Effects of material and timing for European corn borer control in snap beans

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European corn borer (ECB), *Ostrinia nubilalis*, is a sporadic pest of snap beans in eastern North America. Although ECB has a low preference for snap beans, larvae within pods are considered contaminants; this results in zero to low tolerance for this pest. Currently, the only available control methods are insecticides, with pyrethroids (especially bifenthrin) being the most commonly used materials. Applications are made one to two times per field, targeting the bloom to early pin stages of the crop, the critical period to prevent ECB larvae from boring into pods.

Another potential class of pesticides for ECB control is the diamides, which include products known for having long residual effects, unlike pyrethroids. Additionally, diamides are considered reduced risk, causing less harm to beneficial arthropods (especially bees). If diamides are shown to have long residual effects against ECB, this will allow for a reduction in applications to one per field, as well as increased flexibility in application practices. Long-lasting diamides could be tank-mixed and applied mid-season with herbicides and still be effective, or with fungicides later in the season. This increased flexibility and reduced use may somewhat offset the cost of diamide applications (~8× higher than pyrethroids). As the industry moves towards more reduced-risk pesticides, it will also be important to have replacement materials as older and less selective chemistries lose their registrations.

The objective of this study was to test field-aged residues for effectiveness of ECB control. On 25 June 2015, processing snap bean seeds treated with Cruiser 5FS and ApronMaxx were planted at a research snap bean field in Geneva, NY. Natural ECB pressure in the research field is rarely high enough to sufficiently evaluate insecticide treatments on snap bean. To increase ECB pressure, plots were infested with neonates at pod formation. In one row of each plot that had the most uniform plant stand, a 3.0 m section was infested with approximately 1,700 neonates on 7-9 August 2015.

Treatments were arranged in a crossed RCB with five replications. Plots consisted of two 3.0 m long rows, spaced 76 cm apart. Plots were sprayed a single time on either 24 July, 28 July, 31 July, or 6 August, at approximately 14, 10, 7 and 1 days before pod formation/ECB infestation, respectively. The materials tested were Belt SC, Coragen, Exirel, Besiege, and Brigade 2EC (Table 1). Belt SC, Coragen, and Exirel are diamides, Besiege is a combination diamide + pyrethroid, and Brigade 2EC is pyrethroid, serving as the “industry standard”.

Material	Active Ingredient	Chemical Class	Rate (fl oz/acre)
Belt SC	Flubendiamide	Diamide	2.0
Coragen	Chlorantraniliprole	Diamide	3.5
Exirel	Cyantraniliprole	Diamide	13.5
Besiege	Chlorantraniliprole + lambda-cyhalothrin	Diamide + pyrethroid	6.0
Brigade 2EC	Bifenthrin	Pyrethroid	3.0

Table 1. Materials tested

Immediately before ECB infestation, three leaves from each replicate were removed from the row not to be used for infestation (the less

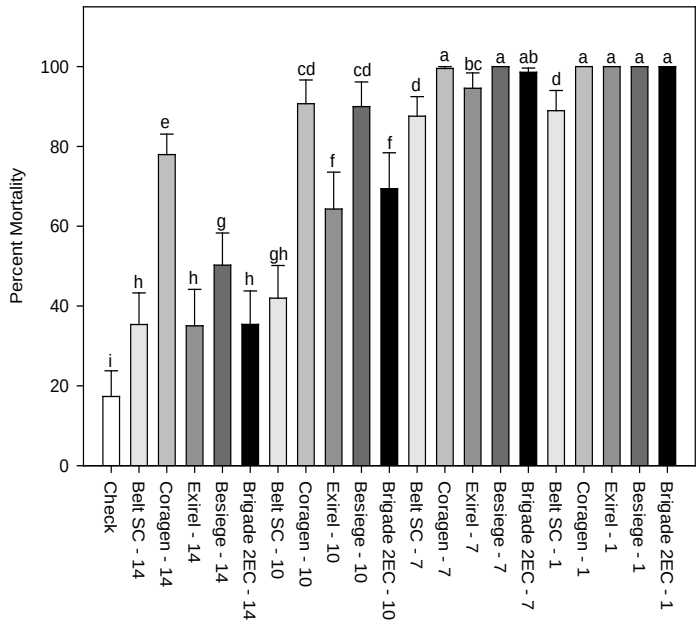

Fig. 1. Percentage ECB neonate mortality on snap bean leaves with pesticide residues of different ages in a bioassay (Pesticide – Residue age (days before pod formation)). Means with letters in common were not significantly different (P>0.05; Least squares means).

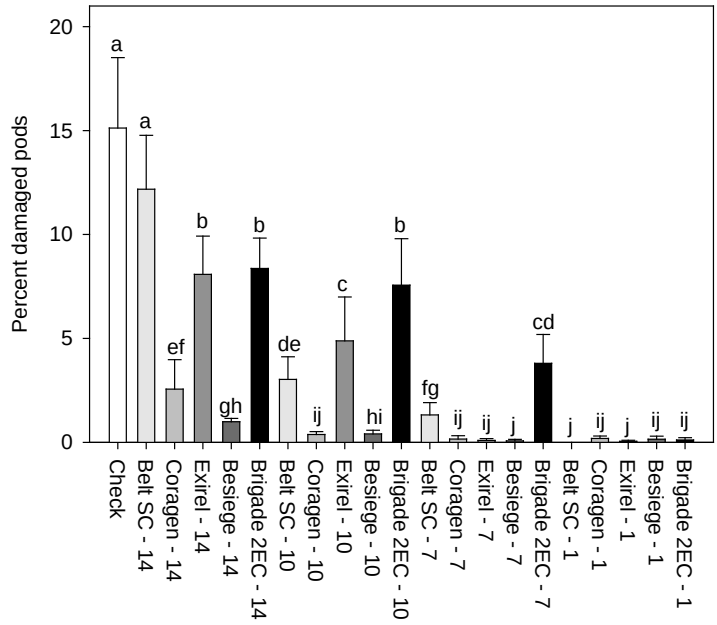

Fig. 2. Percentage pod damage in plots with pesticide residues of different ages in a snap bean field (Pesticide – Residue age (d)). Means with letters in common were not significantly different (P>0.05; Least squares means).

uniform stand). Each leaf was placed in a Petri dish and 15 ECB neonates were added. The number of alive and dead ECB were counted after 72 h.

All plants within the infested portion of each plot were sampled on 25-27 August and inspected for ECB larvae and their damage. The number of snap bean plants and market-sized pods infested/damaged and not infested/damaged by ECB larvae were recorded from each plot. Additionally, all market-sized pods from the plants not damaged by ECB were weighed.

For ECB mortality, the interaction between the material and application timing was significant so all treatments (combinations of specific materials and timings) were analyzed separately (Fig. 1). All material×timing combinations had significantly higher ECB mortality than the untreated control. All materials caused 100% mortality at 1 day after treatment (DAT), except Belt SC. At 14 DAT, Coragen caused >75% mortality and Beseige ~50% morality, while all other materials caused ~35% mortality.

The interaction between material and timing was also significant for pod damage and plant damage. Results for these parameters were similar (Figs. 2 and 3). All materials nearly completely suppressed damage at 1 DAT, but by 14 DAT, there was no difference between the untreated control and Belt SC. Exirel and Brigade 2EC gave a “medium” level of control, and Coragen and Besiege resulted in the least pod and plant damage.

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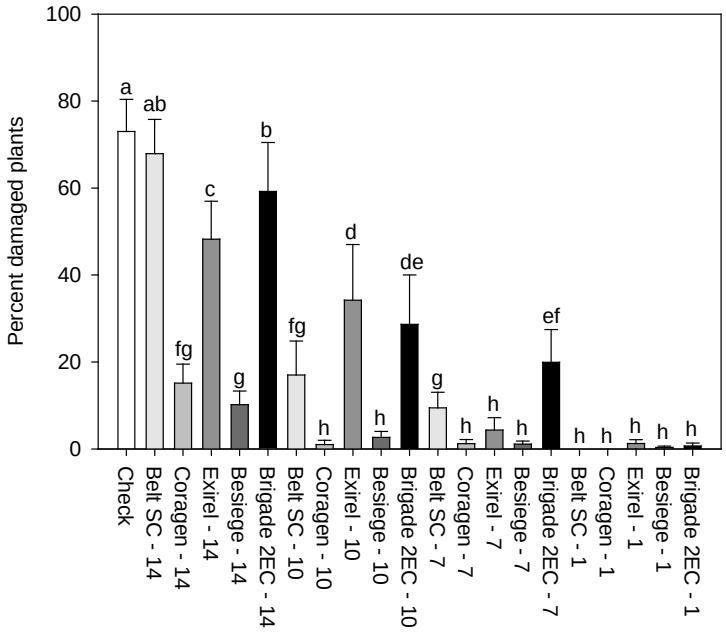

Fig. 3. Percentage pod damage in plots with pesticide residues of different ages in a snap bean field (Pesticide – Residue age (d)). Means with letters in common were not significantly different (P>0.05; Least squares means).

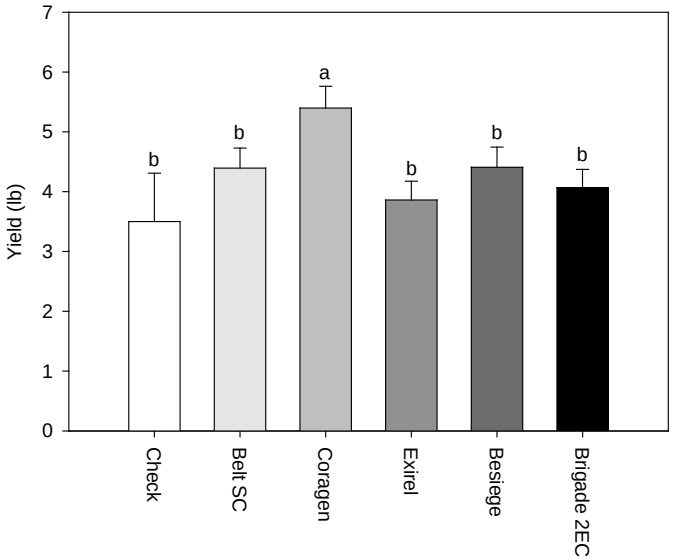

Fig. 4. Marketable yield of pods (lb) in snap bean fields with pesticide residues (residue age effect was not significant). Means with letters in common were not significantly different (P>0.05; Least squares means).

yield, and only the effect of material was significant. All materials resulted in yield equal to that of the untreated control, except for Coragen (Fig. 4). Each 3.0 m row treated with Coragen had at least 1 lb more marketable yield than the other treatments.

Based on these results, Coragen and Besiege appear to result in longer lasting residues than the other materials tested (including the industry standard) and may provide better ECB control. Their longer residuals would also allow for reduced applications (from two to one) and could provide an additional option for application timing (e.g., 7 to 10 days before pod-formation and co-apply with fungicides; possibly even 14 days before pod formation and co-apply with post-emergence herbicides). It should be emphasized that the levels of damage in this trial were unusually high due to the excessive numbers of ECB used for infestation; drastically less damage would occur in commercial snap bean fields with typical ECB levels.