

Agronomic Performance of Camelina and Ethiopian Mustard Under Different Rates of Nitrogen Fertilizer.

Lydia Akot-Kuel, Thandiwe M. Nleya, Kathleen Grady, Sandeep Kumar, and Brianna Wegner
South Dakota State University, Brookings, SD



ABSTRACT

The U.S.A.'s over-dependence on foreign oil threatens national energy security and the country's economy. Biodiesel is an alternative to petroleum-based fuel, and is produced from renewable sources such as oilseed crops. The introduction of non-food oilseed crops can aid in diversifying biofuel sources and lessen the demand of producing biofuels from food-based crops such as corn and soybean. Oilseed crops such as camelina (*Camelina sativa* L.) and Ethiopian mustard (*Brassica carinata*) have been identified as potential non-food crops suitable for production in semiarid environments in South Dakota. However, best management practices for these crops are yet to be developed. This study evaluated the response of two camelina and two Ethiopian mustard varieties to four rates (0, 28, 56, and 84 kg/ha) of nitrogen fertilizer at two locations (Brookings and Pierre) in South Dakota. Camelina plants grew taller and lodging increased as N fertilizer rates increased. Nitrogen fertilizer application increased seed yield for both camelina varieties at both locations but with no statistical differences in yield between the two top fertilizer rates. Ethiopian mustard performed poorly at the Pierre location due to herbicide damage to the crop. At the Brookings location, greater seed yield was observed with higher nitrogen fertilizer rates for both varieties of carinata.

INTRODUCTION

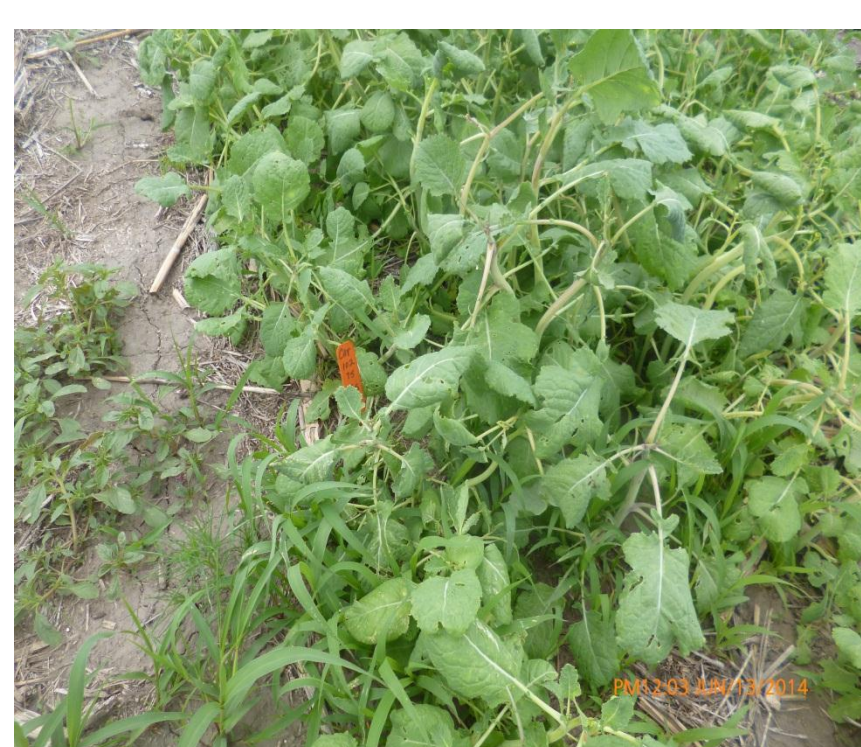
The nation's dependence on petroleum-based oils can be greatly reduced by an increase in biofuel production. Camelina (*Camelina sativa*) and Ethiopian mustard (*Brassica carinata*) are both newly introduced crops in the semi-arid regions of South Dakota as potential sources of biofuel. Camelina is a member of the Brassicaceae family that includes mustard, crambe, broccoli, canola, and different varieties of vegetable crops. Camelina is a winter crop that has been cultivated since the Bronze days. It was first cultivated in Central Asia about 3,000 years ago. Camelina was widely used in Europe and Soviet Union until the production of rapeseed/canola increased; Camelina comprises about 30%-40% oil and is mainly used as a biofuel crop in the United State. According to previous research, camelina is tremendously competitive with weeds, requires small amount of fertilizer, and supposedly has the lowest environmental effect compared to other crops. Low cost of production for camelina helps market options for farmers and improve cost-effectiveness. Ethiopian mustard (*Brassica carinata*) is an oilseed native to Ethiopia recognized for its heat and drought tolerance making it promising in the semi-arid region in South Dakota. Both camelina and carinata, thus far appear to be promising oilseed crops for the semi-arid and arid regions of South Dakota however, significant management practices to attain best seed yield, are yet to be developed.

OBJECTIVE

The objective of this experiment was to evaluate the response of two camelina and two carinata varieties to four rates (0, 28, 56, and 84kg/ha) of N fertilizer at two locations in South Dakota.

MATERIALS AND METHODS

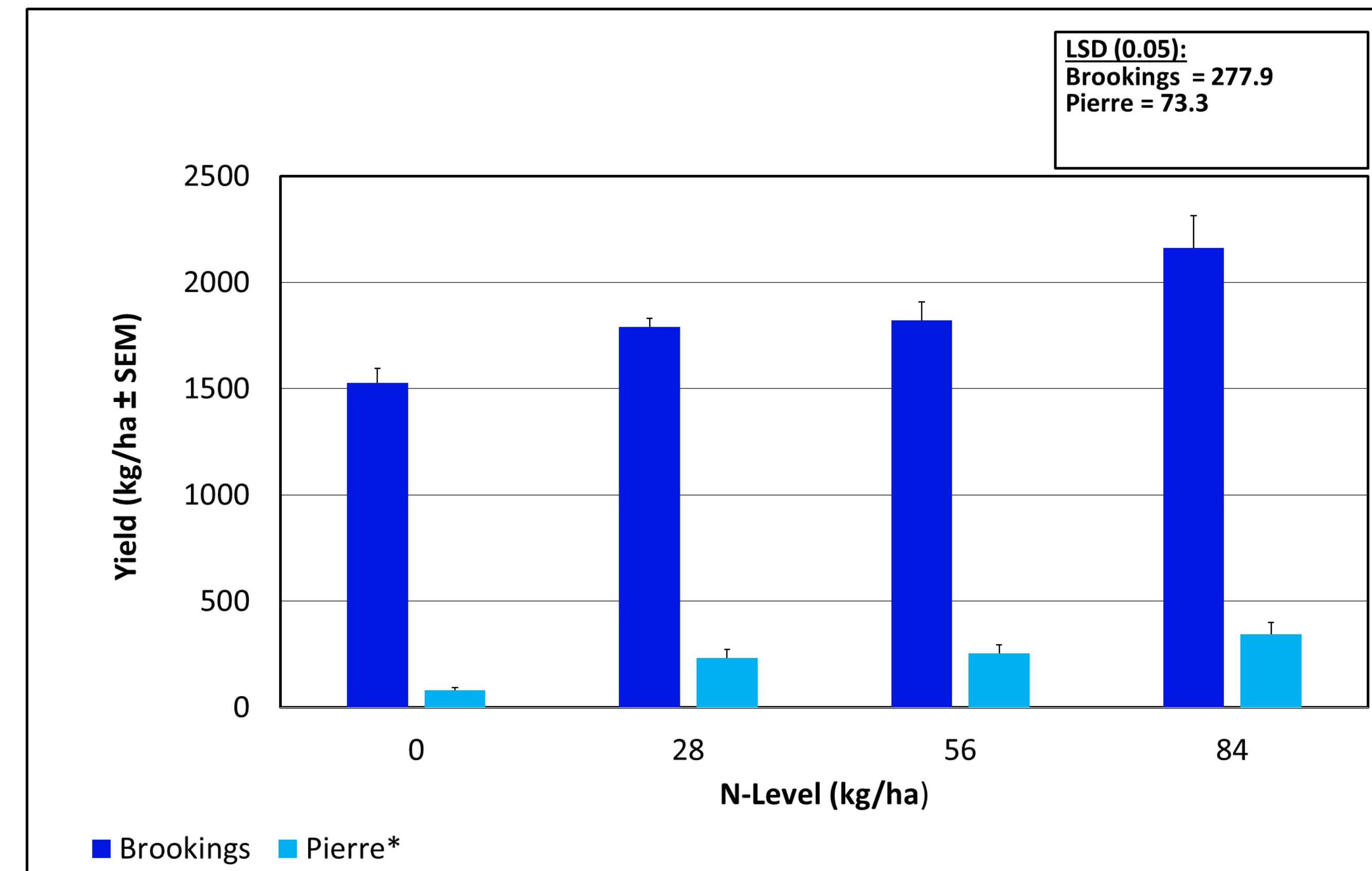
- ❖ **Location:** Felt Farm (Brookings, SD) and Dakota Lakes Research Farm (Pierre, SD)
- ❖ **Planting:**
 - ❖ Winter Camelina - 21 September 2014 at Brookings and 22 April 2014 at Pierre.
 - ❖ Carinata - 5 May 2014 at Brookings and 22 April 2014 at Pierre
- ❖ **Treatments:**
 - ❖ Two different varieties of each crop at both locations
 - ❖ Camelina - Joelle and BSX-WG1
 - ❖ Carinata - 110094EM and AAC110
 - ❖ Four nitrogen rates: 0, 28, 56 and 84kg/ha
- ❖ **Measurements:**
 - ❖ Plant stand, flowering, lodging, plant height, and yield.



Carinata crop injury due to MCPA herbicide- 6/13/14. MCPA was sprayed to control weeds on an adjacent field of flax.

RESULTS

Carinata Seed Yield

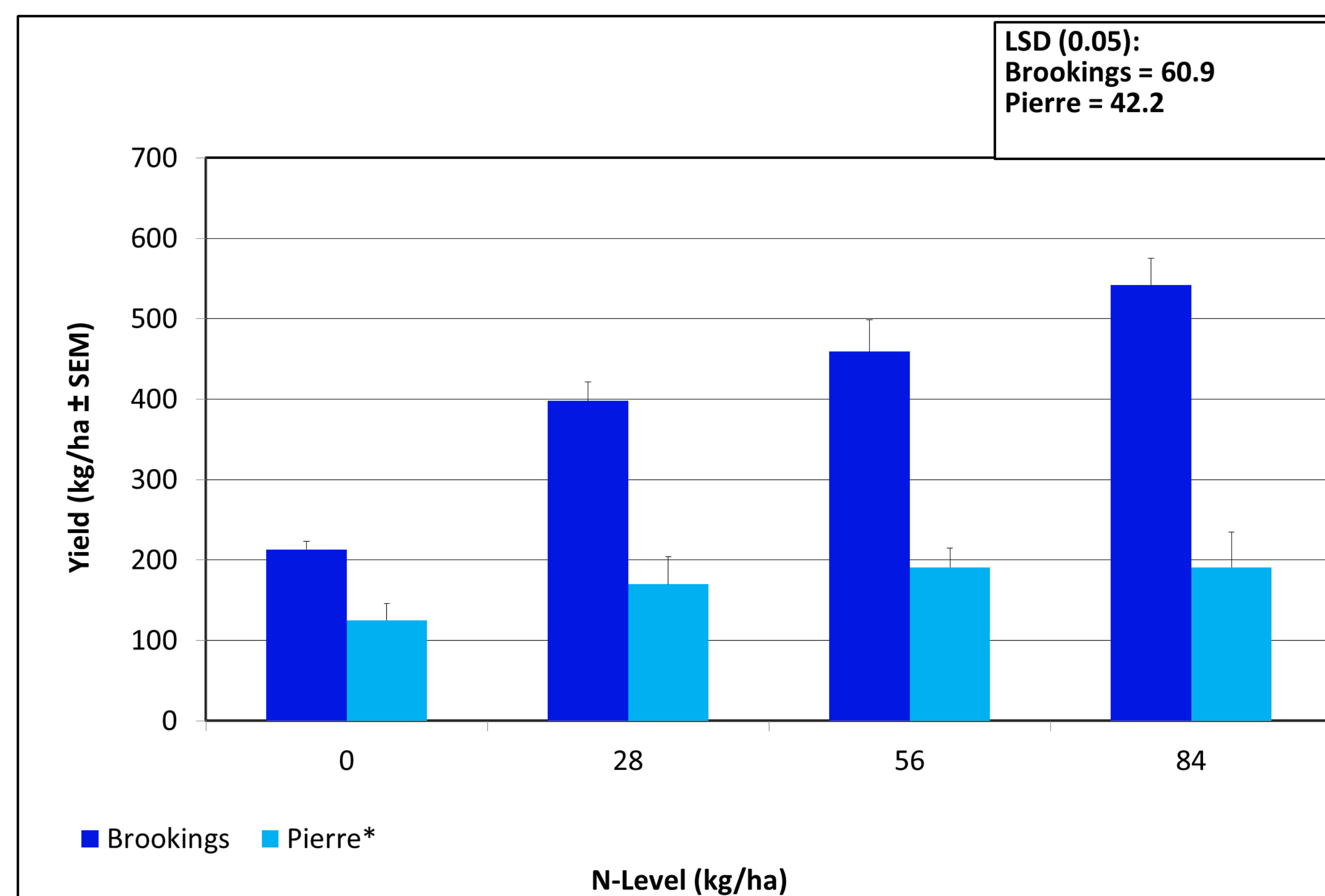


Carinata at Pierre 8/26/14

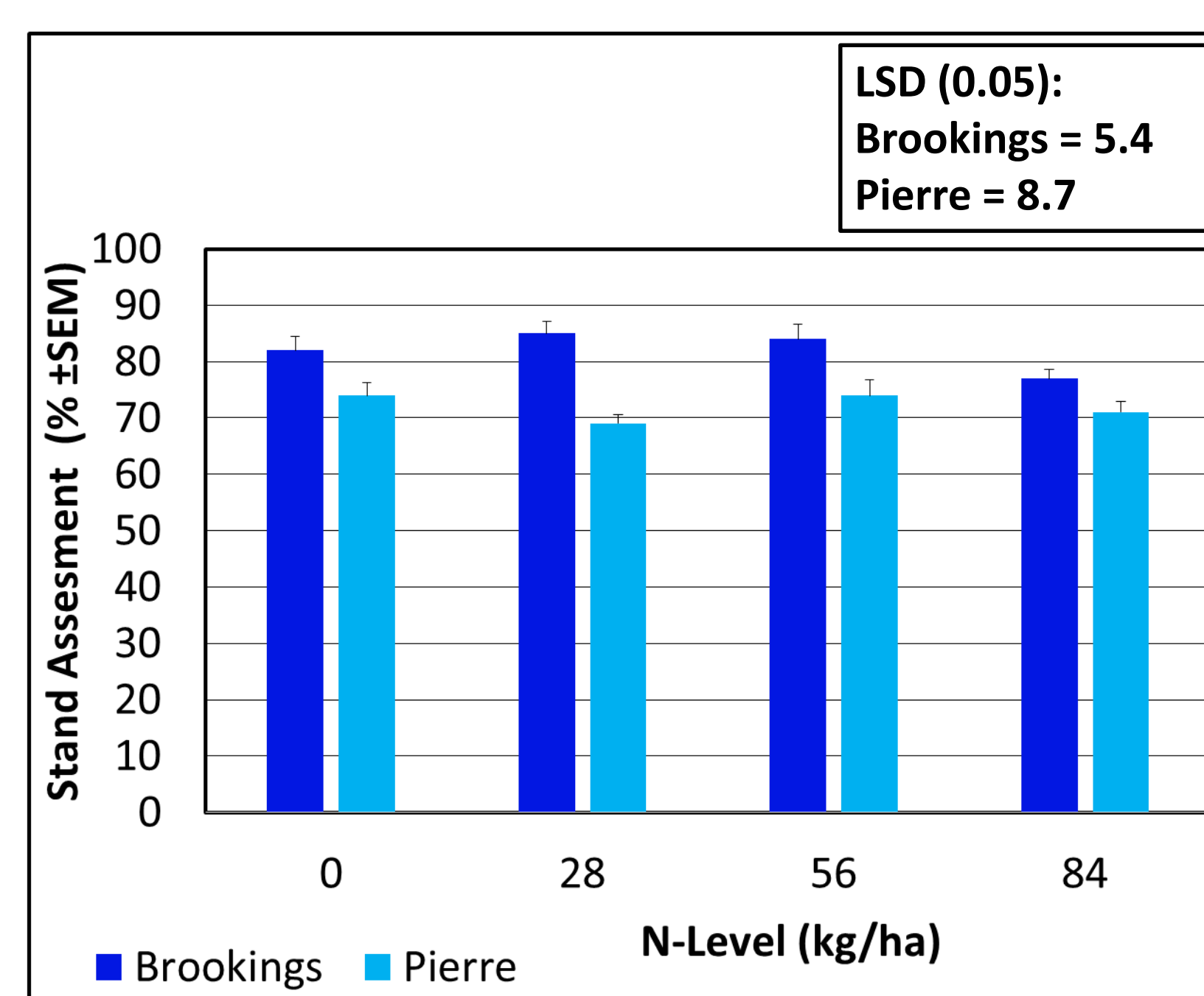


Carinata at Brookings - 7/22/14

Camelina Seed Yield

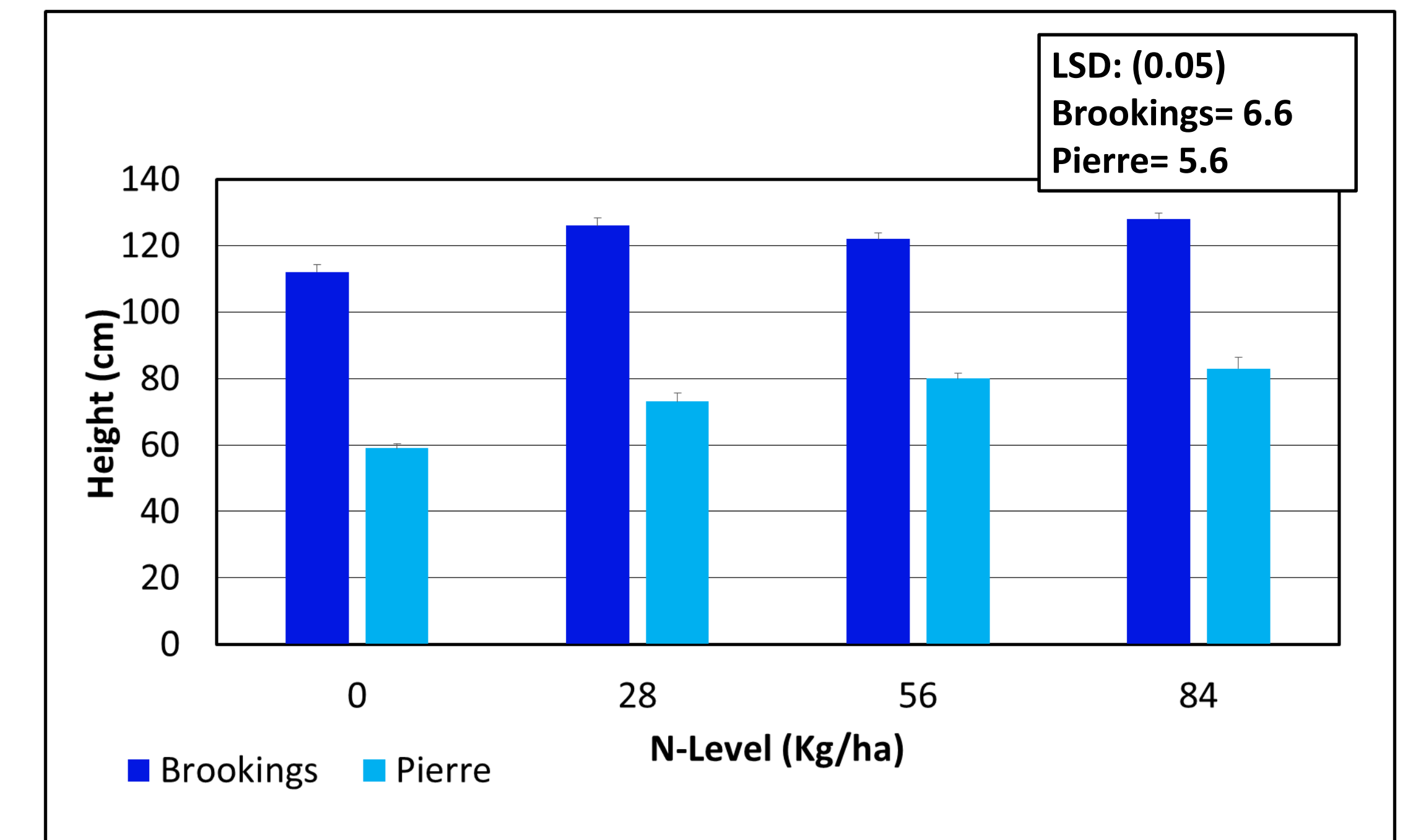


Camelina Plant Stands

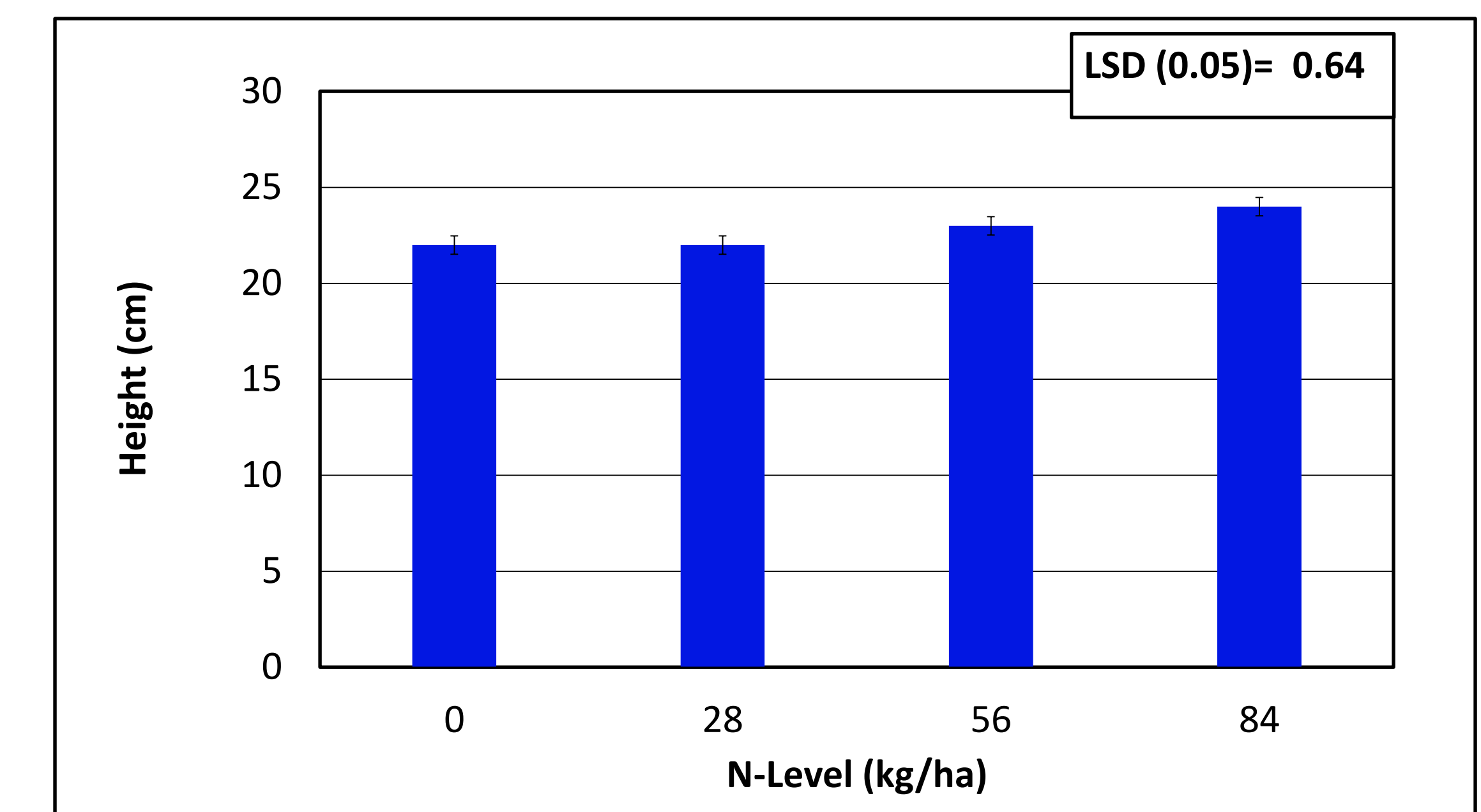


Camelina at Pierre - 6/19/14

Carinata Plant Height



Camelina Plant Height at Pierre



DISCUSSION

Both crops showed a positive significant response to N fertilizer application. The best seed yields for both crops were obtained at the N rate of 84 kg/ha. Plants grew taller with increased N fertilizer rate.

❖ Carinata

- ❖ Carinata yields were lower at Pierre compared to Brookings
 - Likely due to herbicide damage to crop at Pierre
- ❖ Carinata plants grew taller with increase in N rate at Brookings but not at Pierre

❖ Camelina

- ❖ In terms of varieties, at the Pierre location Joelle yielded significantly lower than BSX-G1.
- ❖ At the Brookings location the yields of the two varieties were similar.
- ❖ Camelina had low yields at both locations:
 - ❖ At Brookings, a root rot disease killed plants resulting in thin stands.
 - ❖ At the Pierre location, winter camelina was planted in spring and that could have had an affect on crop performance.

CONCLUSIONS

- ❖ Both crops showed greatest seed yields at the highest N-rate of 84 kg/ha.
- ❖ Lower yields for carinata at Pierre were due to herbicide damage to the crop.
- ❖ Winter camelina has a slow start and yields poorly when planted in spring.
- ❖ Improvement for future studies would be using the right herbicide for crops planted near carinata and making sure winter varieties of camelina are planted in the fall.

Acknowledgement

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❖ Contact: Lydia Akot-Kuel, Email: acakot-kuel9621@jacks.sdstate.edu