

Does plastic mulch increase the soil temperature to help increase wireworm infection by *Metarhizium brunneum* in beet cultivation?

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Introduction

- Metarhizium brunneum* LRC112 has shown promise as a fungal biocontrol of wireworm
- Most infective when soil temp. > 18 °C
- Waiting for soil to warm delays spring planting
- Black plastic mulch is often used on vegetable farms to:
 - Warm soil
 - Conserve moisture
 - Suppress weeds

Objective

- Evaluate effects of *M. brunneum* and black plastic mulch on beets
- Test hypothesis that black plastic mulch promotes earlier *M. brunneum* activity and reduces wireworm feeding damage

Methods

- Study conducted on the KPU Farm in 2022
 - Potatoes grown at study site in 2021 suffered wireworm damage
- Winter cover crop incorporated on 1 June
- Randomized complete block design with six replicates and four treatments (Fig. 1)
 - 24 plots (1 m x 3.3 m, separated by 1 m path)
- M. brunneum* applied on 22 June
 - 2 bands/plot, 10 cm deep, 5 x 10¹³ conidia/ha
- Plastic mulch applied on 29 June
- Three rows of 3-week-old beet seedlings transplanted into each plot between 6 and 13 July
 - Spacing: 15 cm in-row; 30 cm between rows
- Plots irrigated as needed throughout season

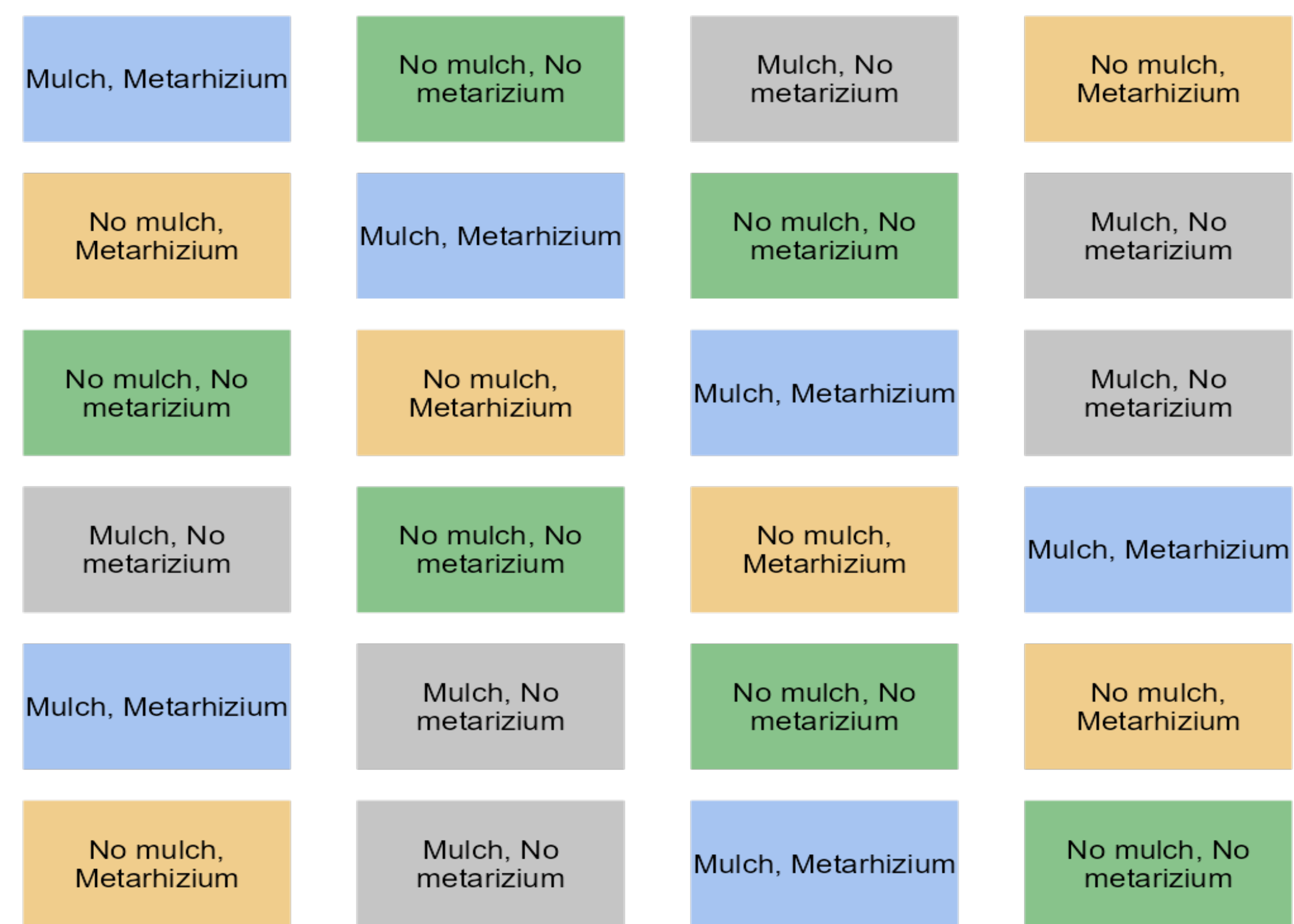


Figure 1. Treatment randomization, blocked by row. Top is north.

Beet root weight increased with the application of black plastic mulch and *Metarhizium brunneum*



Results

- Soil moisture higher in mulched than unmulched plots (Table 1; $F = 4.86$, d.f. = 1,15, $p = 0.043$).
- Beet root weight higher in mulched than unmulched plots (Fig. 2; $F = 5.30$, d.f. = 1,14, $p = 0.038$)
 - Mulch benefit only significant with *M. brunneum* (Fig. 2).
- Excellent beet survival; no wireworm damage observed
- No correlation between soil moisture and beet yield

Table 1. Soil volumetric water content (VWC) in mulched and unmulched plots of beets.

Mulch	Soil VWC \pm SE
No mulch	11.3 \pm 1.1 ^b
Black plastic	14.3 \pm 1.2 ^a

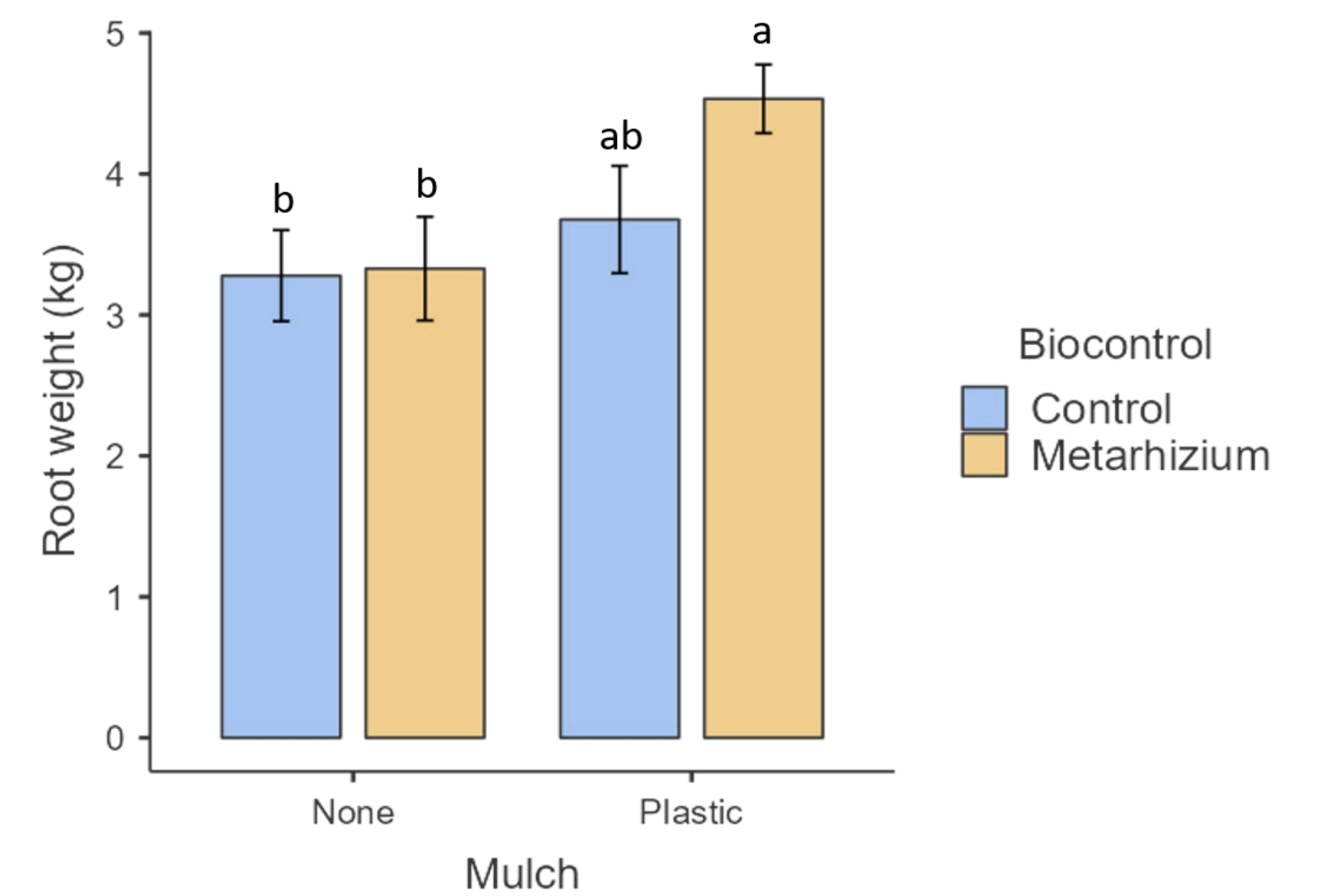


Figure 2. Weight of 10 beet roots in mulched and unmulched plots treated with *M. brunneum* (beige bars) or no biocontrol (blue bars). Error bars denote standard error around the mean. Bars labelled with the same letter do not differ significantly ($\alpha = 0.05$).

Conclusion

- Higher beet yield when *M. brunneum* applied to plots mulched with black plastic
 - No yield increase when black plastic mulch or *M. brunneum* used alone
- Supports original hypothesis but yield advantage could not be clearly attributed to reduced wireworm feeding

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