PROGRESS REPORT TO THE NEBRASKA DRY BEAN COMMISSION

Core Project Title

Selecting for and Improving Chickpea Adaptation to Western Nebraska

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INTRODUCTION

Chickpea (*Cicer arietinum* L.) is an annual grain legume mainly used for human consumption due to its high protein content. It is consumed as a dried pulse crop or as a green vegetable. Nebraska producers need the flexibility to take advantage of emerging market opportunities and chickpeas have this potential. Chickpea production and consumption have been increasing rapidly over the past several years (1,500 acres in 2000 to almost 10,000 acres in 2006). Unfortunately, less than 300 acres were planted in 2008. Chickpeas fit well with existing equipment, dry bean processors and regional infrastructure. Previous research has indicated great variability in potential cultivars, in terms of economically important traits including yield, seed size, pest resistance and quality. Identifying types that will bring the greatest value to regional production will help this region become a competitive production area.

Ascochyta blight (*Ascochyta rabiei* (Pass) L.), a seed-borne disease, is the most limiting disease found in the Nebraska Panhandle. The pathogen attacks leaves, stem, and pods. Seed quality is severely affected. Some information exits on the function and number of genes controlling the pathway of *A. rabiei* resistance. Although genetic resistance is the most cost effective strategy for control of blight there are other disease management strategies such as crop rotation, removal of volunteer plants, deep plowing, and fungicide treatment that can augment the use of resistant genes. Release of chickpea varieties with disease resistance will lower production costs and reduce pesticide use.

The most promising genotypes from previous studies from 2005 to 2007 for disease resistance and production appear to be the breeding lines PI 17256 and CA0090B347C. Although both are Kabuli-types, they unfortunately, are still too small to be successfully used commercially. PI 17256 exhibits better disease resistance than CA0090347C, but produces smaller seed. These two lines should still be useful as parental germplasm sources for ongoing breeding efforts to develop new blight-resistant cultivars with the desired agronomic traits for Nebraska and other areas of the Central High Plains. In the meantime, we have also determined

that the cultivar Sierra may be an acceptable alternative for many producers until more resistant high yielding cultivars are developed, but its use would likely have to be integrated with fungicide applications for disease management.

Evaluation of more genotypes for resistance and developing new cultivars will remain a priority in the hope of stimulating more interest in chickpea production. Identifying types that will bring the greatest value to regional production will help this region become a more competitive production area.

OBJECTIVES

1. Conduct multi-location, irrigated and dryland chickpea trials in the Nebraska Panhandle including Box Butte, Cheyenne and Scotts Bluff Counties, under chemical and non-chemical control to assess yield loses and yield potential due to Ascochyta blight incidence.
2. Evaluate individual plant selections for Ascochyta blight resistance.

METHODOLOGY

Regional Chickpea Trials

The Western Regional Chickpea Variety Trial was conducted at the PHREC-Scottsbluff and Mitchell under irrigated and dryland conditions, respectively. Sixteen lines consisting of 11 advanced chickpea lines and the cultivars Dwelley, Troy, Sierra, HB-14, and HB-19, used as reference checks, were evaluated in replicated trials. Each experimental line was replicated four times. The treatments were arranged in a split plot design, where main plot treatments were fungicide treatment (protected vs. non-protected), and the sub-plots treatments were the lines + cultivars. Entries were planted in 137.5 ft2-plots consisting of 8 25-ft rows spaced 8.25 in apart. Headline was applied as a treatment to protect against ascochyta blight at a rate of 5 ounces/acre at the flowering stage.

Days to flowering and maturity, and Ascochyta blight and root rot reaction, were assessed.

Ascochyta blight segregant populations

One hundred and forty-six bulks from 12 different populations (combinations) selected for A. blight resistance in 2007, were evaluated for A. blight resistance in a nursery trial conducted at the PHREC-Scottsbluff in 2008. Dylan was used as an A. blight susceptible check, and PI 17256 was used as a resistant check. The 146 bulks and the reference checks were planted in an augmented block design with 8 blocks. Days to flowering and maturity, and A. blight reaction were assessed.

RESULTS AND DSICUSSION

Project Objectives:

1. Conduct multi-location, irrigated and dryland chickpea trials in the Nebraska Panhandle under chemical and non-chemical control to assess yield loses and yield potential due to Ascochyta blight incidence.

The trial planted under dryland conditions at the PHREC-Mitchell did not yield. Plants barely grow. The trial planted under irrigated conditions at the PHREC-Scottsbluff was not harvested. It was destroyed by birds after a hail and heavy winds on late August.

On average, A. blight incidence was lower (1.3) under protected compared to non-protected plots (1.3) (Table 1). PI 17256, PI Bulk, and CA0469C020C had the lowest A. incidence under non-protected plots. PI 17256 also showed lower Ascochyta blight incidence from 2005 to 2007, suggesting some Ascochyta blight resistance. Of the commercial cultivars, Dewlley had the highest A. blight incidence followed by Sierra (Table 1).

The experiment will be repeated in 2009 growing season.

2. Evaluate individual plant selections for Ascochyta blight resistance.

Although, Ascochyta blight severity was low in 2008 due to a long hot summer, the susceptible check, Dylan, developed symptoms. Most of the resistant bulks from 2007 showed resistance to A. blight. Remnant seed will be evaluated again in 2009 in replicated trials.

PUBLICATIONS

Refereed Journal Articles

(1) Harveson, R.M., C.A. Urrea, and D.D. Baltensperger. 2008. Evaluating chickpea lines and cultivars for disease tolerance to Ascochyta blight in Nebraska. Plant Health Progress (accepted).

Research or Extension Bulletins/NebGuides

(1) Harveson, R.M., and CA. Urrea. 2008. Chickpeas may still work as an alternative crop in some production systems. The Bean Bag 26(1):14 & 16.

ACKNOWLEDGEMENTS

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Table No. 1. NE20-08/1. Western Regional Chickpea Trial grown under irrigated conditions at the PHREC-Scottsbluff, NE, during 2008.

ENTRY No.	Pedigree	Ascochyta Blight (1-5)†
	Non-Protected	
1	DWELLEY	2.8
2	SIERRA	2.1
3	TROY	1.9
4	CA0090B347C	1.5
5	CA0390B007C	1.6
6	CA0469C020C	1.3
7	CA0469C025C	1.5
8	CA04900443C	3.3
9	CA04900716C	2.0
10	CA04900851C	2.3
11	CA04900509C	2.6
12	PI 17256	1.3
13	PI Bulk	1.3
14	B90	1.8
15	HB 14	2.1
16	HB 19	1.6
	Protected	
1	DWELLEY	1.4
2	SIERRA	1.4
3	TROY	1.4
4	CA0090B347C	1.5
5	CA0390B007C	1.4
6	CA0469C020C	1.0

7	CA0469C025C	1.0
8	CA04900443C	1.8
9	CA04900716C	1.5
10	CA04900851C	1.4
11	CA04900509C	1.9
12	PI 17256	1.1
13	PI Bulk	1.0
14	B90	1.1
15	HB 14	1.0
16	HB 19	1.3
	GRAND MEAN	1.6
	LSD (P=0.05)	0.6
	CV %	18.2

† Blight ratings in mid-July used a 1-5 scale where 1 = 100% stand and no disease, 2 = 75% stand and <25% of plants showing symptoms, 3 = 50% stand and 50% of plants showing symptoms, 4 = 25% stand and up to 75% of plant showing symptoms, 5 = no stand or >75% of plant showing symptoms