

Estimation of Soilborne Herbicide Dose-Response Thresholds in Winter Grain Crops

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Introduction

Phytotoxicity has occasionally been observed in Australia due to soilborne herbicides being an integral part of weed management practices in winter grain crops.

For assessing plant-back risk, little information is known about the precise phytotoxicity thresholds of specific herbicides.

The objective of this study was to evaluate phytotoxicity thresholds for major grain crops grown in Western Australia by exposing them to various priority residual herbicides.

Additionally, this research will support to plan better cropping systems with less crop damage.

Approach methods

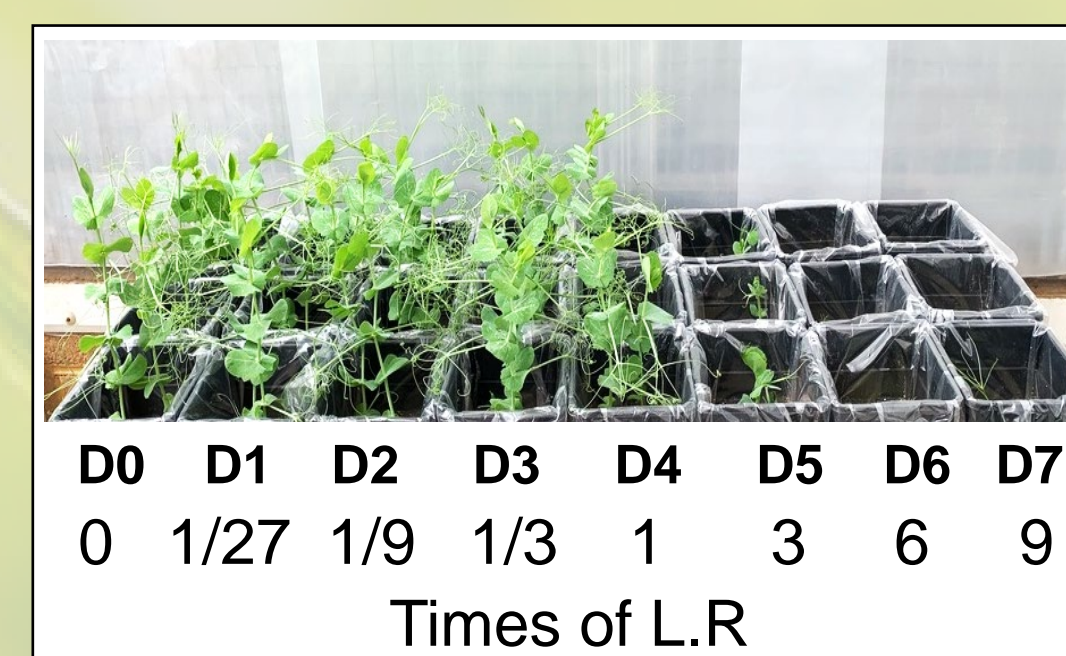
4 herbicides
(Clopyralid, Trifluralin,
Pyroxasulfone, and
Propyzamide)

Washed
sand soil

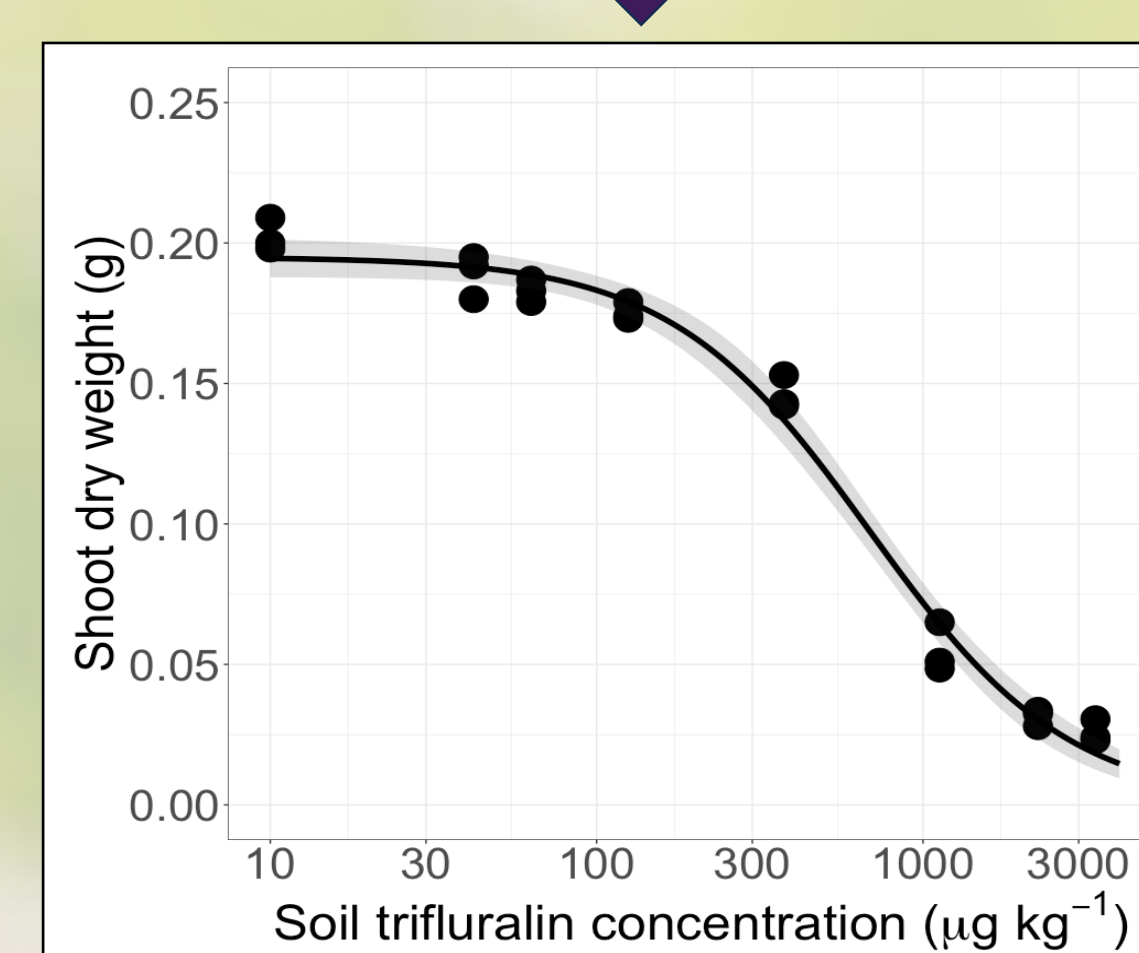
Canola, Chickpeas,
Fieldpeas, Lentil, Lupin
and Wheat

A rapid test for bio-available forms of herbicide residues (bioassays) (28 days)

- Phytotoxic thresholds at effective doses (ED)-reducing shoot and root biomass by 20 and 50% (ED20 & 50), relative to control plants



- Shoot length (Ruler)
- Root length (WinRhizo)
- Shoot & root biomass



Outcomes

- Soil residual herbicide increased risk of rotational crop phytotoxicity
- Germination of wheat was reduced by soil residual propyzamide and trifluralin
- The lowest dose of clopyralid can damage fieldpea shoot and chickpea root
- Canola sensitive to pyroxasulfone
- Propyzamide inhibited wheat growth
- Trifluralin- least phytotoxicity among 4 herbicides on all tested species
- Minimum root damage of chickpea and fieldpea at pyroxasulfone label rate
- Legumes shoot & root inhibition (40-60%) at the lowest dose of clopyralid

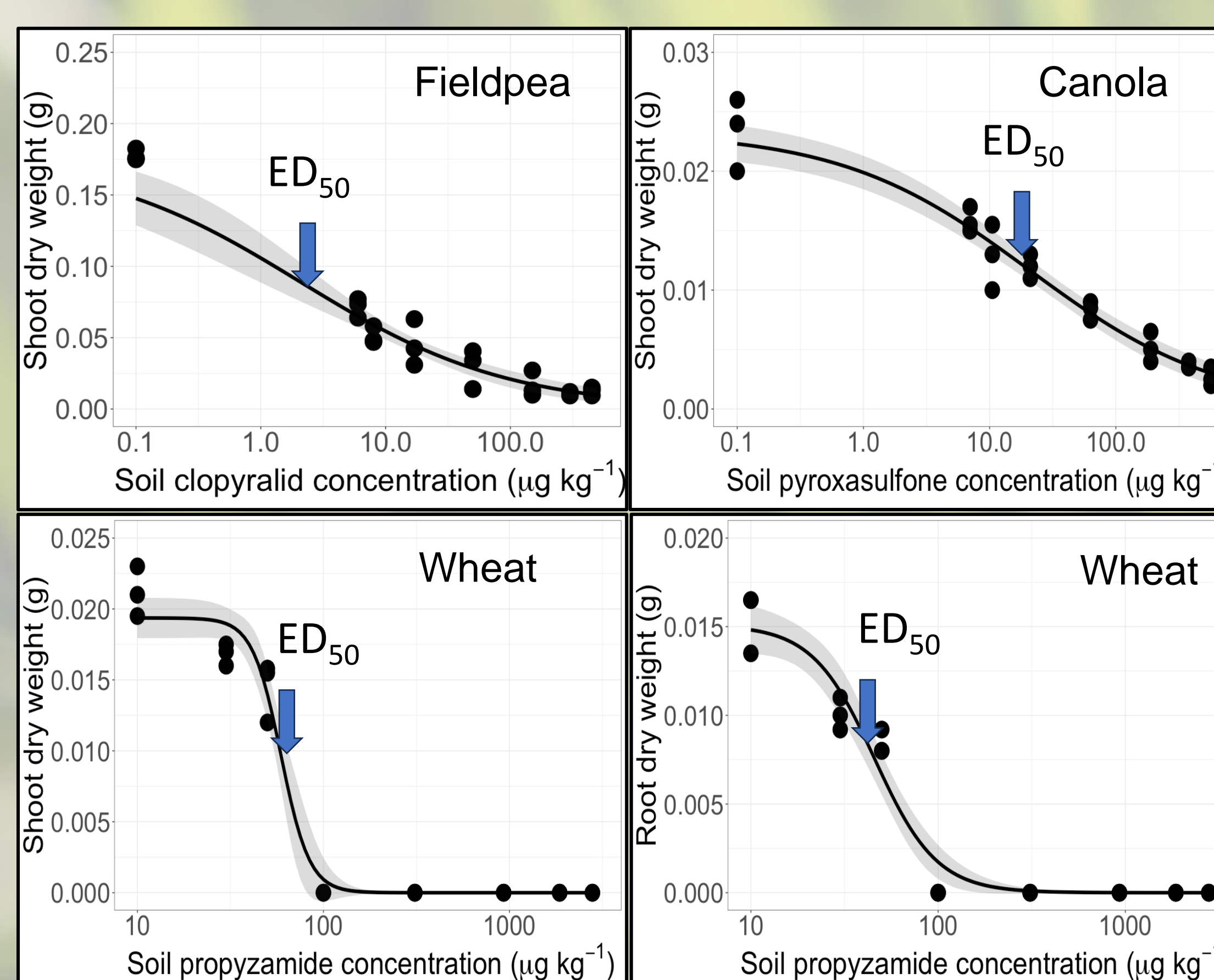


Fig 1. Dose response curves of crops shoot and root biomass against herbicides concentrations

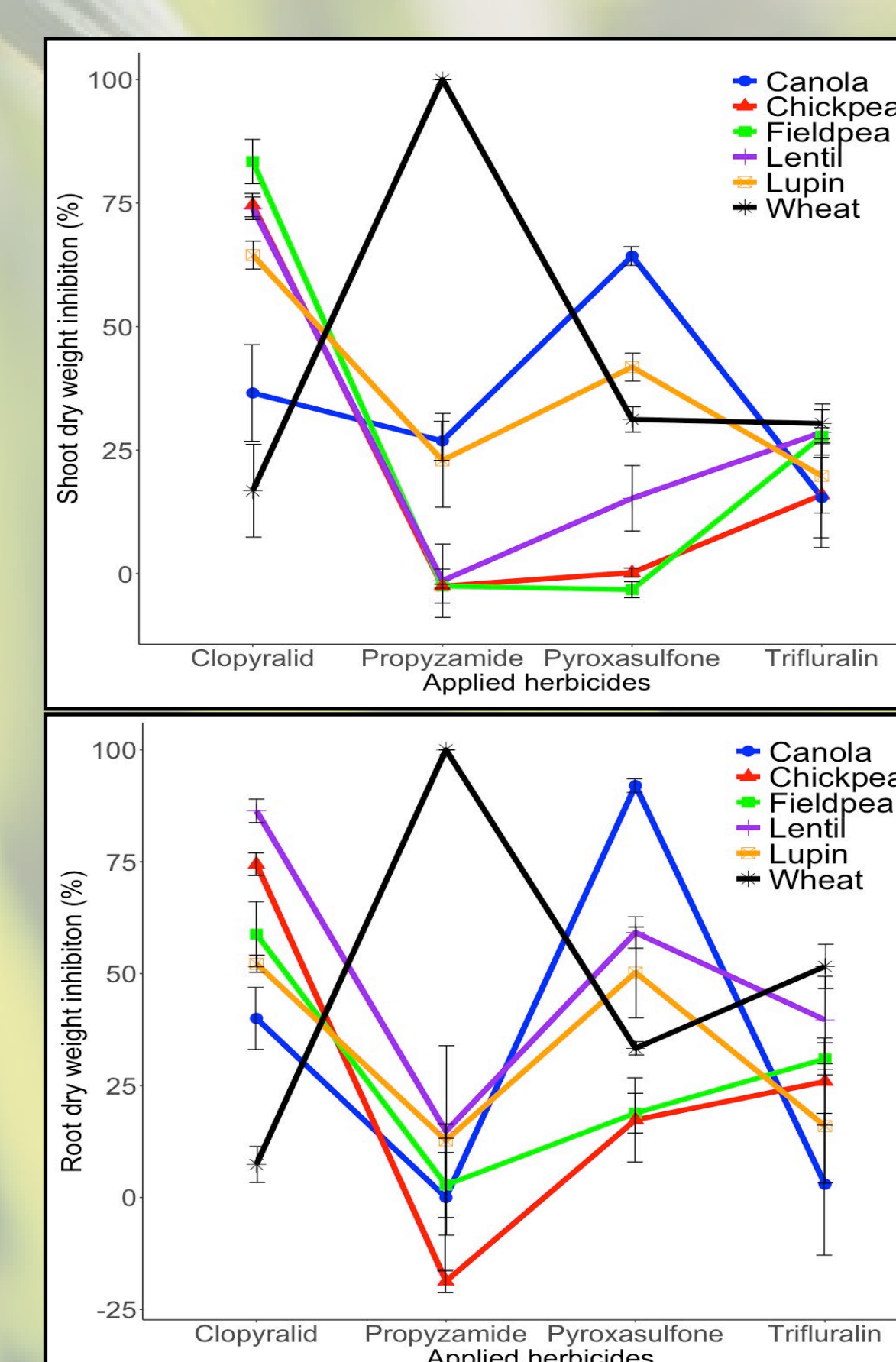


Fig 2. Crops shoot and root biomass reduction at label rates of herbicides

Conclusions

- Clopyralid, pyroxasulfone and propyzamide in the soil can affect the growth of tested crops than trifluralin
- Legume species being more sensitive to clopyralid than other crops
- Wheat was the most sensitive to propyzamide and trifluralin but tolerance to clopyralid