removed. Whiteflies (red-eye pupae and nymphs (crawlers to L4 stage) on the leaf underside) were counted under a dissection microscope. Assessments were made pretreatment and at 6, 13, and 20 DAT. Temperatures inside cages were 30.6°C (range 22.9–43.4°C) with approximately 13-h daylight. Plants were maintained inside cylinder cages with thrips-proof mesh. Plants were infested with adult whiteflies (two females/plant) 57 days prior to spraying and contained a moderate-to-heavy-mixed stage infestation. The study was a RCB design with six replicates (nine treatments) and blocked by bench within a single greenhouse bay. There were three plants per cage/replicate. Plants were watered every 2–3 days and liquid fertilized biweekly (Peter’s Excel Cal-Mag Special 15-5-15 at 50 ppm N). Treatments were applied 26 May via a hand-held spray bottle delivering a relatively fine mist at close to run-off. Plants were sprayed once per cardinal direction, applying 8 ml per square foot (89 gal/acre). All plants were treated twice to manage spider mites (Shuttle O at 9 fl oz/100 gal on 12 May and Floramite SC at 6 fl oz/100 gal on 2 June). For sampling, a mid-stem leaf randomly selected per plant was removed. Whiteflies (red-eye pupae and nymphs (crawlers to L4 stage) on the leaf underside) were counted under a dissection microscope. Assessments were made pretreatment and at 6, 13, and 20 DAT. Temperatures inside cages were 30.6°C (range 22.9–43.4°C) with approximately 13-h daylight.

Mainspring (cyantraniliprole) performed best overall (Tables 1 and 2). Significant reductions from controls were detected in wk 2 for both whitefly nymphs and red-eye stages. There was a clear numerical whitefly reduction in Mainspring treatments in wk 3 (i.e., 86 and 56% reduction in nymphs at the high and low rates, respectively, compared with controls); however, no significant treatment effects were detected. The lack of statistical effects between Mainspring and controls in wk 3 was likely due to the high variance in whitefly reproduction (i.e., new crawlers and young nymphs), following a decline in foliage quality among some control plants. The lack of treatment effects in wk 1 may reflect the time required for insects to acquire a lethal dosage and symptoms to become clear, since dead nymphs remained attached to the leaves. There was some evidence that Mainspring was less effective at the low (4 oz) rate, i.e., based on different statistical separations when compared with some other treatments.

The cyclaniliprole-numbered compound (IKI-3106 50SL) plus flonicamid (IKI-220 1000D) combination significantly reduced red-eye stages in wk 2, although only at the medium (11.7 fl oz) rate. This treatment numerically (but not statistically) reduced nymphs in wk 2 and 3, with the lowest rate (9.4 fl oz) apparently less effective. Flonicamid only treatments (Beleaf and IKI-220 1000D) did not statistically reduce whitefly nymphs, although there was a trend for fewer nymphs in wk 2 and 3. The lack of statistical significance among these additional treatments may have been influenced by the high variability in control plants noted above.

In conclusion, Mainspring was the most effective treatment. Treating plants at an earlier stage of infestation would probably improve control obtained. Product labels for these compounds call for application to be made prior to establishment of high pest pressure, with reapplication as needed. These registered tested materials have translaminar and systemic activity and can be applied as a soil drench, and via chemigation. The clearest symptoms were observed on young nymphs, whereas pupae and eggs may less susceptible, since they do not feed. The activity against different whitefly life stages would need to be confirmed experimentally.
### Table 1.

| Product formulation or compound number* | Rate product/100 gal | 23 May (Pre) | 1 Jun | 8 Jun | 15 Jun |
|----------------------------------------|----------------------|--------------|-------|-------|--------|
| IKI-3106 50SL + IKI-220SL              | 9.4 fl oz            | 26.3         | 15.5  | 45.9a | 111.1  |
| IKI-3106 50SL + IKI-220SL              | 11.7 fl oz           | 23.5         | 11.5  | 28.7abc| 39.4   |
| IKI-3106 50SL + IKI-220SL              | 17.5 fl oz           | 25.6         | 13.3  | 23.3abc| 49.3   |
| IKI-3106 50 SL                         | 16.4 fl oz           | 20.4         | 17.5  | 43.6a | 88.7   |
| Beleaf 50 SG                           | 2.85 oz              | 25.4         | 15.4  | 25.6abc| 32.5   |
| IKI-220 100OD                          | 13.7 fl oz           | 17.6         | 20.5  | 37.1ab | 72.7   |
| Mainspring GNL SC                      | 4 fl oz              | 18.5         | 13.4  | 30.7bc | 50.2   |
| Mainspring GNL SC                      | 8 fl oz              | 21.2         | 10.4  | 14.2c | 16.6   |
| Check (RO water)                       | –                    | 18.0         | 16.7  | 48.7a | 116.0  |
| ANOVA (df 8,45) P value                |                      | 0.854        | 0.855 | 0.044 | 0.201  |

*aSingle foliar application made 26 May.
*bDifferent lowercase letters indicate statistical significance, LSD at P < 0.05 (data were log (n+1) transformed).

### Table 2.

| Product formulation or compound number* | Rate product/100 gal | 23 May (Pre) | 1 Jun | 8 Jun | 15 Jun |
|----------------------------------------|----------------------|--------------|-------|-------|--------|
| IKI-3106 50SL + IKI-220SL              | 9.4 fl oz            | 5.0          | 3.8   | 2.8ab | 5.6ab  |
| IKI-3106 50SL + IKI-220SL              | 11.7 fl oz           | 5.0          | 2.1   | 0.9d  | 2.2bc  |
| IKI-3106 50SL + IKI-220SL              | 17.5 fl oz           | 4.4          | 3.0   | 0.9cd | 4.2bc  |
| IKI-3106 50 SL                         | 16.4 fl oz           | 3.5          | 3.2   | 1.2bcd| 3.7bc  |
| Beleaf 50 SG                           | 2.85 oz              | 3.2          | 3.0   | 2.5abc| 4.3ab  |
| IKI-220 100OD                          | 13.7 fl oz           | 5.9          | 3.5   | 4.3a  | 11.0a  |
| Mainspring GNL SC                      | 4 fl oz              | 4.2          | 2.3   | 0.7d  | 2.9bc  |
| Mainspring GNL SC                      | 8 fl oz              | 4.4          | 0.9   | 0.7d  | 1.8c   |
| Check (RO water)                       | –                    | 5.2          | 4.8   | 2.4abc| 4.2abc |
| ANOVA (df 8,45) P value                |                      | 0.960        | 0.221 | 0.008 | 0.041  |

*aSingle foliar application made 26 May.
*bDifferent lowercase letters indicate statistical significance, LSD at P < 0.05 (data were log (n+1) transformed).
*cThis research was supported by industry gifts of products and research funding.