

# Microbial enzyme activity in irrigated canola plots receiving different nitrogen applications

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## Introduction

Soil enzymes play an important role in controlling the reactions that govern nutrient cycling and organic matter decomposition. As such, they provide a measure of soil quality and productivity, which are greatly influenced by soil organic matter content. Management practices such as irrigation and nitrogen (N) fertilizer application have diverse implications on microbial activities in the soil.

## Objectives

To evaluate the potential for N mineralization and immobilization by measuring arylamidase and urease enzyme activities, and potential nitrification in irrigated canola plots receiving different N applications.

## Materials and Methods

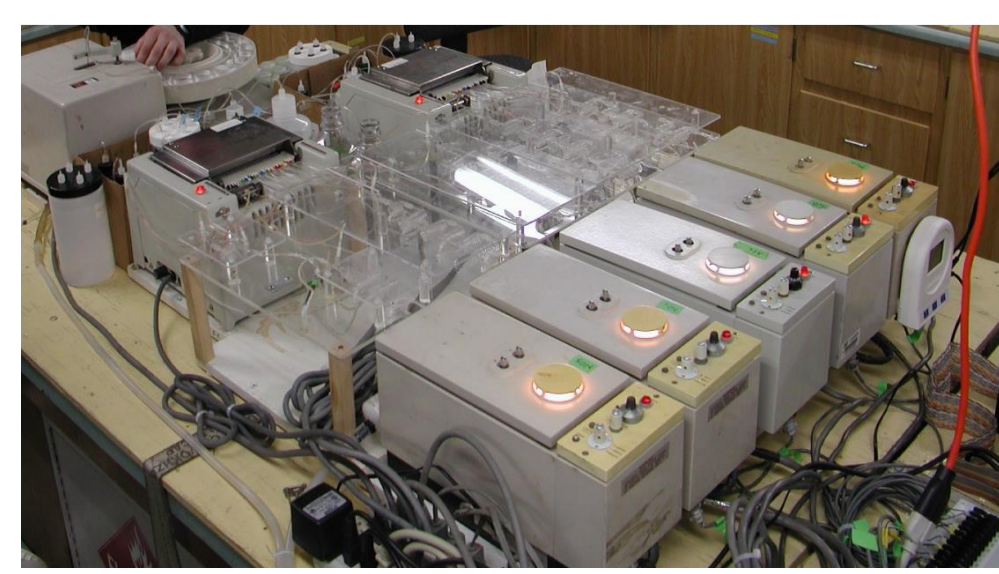
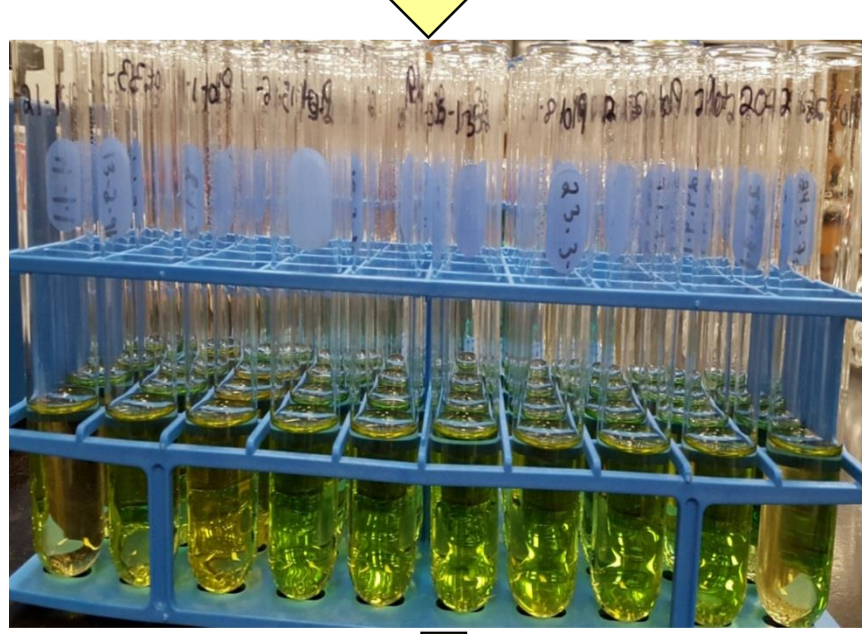
- The field experiment involved a small plot study at the Canada-Saskatchewan Irrigation Diversification Centre (CSIDC), Outlook, SK.
- Canola on wheat stubble in 2015 and 2016 (RCBD; n=4 reps).
- N cycling enzyme activity assays were conducted (urease, arylamidase, potential nitrification).

### 5 N treatments (urea 46-0-0):

- 1) non-fertilized (0N) check
- 2) 110 kg N ha<sup>-1</sup>
- 3) 220 kg N ha<sup>-1</sup>
- 4) 55kg N ha<sup>-1</sup>
- 5) 110 kg N ha<sup>-1</sup>

Table 1. Soil sampling event schedule.

Event	Date sampled	
	2015	2016
pre-seed	11-May	17-May
post-seed	13-May	19-May
pre-irrigation	19-May	7-June
post-irrigation	21-May	9-June
pre-bolt fertilization	23-Jun	20-June
post-bolt fertilization	24-Jun	22-June



## Results and Discussion

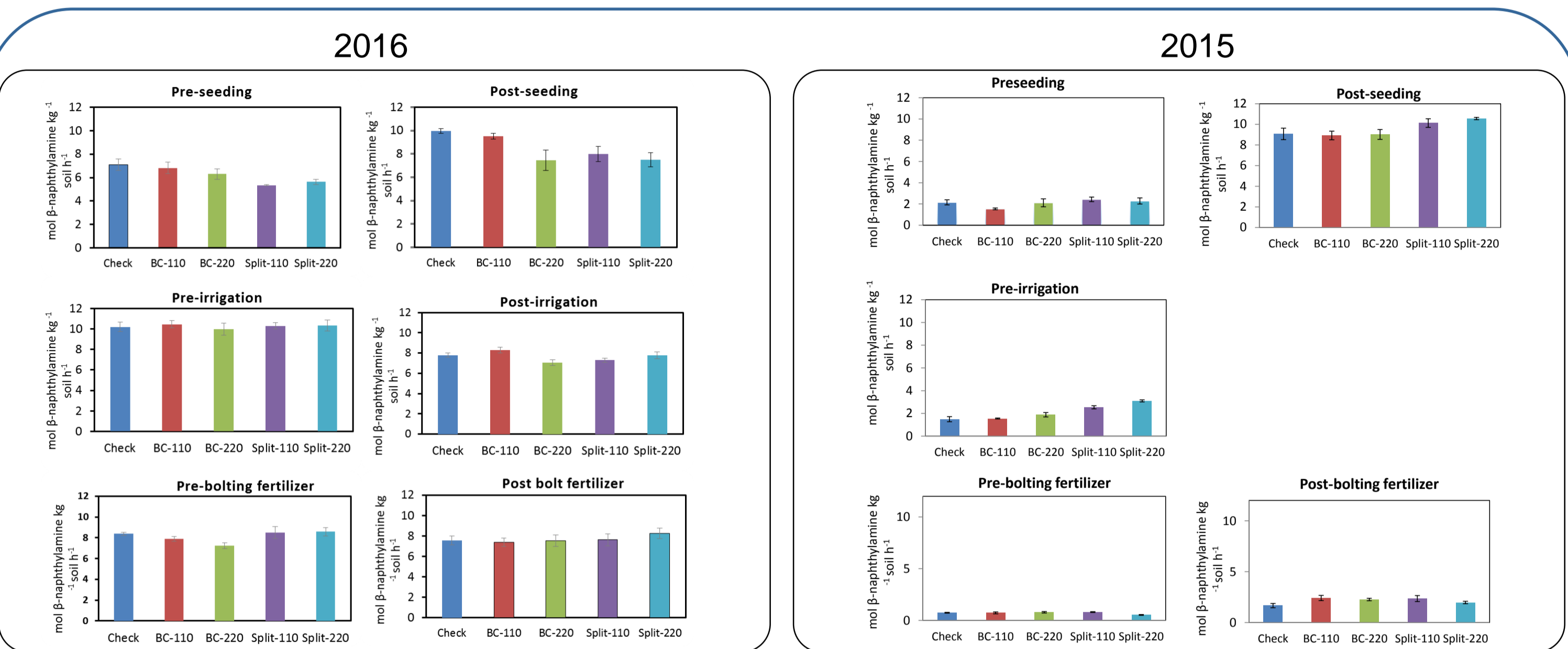


Fig 1. Soil arylamidase enzyme activities (0-7.5 cm)

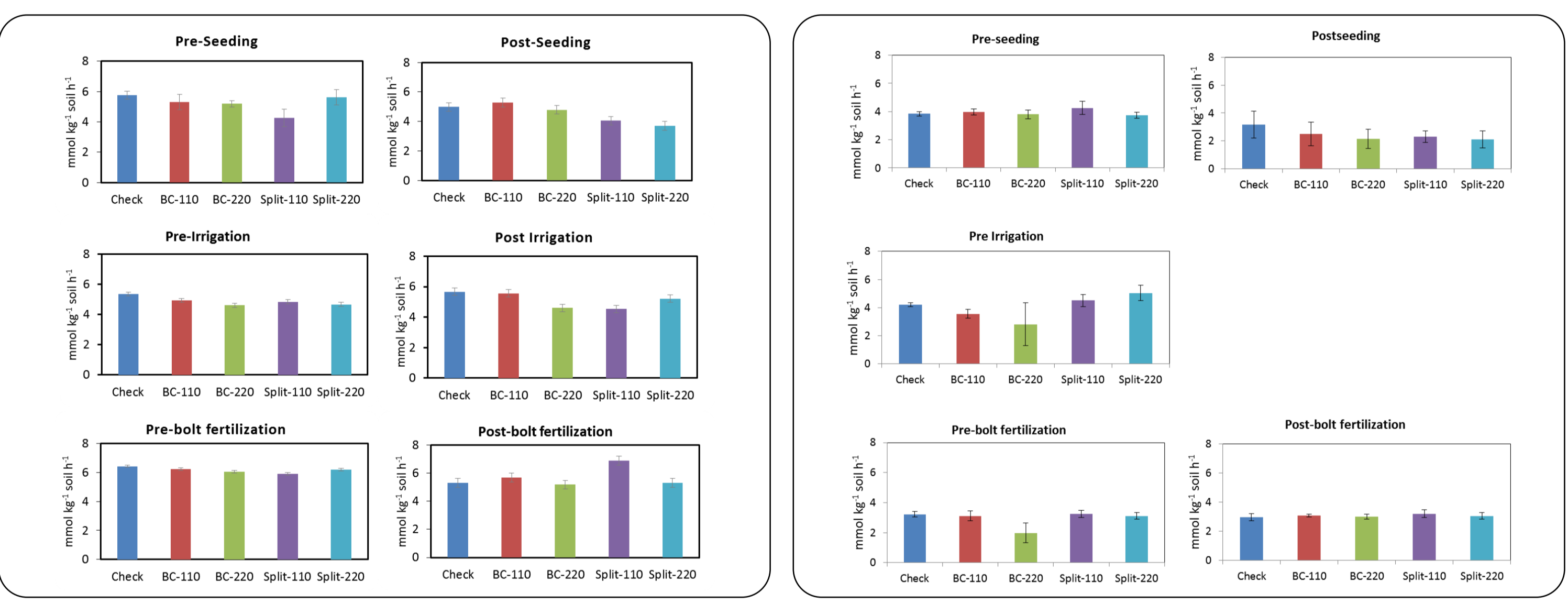


Fig 2. Soil urease enzyme activities (0-10 cm)

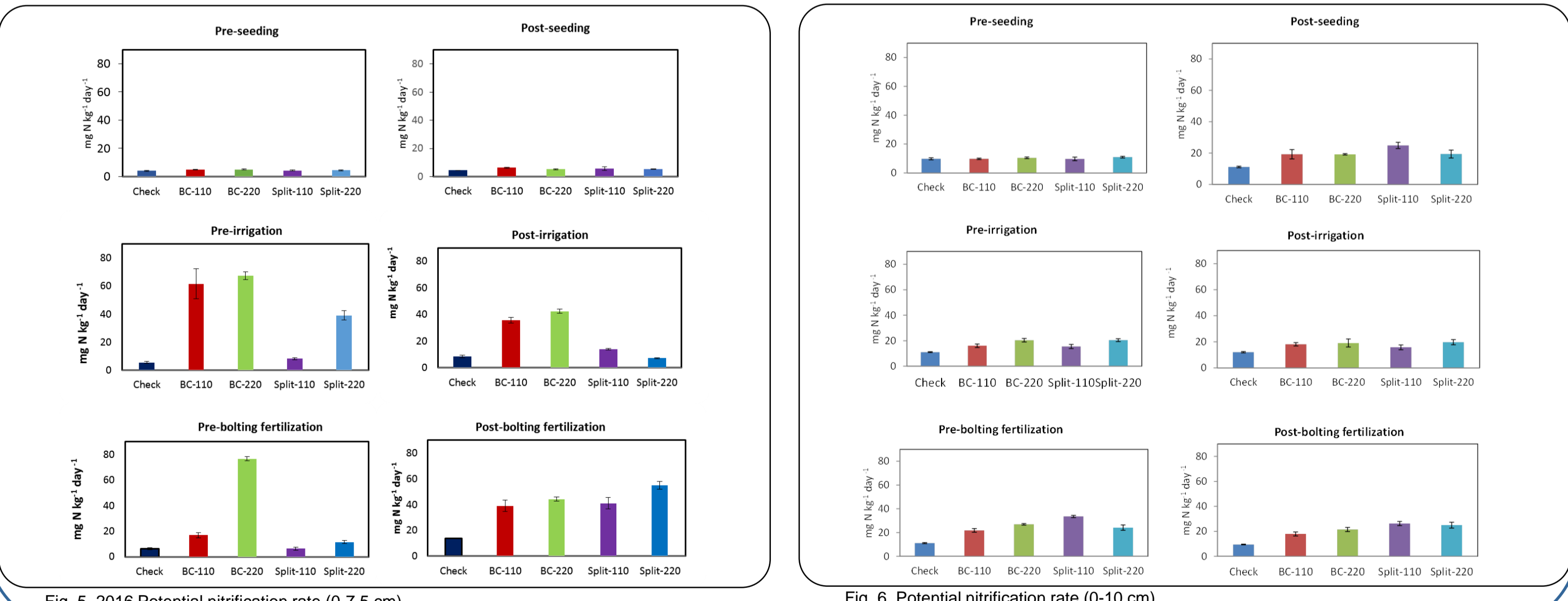


Fig 3. 2016 Potential nitrification rate (0-7.5 cm)



Fig 4. Potential nitrification rate (0-10 cm)

2015 (Site A) and 2016 (Site B) growing season data were analyzed using a repeated measures mixed model-analysis. Following the 2015 season, the field site was relocated so that the canola crop was always seeded into wheat stubble.

- Urease and arylamidase activities were affected ( $p < 0.001$ ) by N application method (i.e., 100% broadcast at seeding or 50% as a split application with the remaining 50% applied prior to bolting) and time of sampling (Figs. 1 and 2).
- The impact of the 100 and 220 kg ha<sup>-1</sup> N split applications on urease enzymes activities, arylamidase enzymes activities and potential nitrification assay were not statistically different ( $P = 0.05$ ).
- Post-irrigation urease and arylamidase activities did not differ significantly ( $P = 0.05$ ) from either the pre-bolt fertilization or post-bolt fertilization enzyme activities.

Urea fertilizer is converted to plant available nitrate through the key enzymatic processes measured here. By measuring the rate of these conversions under different fertilizer management practices we can better inform the development of best management practices for N management in irrigated canola production systems.

## Conclusions and next steps

Preliminary results suggest that both the rate and method of application of N fertilizer can affect biological conversions of fertilizer N in the soil. Relating these conversions to canola yield and gaseous N losses as N<sub>2</sub>O is underway.

## Acknowledgements

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