

Identifying and Assessing Delayed Emergence and Reduced Yield from Glyphosate Residues in Seed Potato

Identification

Symptoms of glyphosate residues in seed pieces



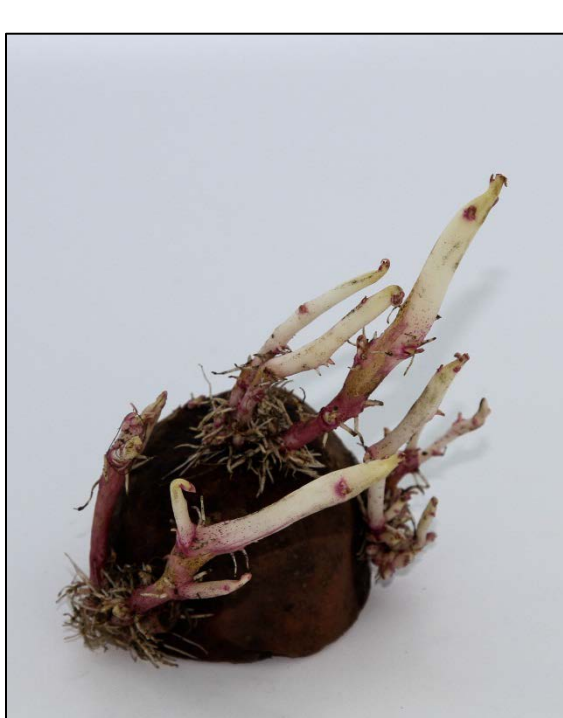
- Erratic and slow emergence



- Bending, twisting, and/or yellowing of new leaves



- Multiple shoots from a single eye



- "Candelabra" formation of shoots



- "Cauliflower" formation of shoots around eyes



- Enlarged shoots and reduced roots

Introduction

Background: Seed potato fields can unintentionally come into contact with glyphosate by physical drift, contamination of spraying equipment, inversions, or misapplication. Glyphosate translocates to the daughter tubers and can be stored there until planting the next spring. This results in delayed emergence when potato seed is planted the next growing season. Glyphosate use continues to increase because of the rapid adoption of genetically modified crops, low cost, and effective control of weeds.

Objective: The purpose of this study was to compare normally growing plants with plants affected by glyphosate residues in the seed in commercial fields.

Materials and Methods

Experimental procedure:

- Location: 3 commercial fields (North Dakota and Minnesota)
- Cultivars: Dark Red Norland, Yukon Gold, and Red Lasoda
- Glyphosate: Confirmation determined by symptomology and commercial laboratory analysis – 0.015 to 0.036 ppm glyphosate.
- 10 adjacent plants were flagged to compare a normally growing plant to a glyphosate-affected plant that was delayed in emergence by 3 weeks.
- After vine kill potato hills were hand harvested and yield and tuber number were recorded.
- Data was analyzed using the SAS MIXED procedure with field as the replication. Means were separated using Tukey's pair-wise comparison ($P \leq 0.05$).

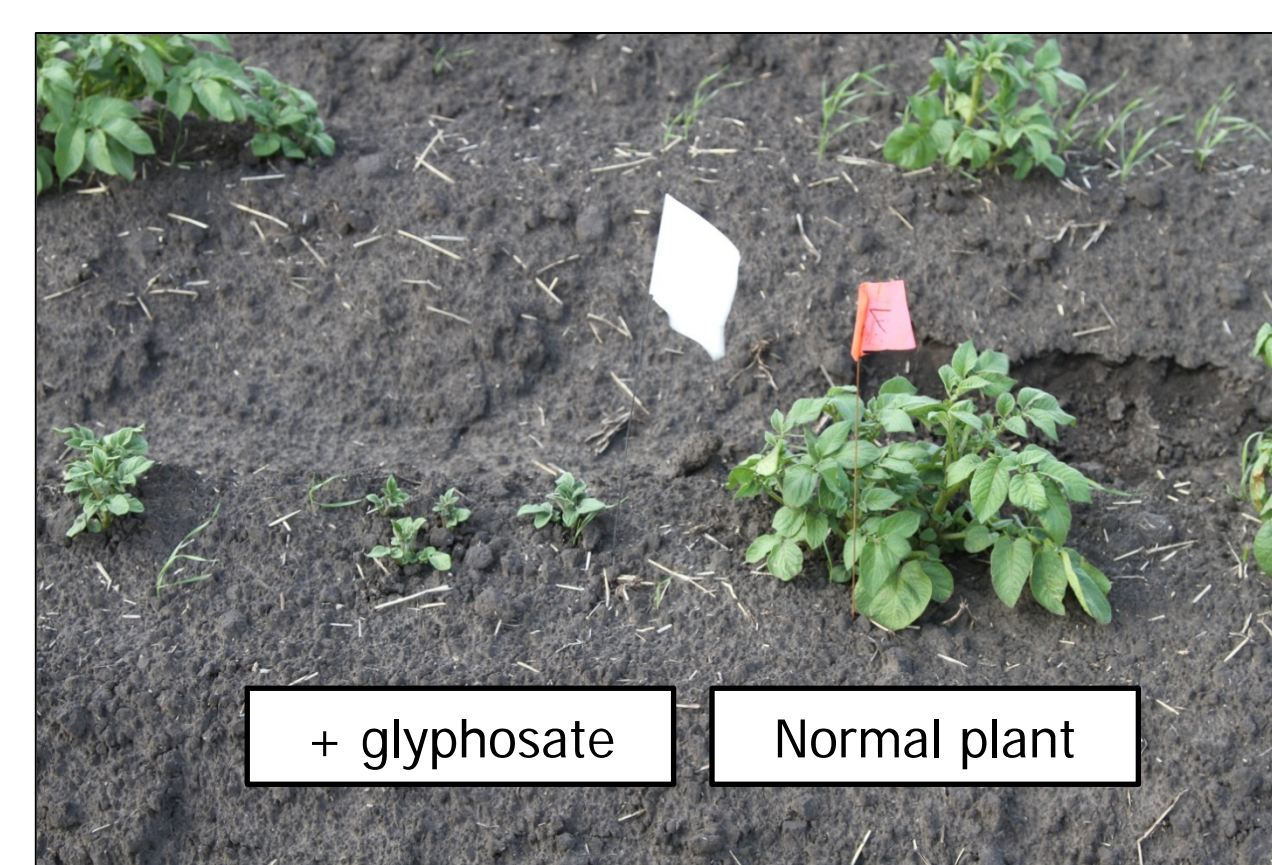


Figure 1. Plants were flagged to compare those with glyphosate residues to normally growing plants.

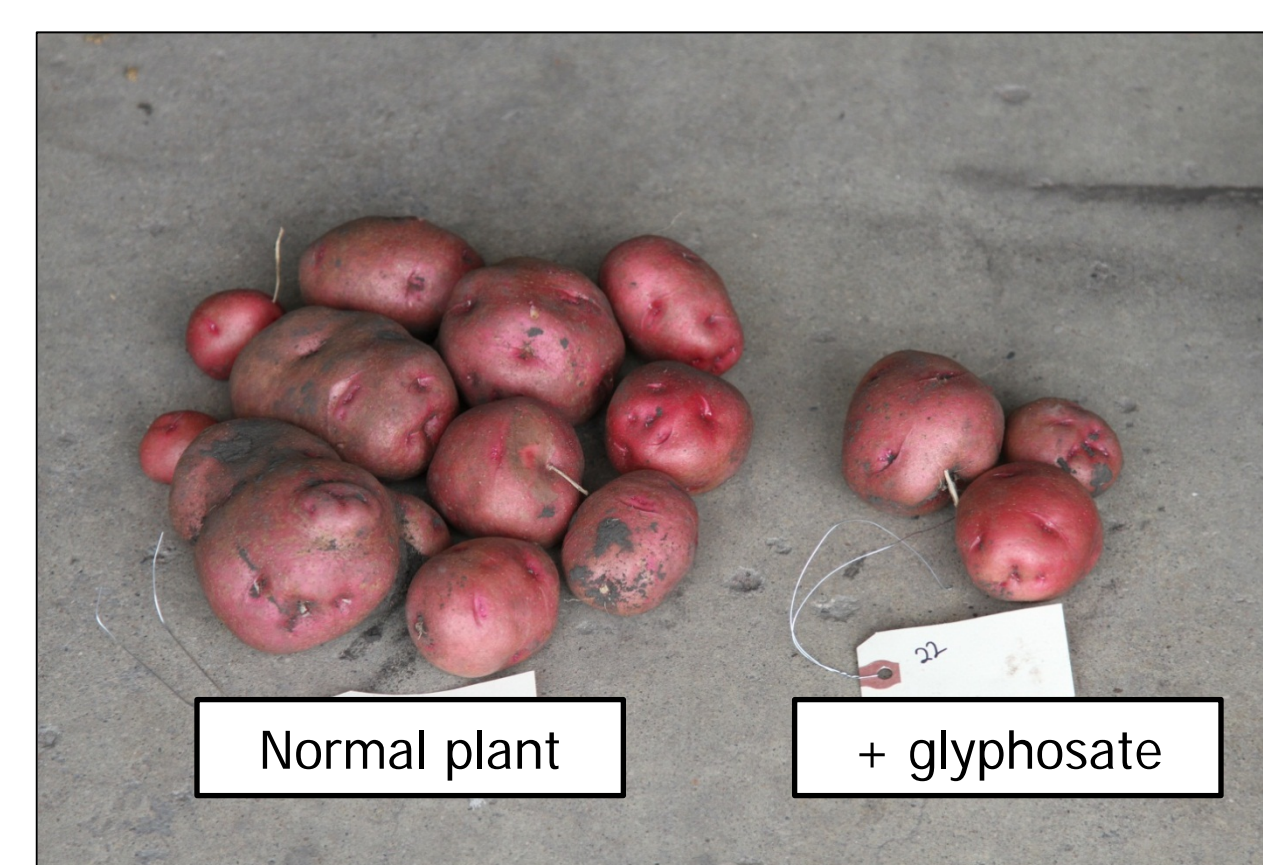


Figure 2. Effect of glyphosate residues in seed piece on tuber number and size.

Results

Seed pieces with glyphosate residues had:

- a 67% reduction in total yield (from 2.25 to 0.75 lb/hill)
- a 50% reduction in tuber number (10 to 5 tubers/hill)
- a 38% reduction in mean tuber weight (3.92 to 2.40 oz/tuber)

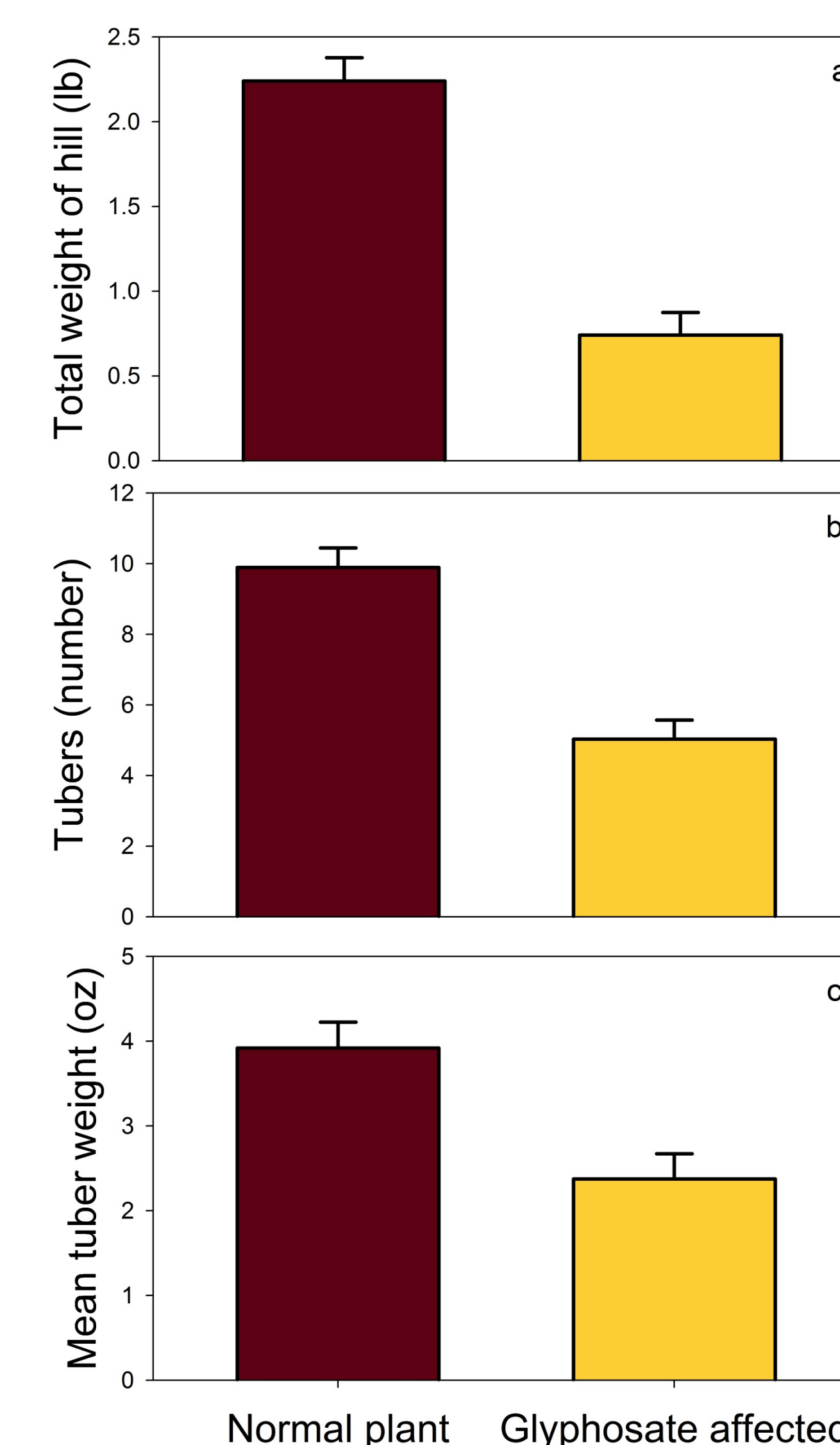


Figure 3. Effect of glyphosate residues in potato seed on a single potato hill's (a) yield, (b) tuber number, and (c) mean tuber weight. Error bars represent one standard deviation.

Summary and Conclusions

- Glyphosate levels between 0.015 to 0.036 ppm were enough to delay emergence 3 weeks and this caused a reduction in tubers and yield.
- If emergence problems exist examine the plants for symptomology of glyphosate, other herbicides, and diseases that can affect early potato growth. Contact an Extension specialist for assistance in identification.
- Samples can be sent to laboratories to verify herbicide residues or disease presence.
- Winter-tested potato seed may give an early indication of glyphosate or other herbicide residues in seed.