Corn gluten meal and soybean meal are useful as fertilizers, not herbicides

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Background

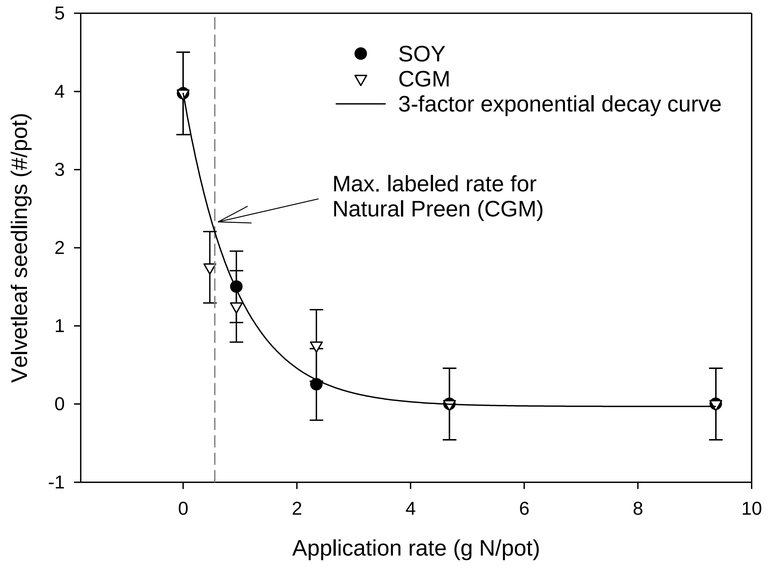
- Weed management is consistently one of the top three concerns and priorities among vegetable growers.
- Soybean meal (7-2-4, NPK) and corn gluten meal (10-0-0, NPK) are commercially available organic fertilizers that can be produced in the Midwest given local ethanol and biodiesel industries.
- Some organic fertilizers may have the potential to suppress weed germination. As organic nitrogen is mineralized by soil microbes, there is an initial burst of ammonium (NH_4^+) in near-surface soil which can be toxic to germinating weed seedlings.
- If the crop is transplanted (annuals), or already established (perennials), then it may not be negatively impacted by the high soil NH_4^+ concentrations. After several weeks, NH_4^+ will be further converted to nitrate (NO_3^-) and may supplement crop nutrition.
- Our objective was to determine application rates of soybean meal and corn gluten meal that maximize weed suppression and nitrogen availability without reducing yield of broccoli, tomato, or hop.

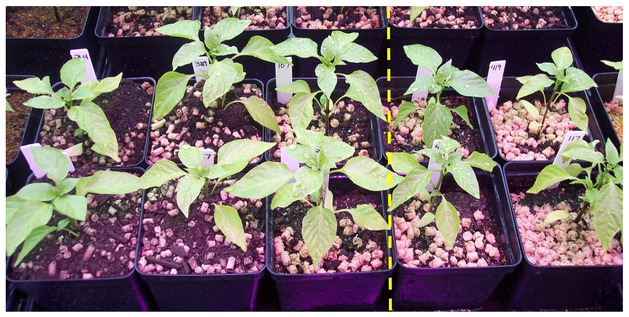
Study Approach

- Conducted greenhouse trial in 2017 and field trials in broccoli, tomato, and hop in 2017 & 2018.
- Velvetleaf and shattercane were seeded into planting hole of plastic mulch (tomato and broccoli) or around the plant (hop) prior to organic fertilizer application.
- In order to achieve 2, 3.5, and 5 g N/planting hole in tomato and broccoli, we applied 20, 35, and 50 g corn gluten meal (10% N by weight) per planting hole and 28.5, 50, and 71.4 g soybean meal (7% N by weight) per planting hole.
- Corn gluten meal was applied at a rate of 209 g/ft^2 in hops.
- Each treatment was compared against a weedy, weed-free, and synthetic fertilizer (100 lb N/acre equivalent) controls.

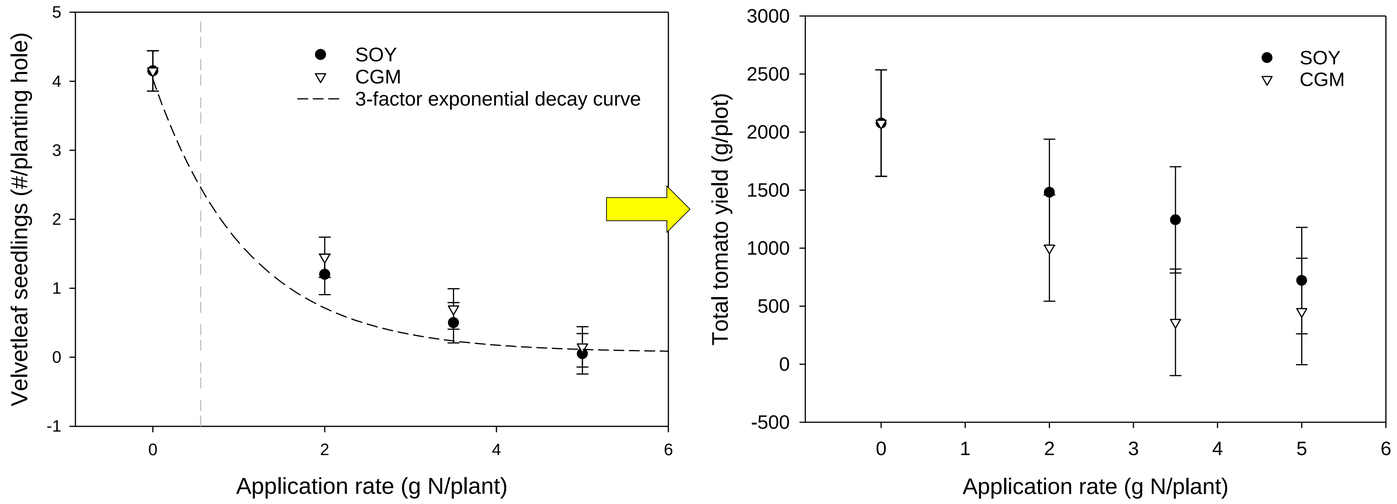
- Soil mineral N was measured continuously for 6 weeks after treatment application with ion-exchange resin membranes (PRS Probes; Western Ag Innovations).
- Measured weed density and biomass and crop yield and quality at the end of each trial.

Results

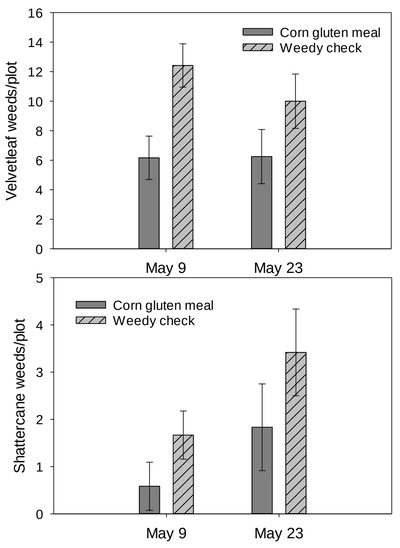


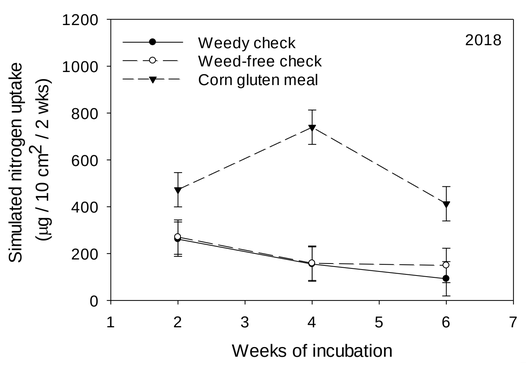


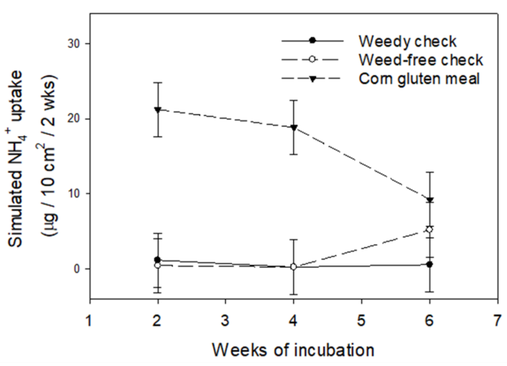
Application rates necessary to achieve >95% weed suppression in the greenhouse were 4 to 8 times greater than the maximum label rate for Natural Preen



Weed suppressive application rates of corn gluten meal (CGM) and soybean meal (SM) (≥2 g N/plant) were also "crop suppressive" rates in tomato and broccoli







Modest weed suppression (left) – likely due to ammonium toxicity – (above and right) and increased soil nitrogen (above) did not result in measurable hop yield gains

Acknowledgements

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