

EFFECTIVENESS OF CORN GLUTEN MEAL AS A NATURAL HERBICIDE

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Background

- Corn gluten meal (CGM) is a byproduct of corn (*Zea mays* L.) wet milling process
- Corn gluten meal has been proposed as a naturally-derived pre-emergent herbicide, suitable for use on organic farms
- When CGM is exposed to moisture it releases dipeptides that inhibit root formation in germinating seedlings
- As a plant food, corn gluten meal has a N-P-K ratio of 9-1-0, or 9% nitrogen by weight (eartheasy)



Objectives

- Determine effect of CGM application rate on weed germination and growth
- Determine if incorporation of CGM enhances its effectiveness



Methods

- CGM was applied at 0, 50, 100, 200, and 400 g/m² to 30 freshly-cultivated 1 m² plots arranged in a completely randomized design
- CGM was incorporated into the soil by raking after application or left on the soil surface by raking before application
- Plots were irrigated twice after treatment to stimulate germination of weeds from the existing seedbank and to release dipeptides from CGM

| Plots sampled | [CGM] I vs. U |
|---------------|---------------|
| 2 | 0 I |
| 3 | 0 U |
| 2 | 100 I |
| 2 | 100 U |
| 1 | 200 I |
| 2 | 200 U |
| 1 | 50 I |
| 1 | 50 U |
| 2 | 400 I |
| 3 | 400 U |



Picture by: Dr. Michael Bomford



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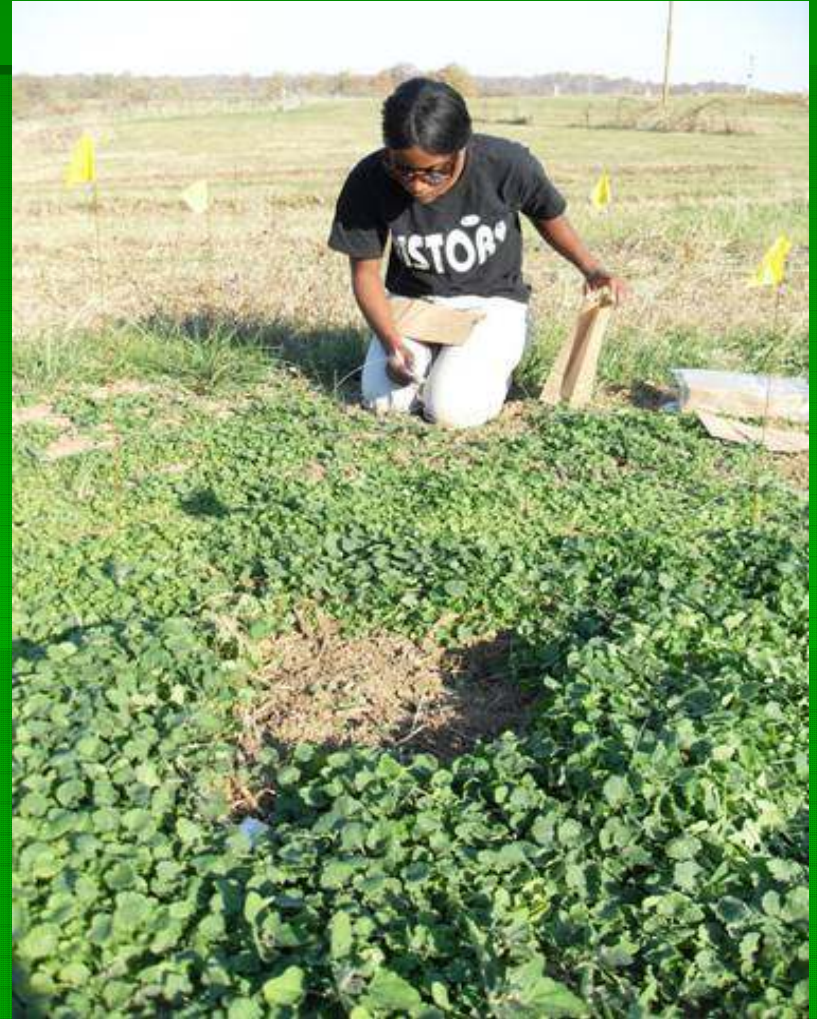
Picture by: Dr. Michael Bomford



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Methods Continued

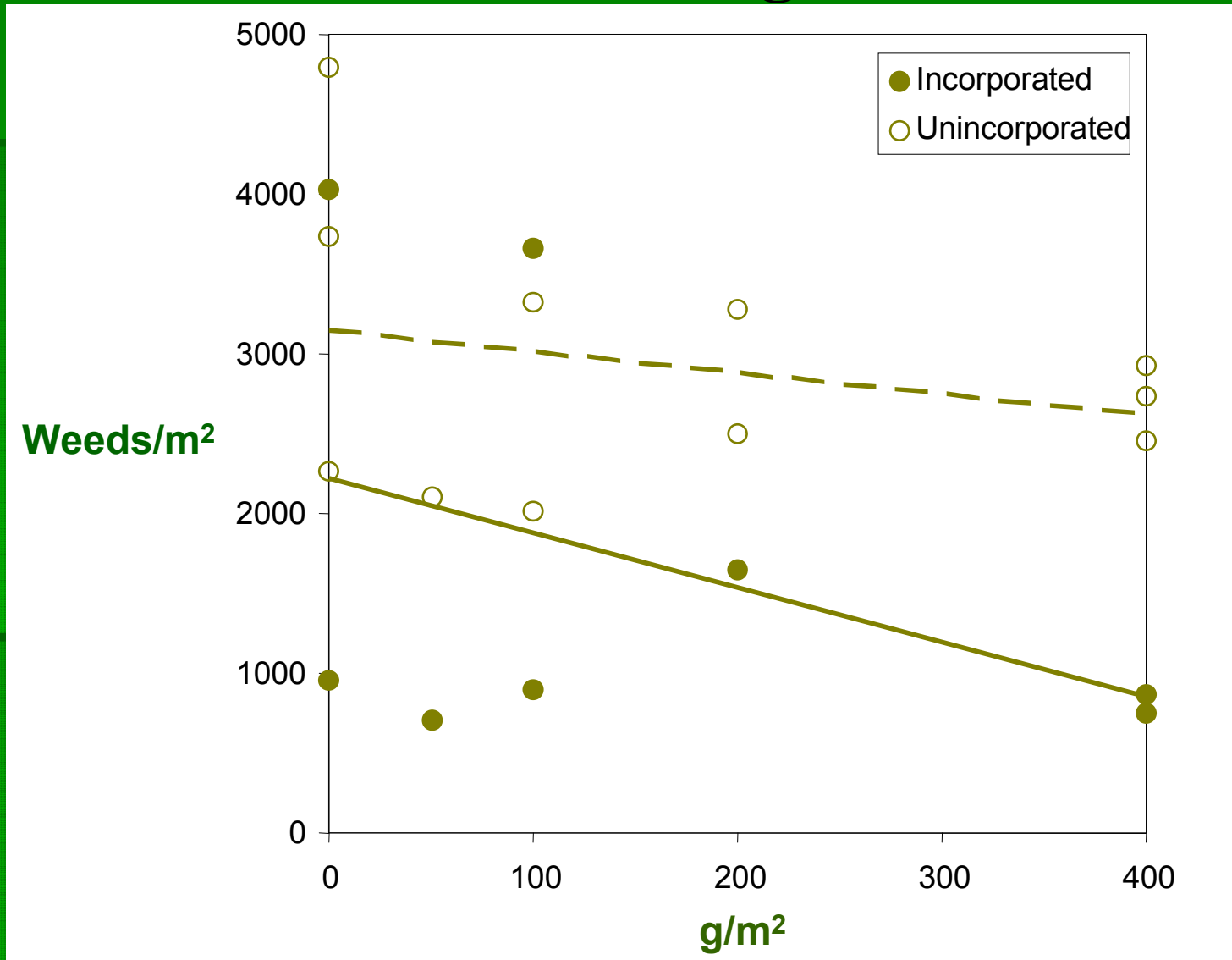
- Eight weeks after treatment all weeds from a 0.1 m² area (31.6 x 31.6 cm) in the center of 19 plots were identified, counted, dried and weighed
- Regression analysis was used to test for effects of CGM concentration and incorporation



Results

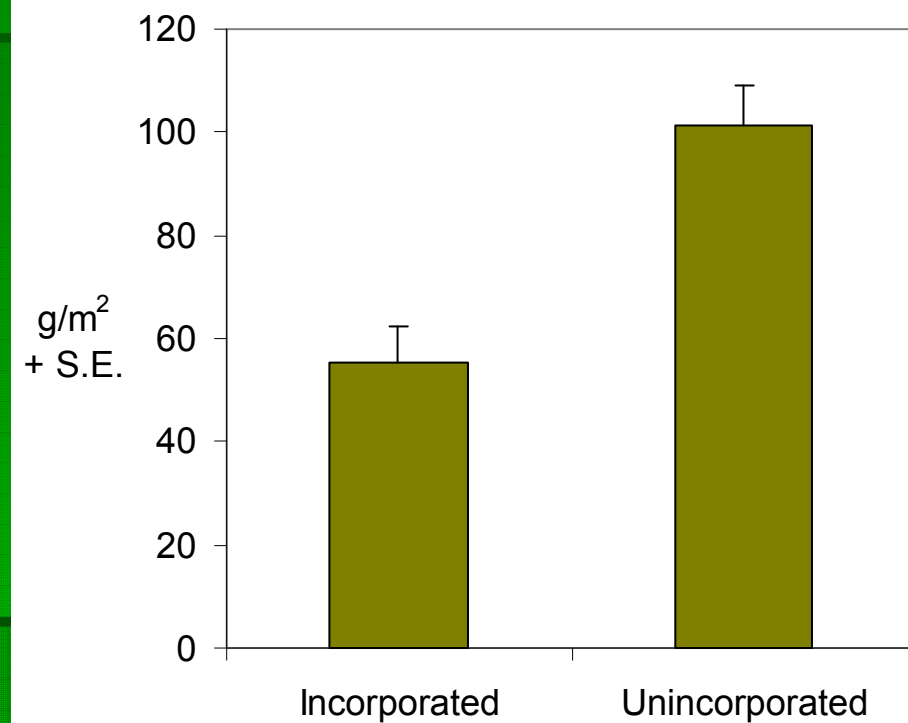
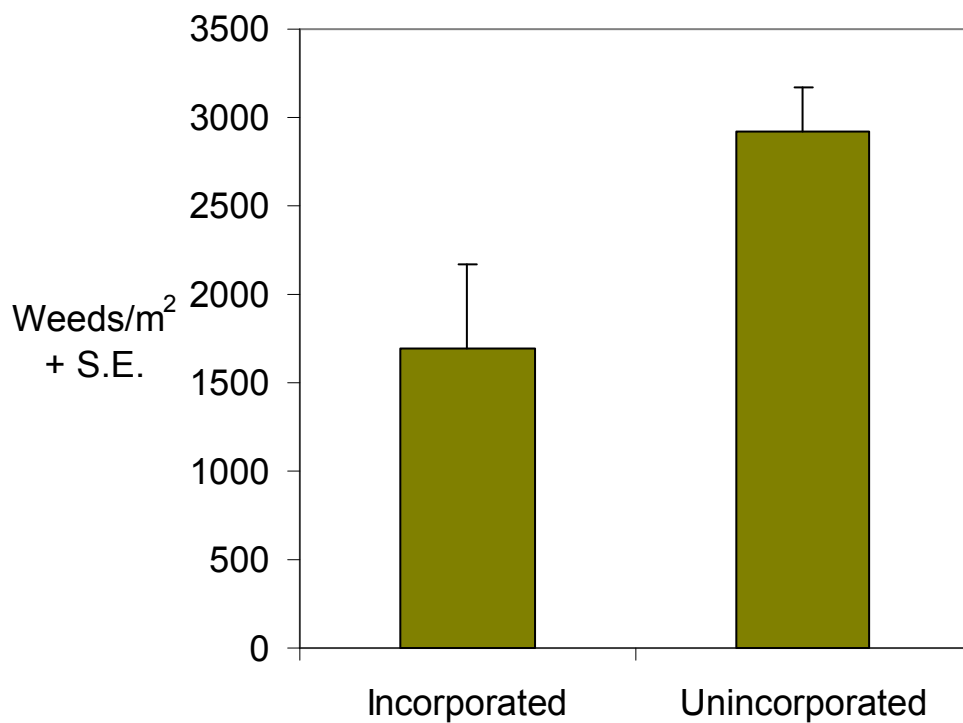
- Henbit (*Lamium amplexicaule* L.) was the dominant weed, accounting for 87% of the plants counted
- Other prominent weeds included:
 - Lambsquarters (*Chenopodium album* L.),
 - Wild garlic (*Allium vineale* L.),
 - Dandelion (*Taraxacum officinale* Weber),
 - Chickweed (*Stellaria media* Cyrill.),
 - Narrow leaved plantain (*Plantago lanceolata* L.), and
 - Canada thistle (*Cirsium arvense* L.)

Regression Analysis: Weed count at each concentration of corn gluten meal



Slopes of calculated regression lines are not significant

Results: Incorporated vs. Unincorporated



Differences significant at $P < 0.05$

Results

- CGM rate had no effect on the survival or growth of different weed species
- Soil incorporation of CGM reduced emergence by 43%, relative to unincorporated treatments ($([#U - #I] / #U)$)
- Soil incorporation of CGM reduced biomass production by 45%, relative to unincorporated treatments

Conclusion

- CGM incorporation reduced weed emergence and growth
- As the concentration of CGM increased, the amount of weeds did not decrease
- Weed control under the field conditions tested was not sufficient to recommend CGM use by organic growers as a pre-emergent herbicide

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