



## Introduction

- Arbuscular mycorrhizal fungi (AMF) can influence plant growth and plant-plant competition<sup>1</sup>.
- AMF have the potential to differently affect crop and weed growth in agricultural ecosystems<sup>2</sup>.

1. Bever et. al., (2012) *Annual Review of Microbiology*, 66:265-283.  
2. Li et. al., (2016) *Weed Science*, 60(4):642-652.

## Objectives

- Quantify the relative contributions of AMF, soil properties, and crop productivity to weed competition intensity *in situ*.

## Methods

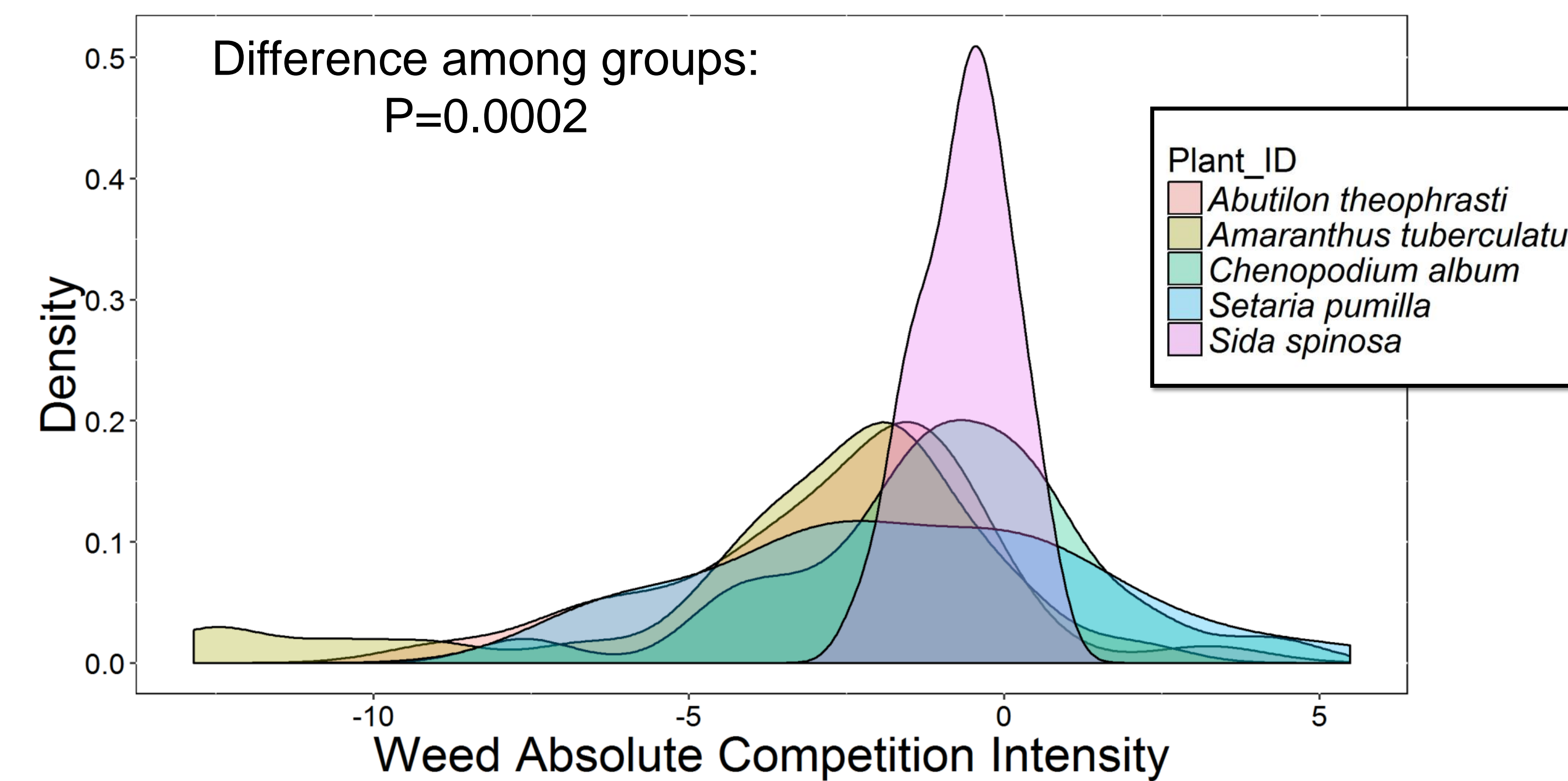
- Split-plot design:
  - Main plot factors:
    - Tillage: ridge till / chisel plow
    - Cover crop: no rye / rye
  - Subplot factors: 5 weed species  
*Abutilon theophrasti*, *Sida spinosa*, *Setaria pumilla*, *Amaranthus tuberculatus*, *Chenopodium album*



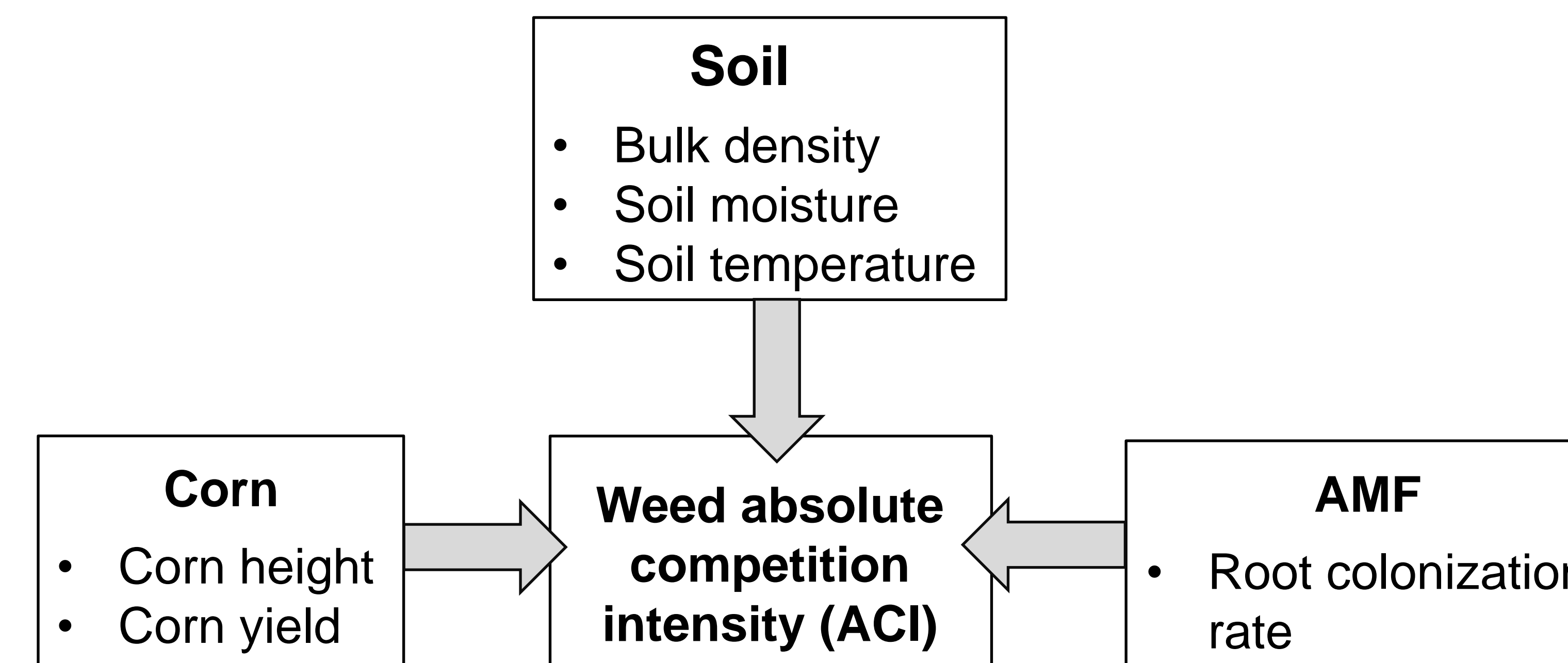
- **Weed absolute competition intensity (ACI)** = Biomass(Mix)-Biomass(Mono)
- AMF root colonization rate
- Soil properties: bulk density, soil temperature, soil moisture
- Corn height, corn yield
- Structural equation models

## Results

- 1. The intensity of weed competition with corn varied significantly among weed species.
- *Sida spinosa* had the highest intensity of competition and the smallest range of variation, compared to other species.

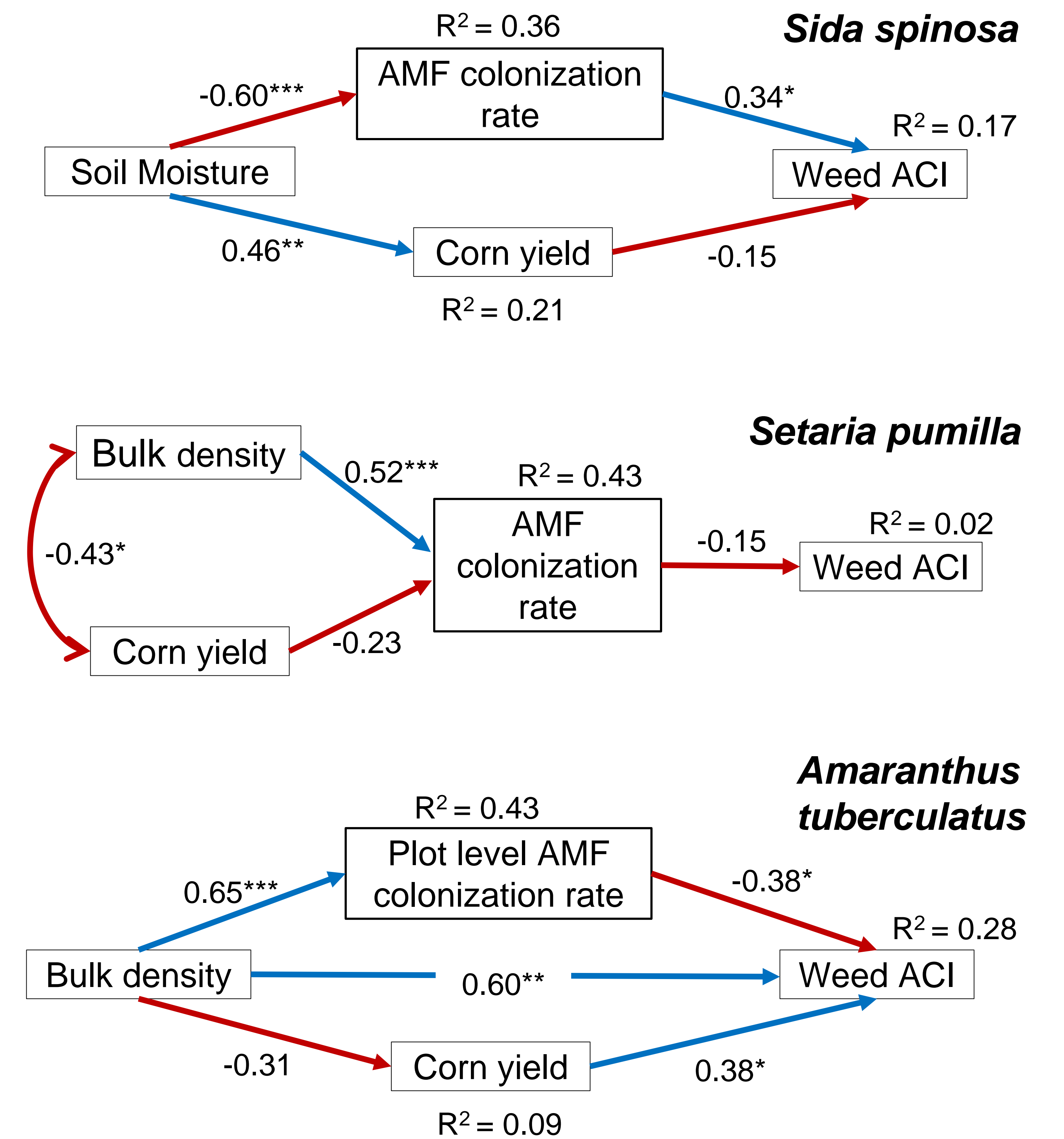


**Figure 1.** Kernel density distributions of weed absolute competition intensity (ACI).



**Figure 2.** Conceptual framework for structural equation model to investigate effects of soil, corn, and AMF on weed absolute competition intensity.

- 2. Contributions of different factors to weed competition intensity:
  - AMF: **positive** on *Sida spinosa*; **negative** on *Amaranthus tuberculatus*
  - Soil moisture: **negative** total effects on *Sida spinosa*
  - Bulk density: **negative** total effects on *Setaria pumilla*
  - **positive** total effects on *Amaranthus tuberculatus*



**Figure 3.** Most parsimonious structural equation models for three weed species.  $P < 0.05$  (\*),  $P < 0.01$  (\*\*),  $P < 0.001$  (\*\*\*)

## Conclusions

- Our results revealed strong interspecific variation in competition intensity among weed species.
- Weed identity showed strong influences on the relative contributions of AMF, soil properties, and corn productivity to competition intensity of weed with corn.

## Acknowledgement

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