Evaluation of a push-pull system for diamondback moth management, 2021

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A field evaluation tested the effectiveness of a push-pull system for managing the diamondback moth (DBM) - a key pest of brassica crops. The simultaneous use of trap and repellent plants constitutes a 'push and pull' system for insect pest management. This type of system is very effective against a number of insect pests. Many studies have examined only the single use of repellent or of trap crops against DBM. The experiment described below combines plants that have shown a degree of effectiveness either as repellent or as trap crops against the DBM.

Methods

The experiment was set at the Department of Plant Science Research and Teaching Facility, UConn and followed a completely randomized block design with 5 block replications and 5 treatments. Cabbage ('Blue Thunder') was planted in 5.2 x 8 m plots that included tomatoes as a repellent crop in combination with the following trap crops: glossy collards, red Russian kale, and upland and garden cress. Trap crops were arranged to form a 3-row perimeter around the main twelve cabbage crop rows. The tomato was planted as one row centrally located in the middle of 4 cabbage rows. Control plots consisted of only cabbage. All plants were planted with a 0.3 m spacing within the row and rows were 0.9 m apart. There was a 3 m buffer spacing between plots. Weeds were managed by hand and through mechanical cultivation.

Ten randomly selected plants (trap crop and main crop plants) from each experimental plot were sampled weekly to quantify caterpillar presence. DMB eggs were not counted because they were easy to miss. However, all caterpillar and pupal stages were recorded. Plants were numbered to minimize resampling plants within consecutive weeks. Data were collected from June 30 to September 8 but due to heavy rainfall and/or flooding, some weeks were not included in the analysis. Data were analyzed using analysis of variance (ANOVA with repeated measures) with the PROC Mixed procedure of SAS (SAS Institute, 2019).

Results

The mean number of DBM caterpillars per cabbage significantly decreased when cabbage was planted with red Russian kale and glossy collards in combination with tomatoes. The mean number of DBM per cabbage averaged over seven weeks of data collection is shown in Fig. 1. Upland and garden cress in combination with tomato had a trend for lower numbers but more work is needed to adjust the density of these plants and to tease out other plant effects. The data collected on number of DBM on trap plants is being analyzed. The reduction of DBM caterpillars per cabbage for 2 trap crops used in combination with tomatoes indicate that there is the potential to identify successful trap plants to develop a push and pull system for DMB. This experiment will be repeated in 2022.
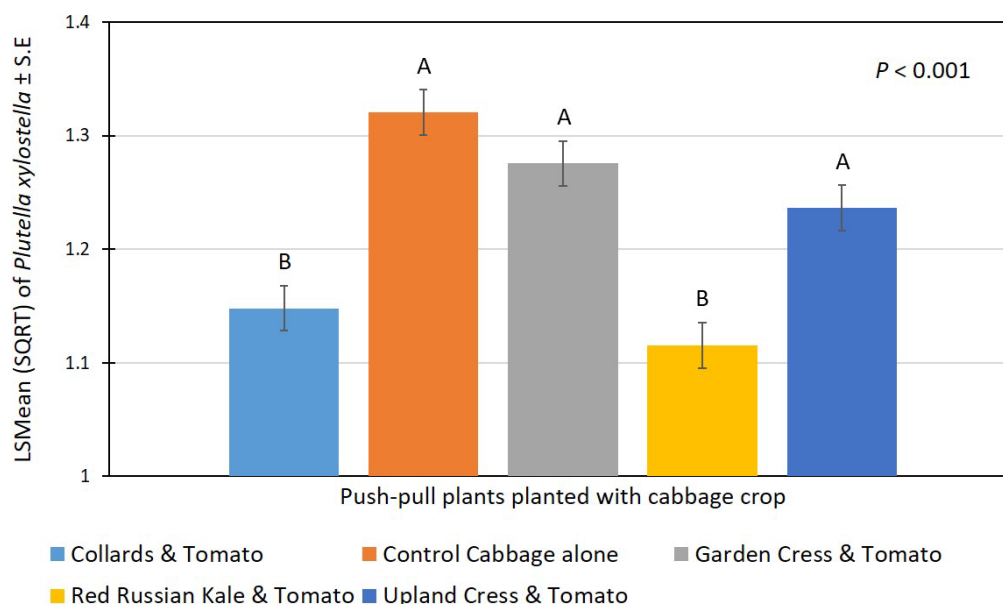
Figure 1. Mean number of diamondback moth *Plutella xylostella* per cabbage plant grown with four 'push-pull system' plant combinations. Significant treatment effects after repeated measures analysis over seven weeks and no significant time by treatment interaction. Means with a different letter are significantly different at the *P*< 0.001 level. Square root transformed data are presented. Arrunategui and Legrand, 2021 unpublished data.