

Phytotoxicity of Tolerant Exempt Pesticides on *Cannabis sativa* L. Hemp Transplants

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Introduction

Prior to the 2018 Farm Bill, hemp (*Cannabis sativa* L.) was illegal to grow. Thus, few pesticides were labeled for the crop and no EPA tolerance levels had been established. In Alabama, the Department of Agriculture allowed the use of tolerance exempt pesticides; however, growers were unsure of their effects on plant yield and safety. Soft chemistry pesticides associated with tolerance exemption in some cases can cause damage to plant tissue. This is especially the case of oxidizers, soaps, and oils. The objective of this study was evaluate the safety of five commonly used tolerance exempt pesticides on hemp, *Cannabis sativa*.

Materials and Methods

This study was conducted at the Auburn University Ornamental Horticulture Research Center in Mobile, AL, in a glass greenhouse with 50% sprayable shade. Greenhouse temperature ranged from 27-38°C with humidity at 72%. Four week old transplants of *Cannabis sativa* 'Easy Girl' were grown from seed in 10 cm square pots. Plants were fertilized with an Ultrasol 20-10-20 at 200ppm N (SQM North America Corporation, Atlanta, GA.) Treatments (Table 1) were applied on July 14, 2020 at 1x, 2x and 4x the labeled rate 270 gal/acre on using a backpack CO₂ sprayer utilizing a XR TeeJet 8004VS nozzle. A second application was made at 7 days after transplanting. The plants were arranged in a randomized complete block design with 20 blocks per treatment. Plants were blocked by size. Growth indexes [(Height + Width + Width)/3] were recorded for plant height at 7 and 14 days after the first treatment (DAT). Phytotoxicity damage ratings and observations were taken at 24 hours after both first and second application. Ratings were based on the overall amount of phytotoxicity damage observed from each plant. Phytotoxicity ratings were scaled from 0 – 100%.

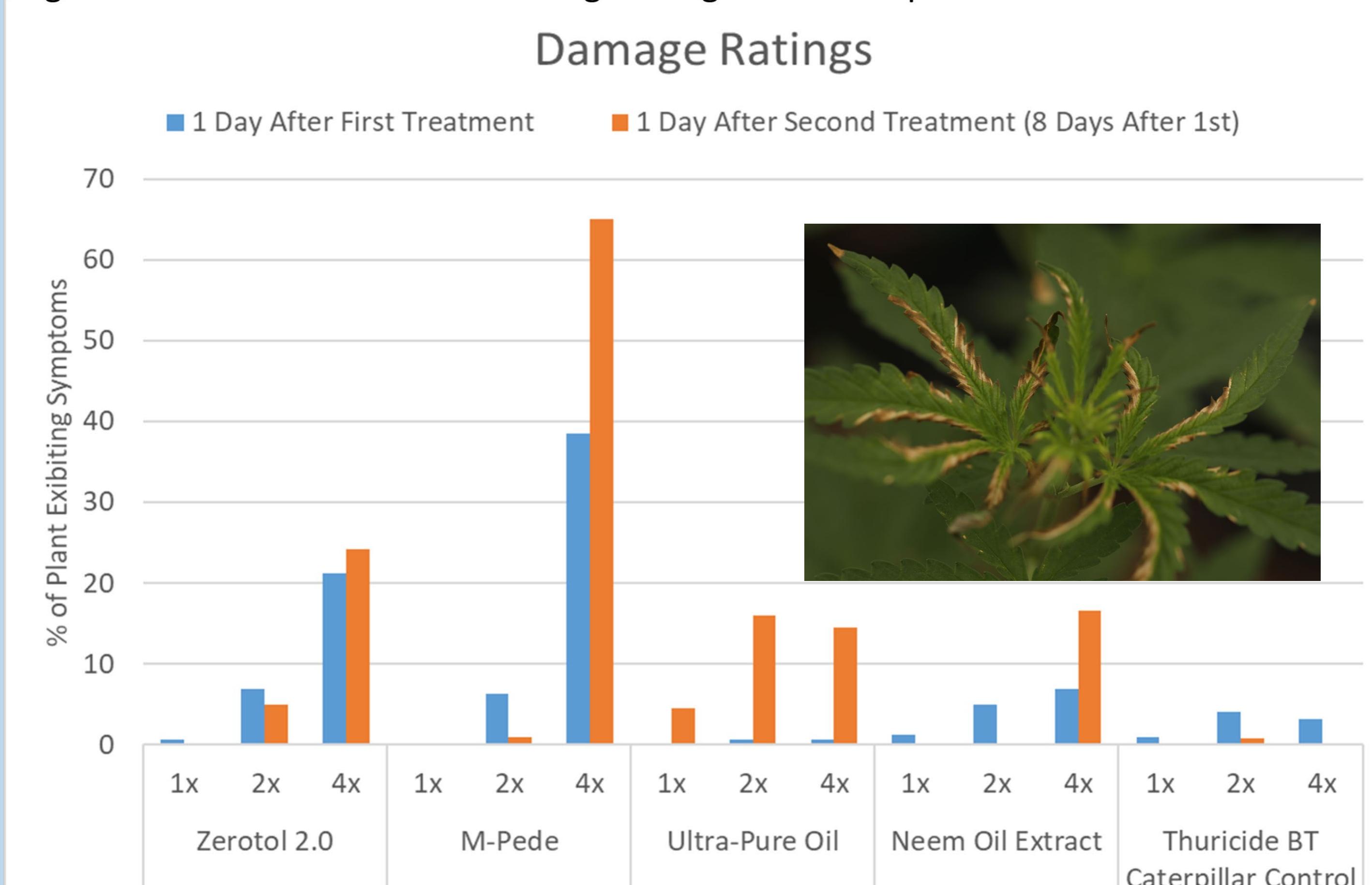
Table 1. Tolerant Exempt Pesticides Applied to Hemp at 1x, 2x and 4x the labeled rate.

Treatments	Product	AI	Rate 1x
Control	Control	Water	
Zerotol 2.0	Hydrogen Peroxide, Peroxyacetic Acid	1%	
M-Pede	Potassium salts of fatty acids	2%	
Ultra-Pure Oil	Mineral Oil	.02gal/1gal	
Neem Oil Extract	Clarified Hydrophobic Extract of Neem Oil	29.57mL/1gal	
Thuricide BT Caterpillar Control	<i>Bacillus thuringiensis</i>	.5floz/1gal	

Figure 1. Example of damage rating scale used to evaluate phytotoxicity on transplants.



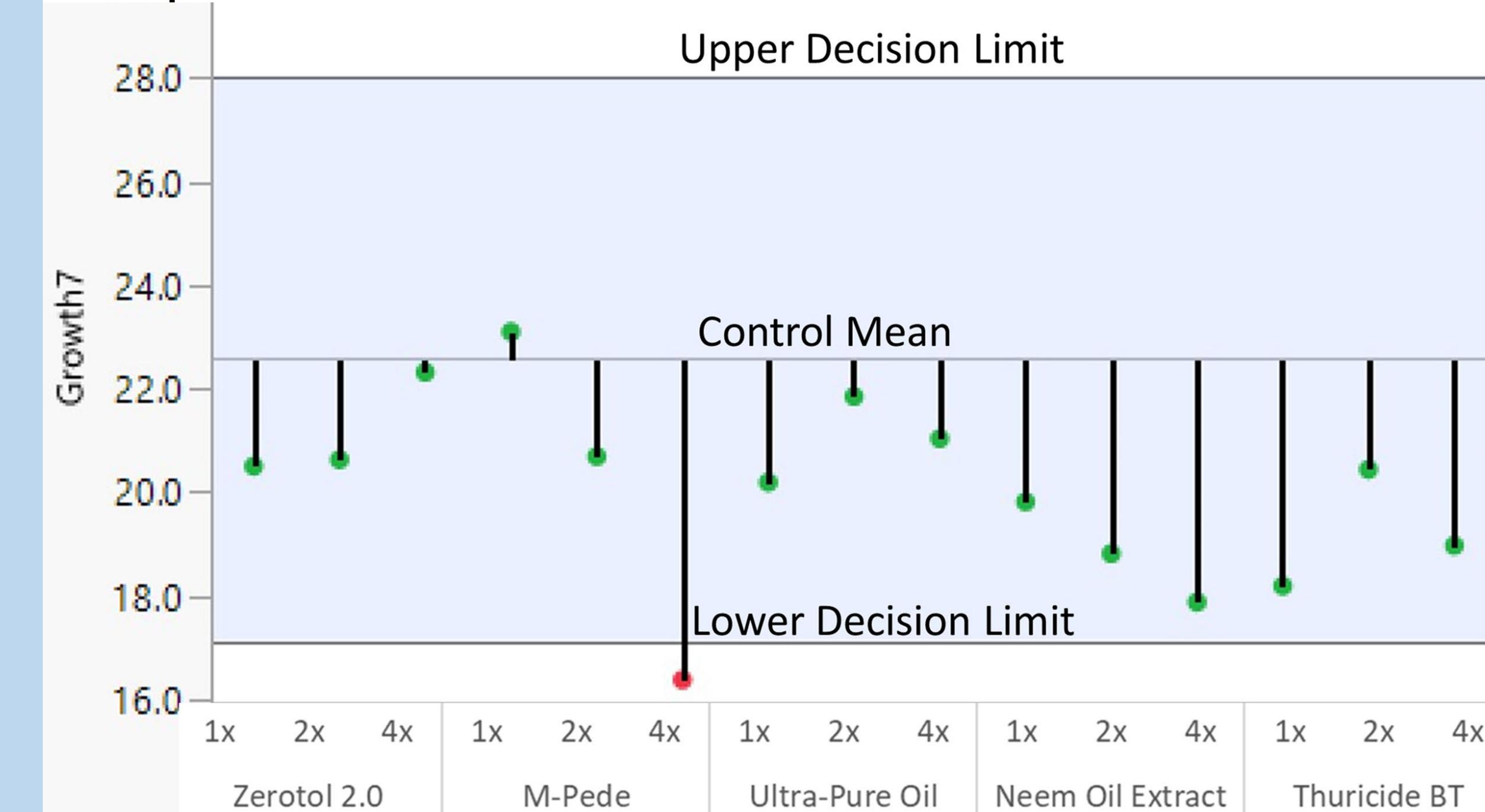
Figure 2. Treatment effects on damage ratings when compared with untreated control



Results

- M-Pede and Zerotol showed significant phytotoxicity damage at 4 times the label rate.
- Minimum damage was observed on the label rate across all treatments.

Figure 3. Treatment effects on plant growth when compared to untreated control.



Results

- Only M-Pede at 4x rate demonstrated significant reduced growth when compared to other treatments.
- Variability associated with seeds contributed to a wide span of confidence intervals resulting in inconclusive results related to growth and biomass.

Discussion

Currently, the lack of efficacy data against pest of hemp could result in growers utilizing higher than label rates to gain control over certain pest. This work demonstrates a potential for damage when exceeding label rates for Zerotol, M-Pede and Ultra-Pure Oil. Environmental factors should also be taken into account when planning applications with these pesticides. Additionally, this work provides some indication of plant tolerance of specific products. Future efficacy trials may determine that higher rates of these products are necessary for control.



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