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# Potential of Chickpeas as a New Crop for Nevada

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## Introduction

Chickpeas (*Cicer arietinum* L.), commonly known as garbanzo beans, originated in southeastern Turkey and the adjoining part of Syria. Chickpeas are an annual grain legume or pulse crop, extensively used for human consumption. Chickpea seeds contain about 13–33% protein, 40–55% carbohydrates, and 4–10% oil. The harvested seed can be used by the canning industry, including garnishes for salads. Large-seeded varieties can be sold as dry-packaged garbanzo beans. However, small-seeded varieties can be milled for flour or hummus food spread.

The two main types of chickpeas are the large-seeded Kabuli type and the small-seeded Desi type. Kabuli types are larger, more rounded and pale cream (about 960 to 1,200 seeds per pound). Desi types are usually small, irregular in shape and dark brown to black (about 1,600 seeds per pound).

Chickpea plants stand erect and resemble a bush with primary, secondary and tertiary branching. They flower profusely and have an indeterminate growth habit, continuing to flower and set pods as long as conditions support it. Pods appear on the primary and secondary branches and the main stem, with each of the individual round pods generally containing one seed in Kabuli types and often two seeds in Desi types. The plant height ranges from 14 to 22 inches in Kabuli types, and from 10 to 20 inches in Desi types. Chickpeas typically mature in 120 days; however, Desi types usually mature two weeks earlier than Kabuli types.

Chickpeas tend to grow best in fertile sandy, loam soils with good drainage. Because of their deep taproot system, they can endure drought conditions by extracting water from deeper in the ground.

The inclusion of legumes as a rotational crop helps improve soil tilth, reduces weed pressure, and may increase soil nitrogen fertility for following crops in rotation. Pulse crops produce their nitrogen from the atmosphere through a symbiotic relationship with a soil bacterium; thus, commercial nitrogen applications are unnecessary or significantly reduced for the pulse crops.

There has been increased interest in growing alternative crops among Nevada farmers. Testing alternative crops is

an important task, given that 92% of the crops currently produced in Nevada are forages that require large amounts of water. Therefore, chickpeas production was evaluated in 2019 as a potential alternative crop. The objective of this study was to assess the production potential of chickpea in western Nevada.

***(A)*** ***(B)***

***Figure 1****: Chickpea varieties planted at the Experiment Station in Fallon. Most chickpea varieties have compound leaves that exhibit a fernlike appearance (A); however, a few Kabuli types have simple leaves (B). Photo by Mainder K. Walia, Extension.*

**Methodology**

A field experiment was conducted at the Fallon Research Center and Experiment Station in Fallon, Nevada, during the 2019 growing season. The soils on the site are Sagouspe loamy sand (sandy, mixed, mesic, Oxyaquic Torrifluvents), with 0-1% slopes, according to USDA-Natural Resources Conservation Service soil survey. It is considered prime farmland if irrigated. The available water capacity is rated as moderate (approximately 7.3 inches).

Before the experiment initiation, the soil was sampled randomly to a depth of 12 inches across the experimental area and composited before soil test analysis, which was carried out at a commercial laboratory (A & L Western

. The results of the soil analysis are presented in Table 1.

**Table 1:** Selected soil characteristics before initiation of the experiment.

| Parameter | Value | Rating |
|---|---|---|
| pH | 7.1 | - |
| Texture classification | Loamy sand | - |
| Sand (%) | 85 | - |
| Silt (%) | 6 | - |
| Clay (%) | 9 | - |
| OM (%) | 1.0 | Very low |
| $NO_3$-N (lbs/ac) | 14 | Very low |
| P (Weak Bray) (lbs/ac) | 48 | Medium |
| P (Bicarbonate) (lbs/ac) | 20 | Medium |
| K (lbs/ac) | 312 | Medium |
| Mg (lbs/ac) | 322 | Medium |
| Ca (lbs/ac) | 2034 | Medium |
| Na (lbs/ac) | 58 | Very low |
| $SO_4$-S (lbs/ac) | 4 | Very low |
| [a]CEC (meq/100g) | 6.9 | - |

*[a]CEC= cation exchange capacity*

***Figure 2****: Chickpea plant bearing pods grown in Churchill County. Photo by Maninder K. Walia, Extension.*

The plot area was plowed, disced and leveled before planting. Nine chickpea varieties were planted on April 25, 2019, using the Plotseed XL plot seeder

(Wintersteiger AG., Ried im Innkreis, Austria). These varieties were provided by Eastern Agricultural Research Center of Montana State University in Sidney, Montana; and Meridian Seeds for evaluation. Weather parameters (cumulative precipitation and average temperature) during the growing period are presented in Table 2.

| Month | Mean air temperature (°F) for 2019 | Mean air temperature (°F) for 30 year average | Cumulative precipitation (mm) for 2019 | Cumulative precipitation (mm) for 30 year average |
|---|---|---|---|---|
| April | 52 | 51 | 12 | 15 |
| May | 55 | 59 | 29 | 17 |
| June | -* | 67 | - | 10 |
| July | 73 | 75 | 0.3 | 2 |
| August | - | 72 | - | 4 |
| Total | - | - | 41 | 48 |

**Table 2:** Monthly accumulated precipitation and mean air temperature during the growing season (2019) at Fallon and 30-year average (1981-2010).

** Data not available. Weather data were collected from the U.S. climate data.*

The varieties planted are included in Table 3. Seeds were planted at a rate of four to five seeds per square foot and a depth of 1.5 inches. Seeds were treated with fludioxinyl and mefenoxam fungicide (Apron Maxx RTA, Syngenta) at a rate of 1.47 ml a.i. (active ingredient) lb seed$^{-1}$, and thiamethoxam insecticide (Cruiser MAXX, Syngenta) at a rate of 0.45 ml a.i. lb seed$^{-1}$ to control soilborne diseases and pea leaf weevil, respectively. The seeds were inoculated with peat-based commercial *Rhizobium* N-Charge inoculant to enhance biological nitrogen fixation at planting. The plots were arranged in a randomized complete block design with four replications and consisted of 36 total plots. The plot size was 70 square feet (10 feet long, 7 feet wide), and the spacing between the rows was 8 inches.

**Table 3:** Chickpeas variety tested, clean seed yields and 1000-seed weight during 2019.

| Variety | Market type | 1000 seed-weight (g) | Seed yield (lb/a) |
|---|---|---|---|
| CDC Palmer | Kabuli | 386.3 b | 1678.3 a |
| CDC Frontier | Kabuli | 332.1 cde | 1201.7 b |
| CDC Orion | Kabuli | 360.7 bcd | 1002.0 bc |
| CDC Leader | Kabuli | 324.0 de | 932.1 bc |
| Alma | Kabuli | 303.0 e | 912.2 bc |
| Sierra | Kabuli | 378.3 b | 658.2 c |
| Myles | Desi | 147.3 f | 624.2 c |
| Nash | Kabuli | 451.6 a | 1129.3 b |
| Sawyer | Kabuli | 364.3 bc | 923.9 bc |
| Mean | - | 338.6 | 1006.9 |
| P-value | - | <0.0001 | 0.0026 |

** Seed yields and 1000-seed weights followed by the same letters are not significantly different from other varieties using LSD at the P < 0.05 level.*

All experimental plots received the same amount of irrigation water throughout the experiment. Supplemental irrigation was provided once per week using a sprinkler irrigaton system. Irrigation was terminated one week prior to harvesting. No fertilizer was applied before or during the growing season. Postemergence weed control for grass weeds was carried out using Intensity at a rate of 16 fluid ounces per acre in a single application applied almost one month after planting. Plots were subsequently hand-weeded regularly to control broadleaf weeds until harvest. The plots were monitored weekly. The test plots were hand harvested from an area

of 1 square meter using hand clippers on July 29, 2019, when most pods were straw yellow colored. The pods were threshed manually to determine seed yields and 1000-seed weights.

An analysis of variance was used to examine chickpea seed yield and 1000-seed weight with mean separation at the <0.05 level.

## Results and Discussion

The results of the seed yield and 1000-seed weight are shown in Table 3. Yields of different chickpea varieties varied from 624.2 to 1678.3 pounds per acre, with a mean of 1006.9 pounds per acre.

A significant difference was observed among different chickpea varieties based upon the seed yield. Table 3 shows an average yield for each variety. The garbanzo bean variety named CDC Palmer produced the highest seed yield of 1678.3 pounds per acre. However, Desi variety Myles produced the lowest seed yield of 624.2 pounds per acre. Similar to seed yield, a significant difference was observed among different types for the 1000-seed weight. The 1000-seed weight varied from 147.3 to 451.6 grams, with a mean of 338.6 grams. Seed weight was highest for Kabuli variety Nash and lowest for Desi variety Myles. Seed greater than 9 millimeters is considered a large Kabuli and would receive a higher price. Also, price premiums are paid for large-sized chickpea seeds, but price discounts often apply for damaged, broken or discolored seeds.

## Conclusion

The results indicate that significant differences exist among commercial chickpea varieties for 1000-seed weight and seed yield grown in Fallon. The top three varieties (CDC Palmer, CDC Frontier and Nash) yielded more than 1100 pounds per acre, with the top-performing variety, CDC Palmer, producing 1678 pounds per acre. Variety Nash produced seeds with the highest 1000-seed weight of 451.6 grams. Most Kabuli varieties performed better in this environment, except Sierra, which yielded the lowest seed yield of 658 pounds per acre. However, Desi variety Myles did not perform well, producing the lowest seed yield and also 1000-seed weight. This one-year trial also demonstrates that seed yield of variety CDC Palmer, which averaged 1678 pounds per acre, exceeded the 2019 state average for chickpea production in the western U.S. region (Washington, Idaho and Montana), which ranged from 1410 to 1660 pounds per acre (USDA National Agricultural Statistics Service 2019).

The results may indicate that chickpea can be grown as an alternative crop in western Nevada to diversify the cropping system. However, more research will be needed to confirm these results. Also, a producer wishing to grow chickpea as a rotational crop is advised to conduct small-scale trials and also look for market opportunities to sell the harvested produce before planning large-scale production.

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