Beneficial and Harmful Effect of Mustard in Wheat-Chickpea Rotation

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Introduction

The aim of this study is to examine the impact of mustard (which has allelopathic effects) in rotation with wheat and chickpea on crop productivity, soil and stubble borne diseases, nutrient and moisture in soil as well as microbial communities. The outcome will be identification of sustainable and profitable solutions for farmers in northwestern NSW, Australia.

Methodology

Different rotation combinations of wheat, mustard and chickpea were sown on a deep vertisol soil over 5 years. A range of crop growth, phenological, physiological and yield parameters were measured, along with incidence of diseases (above and below ground) of wheat and chickpea and nodule of chickpea.

Figure 1: The 2016 field trial (wheat, mustard and chickpea rotation)

Results

Legend: W= Wheat, M= Mustard, C= Chickpea

Chickpea productivity

Figure 2: *High incidence of Ascochyta blight and Sclerotinia rot reduced plant growth (circled plant), but mustard or wheat preceding chickpea ameliorated the effect.*

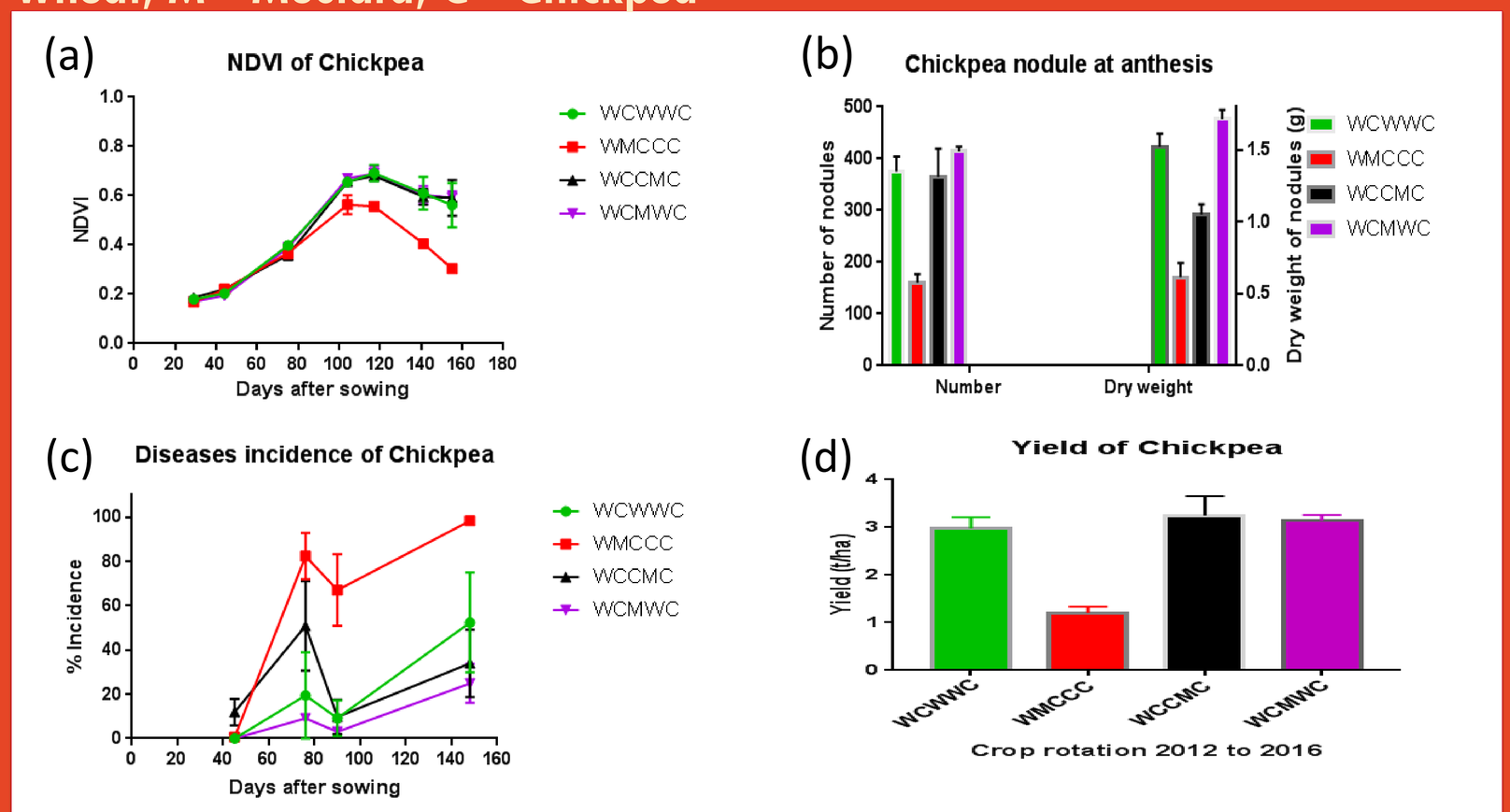

Figure 3: *Mustard or wheat in the rotation resulted in (a) higher ground cover (NDVI), (b) higher number and weight of nodule, (c) less diseases, and (d) greater yield.*

Wheat productivity

Figure 4: *High incidence of Yellow leaf spot reduced plant growth (circled plant), but mustard or chickpea preceding wheat ameliorated the effect, producing better growth*

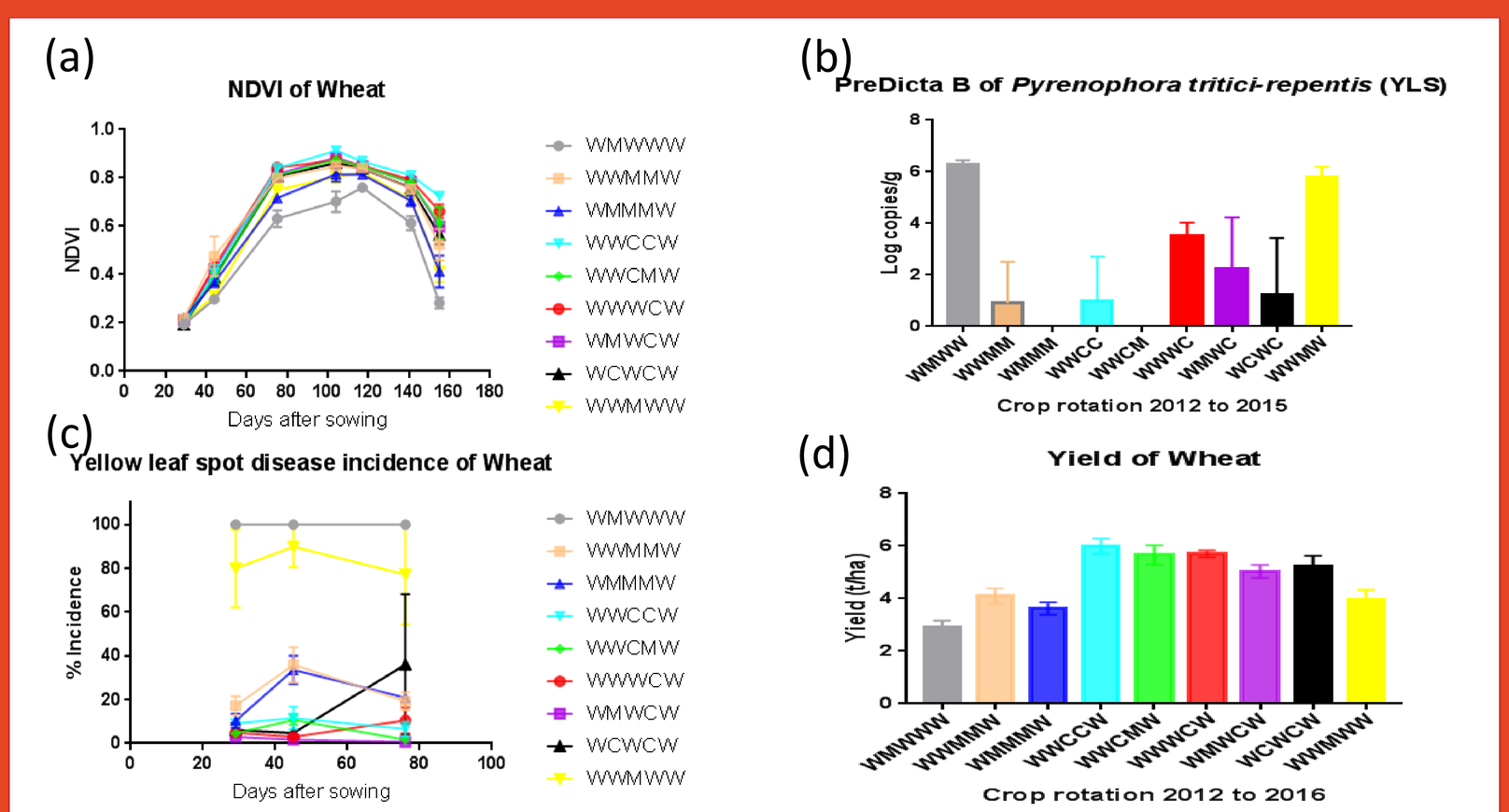

Figure 5: *Wheat preceded by mustard or chickpea in rotation had (a) higher ground cover (NDVI), (b) lower* Pyrenophora tritici-repentis, *(c) less disease, and (d) greater yield.*

Summary

Mustard appears to have a beneficial role in crop rotations in northern NSW by reducing the occurrence of disease in subsequent chickpea and wheat crops, which ultimately improves growth and yield. There appeared to be no harmful effect of mustard bio-fumigation on chickpea nodule number but impacted nodule development. Further season of testing will follow along with an assessment of microbial populations and mycorrhizae colonisation to confirm the results.

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