W1327

Are Chickpeas a Viable Crop for Small Farmers in Tennessee?

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Key Points

1. Chickpeas are widely consumed and offer potential diversification for CSAs and farmers markets.
2. Five varieties performed similarly under Tennessee growing conditions and yields were comparable to other growing regions in the U.S.
3. The chickpea growing season overlaps with other well-established crops that provide better economic returns.

Chickpea Background and Uses

Chickpeas (*Cicer arietinum L.*), also known as garbanzo beans, are native to Turkey and are currently one of the most consumed legumes in the world [1, 3, 5]. Chickpeas are currently grown in nine states, primarily in the Western U.S., with California leading production [2]. Chickpeas are a great source of carbohydrates, protein and healthy unsaturated fat [1, 2]. The demand for chickpeas in the U.S. is on the rise, following the growth of vegetarian diets and the increase in demand for hummus and roasted chickpeas for salads, soups and curry [1]. They also can be used in animal feed [5]. For diversified growers selling at farmers markets or running Community Supported Agriculture (CSA) programs, having items early and consistently throughout the season is critical to success. Dried chickpeas can be stored throughout the winter and used for early markets and CSA shares. Adding chickpea to your cropping portfolio could fill seasonal gaps in production due to unpredictable weather or crop loss and add diversity to your offerings.

An annual crop, chickpeas have a low bushy plant canopy with an indeterminant growth habit [4]. Plants typically grow to 8 to 24 inches tall [5]. Seeds of chickpeas have a distinct wrinkly appearance and are roughly one-third of an inch in diameter [4]. In the southern U.S., based on a study in Florida, chickpeas should be planted between February and April [4]. They need roughly four to five months to grow from seeding to maturity [4].

Figure 1: *Chickpea plant with green pods. Photo Credit: Francisco Palacios.*

Figure 2: *Chickpea plant beginning to dry down in the field. Photo Credit: Francisco Palacios.*

At planting, chickpeas require inoculation with the rhizobium species *Mesorhizobium ciceri* or *M. mediterraneum* [5]. These rhizobium species are unique to chickpeas; inoculum listed for use on other legumes will not be effective [5]. The seed company should disclose if the inoculum is supplied with the seed or if it will need to be purchased and applied separately. Like many legumes, chickpea yields are higher in fields with low residual nitrogen because the chickpeas will fix their own nitrogen with the help of the rhizobia inoculum [5].

Significant disease pressure has been documented throughout the growing season for chickpeas produced in the Northwest U.S. [5, 6]. Disease pressure in Tennessee is still largely unknown. Growers should regularly scout fields for signs and symptoms of disease. The main diseases of concern are Ascochyta blight and Fusarium wilt [5]. Chickpeas have few pests due to plant pubescence, but wireworms, cutworms, aphids, leaf miners and corn earworms have been noted [5, 6].

Chickpeas are an agronomic crop that must be sufficiently dried down before harvest. Plants are physiologically mature when pods turn tan and leaves drop [6]. High rains near harvest time can prevent sufficient drying [5], so applying desiccants or swathing (making raised rows on the plant stubble) may be required to prevent yield loss in this scenario [5]. Luckily, chickpeas are not prone to seed shatter [5, 6]. It is generally recommended to desiccate or swath, then use the combine to harvest chickpeas [5]. Harvest can be difficult using a combine due to the very short height of chickpea plants [5]. Hand harvest and shelling may be an option as well for smaller plantings. Average chickpea yield ranges from 1,300 to 1,850 lbs/ac [1, 6]. After harvest, chickpeas should be dried and stored at 14 percent moisture [5,7]. Chickpeas are graded using the USDA standards for dry beans.

Project Objective

Our project aimed to determine whether chickpeas can be grown in the hot, humid environment of Tennessee. Chickpeas may be able to fit a niche in the region for small, diversified growers or for soybean or canola growers who already have the equipment to produce on a larger scale.

Project Design

Five chickpea varieties were planted at the East Tennessee AgResearch and Education Center (ETREC) Plant Sciences Unit in Knoxville, Tennessee, with four randomly arranged replications of each variety in the field. Varieties included 'UC 27,' 'CDC Frontier,' 'CDC Leader,' 'CDC Orion,' and 'CDC New Hope'.

This study was conducted in 2022 and 2023. In 2022, the chickpea variety trial was established in late May. Excessive spring rainfall delayed field preparation. The planting delay led to sun damage and a corn earworm infestation which ultimately resulted in little to no seed production. Therefore, all of the following information will refer to the chickpea crop planted in 2023.

Figure 3: *Chickpeas planted at the East Tennessee Research and Education Center Plant Sciences Unit in 2023. Photo Credit: Francisco Palacios*

Seeds were planted on February 2, 2023. A small plot research planter (John Deere MaxEmerge 7200, Moline, IL) was used to direct seed the chickpeas. EXCEED Peat Inoculant for Garbanzo Beans (Visjon Biologics, Henrietta, TX) was applied to seeds at planting according to the package directions.

Each plot was 10-ft wide and 30-ft long, with a 5-ft aisle between plots. Within each plot, four rows of chickpeas were planted 30 inches apart. Three-hundred seeds were planted per row (10 seeds per foot; 174,200 seeds per acre). Plants grew from February until harvest in July. Burndown herbicide was applied at planting to reduce weed pressure—Dual II Magnum (32 fl oz/ac; Syngenta, Wilmington, DE), Sharpen (2 fl oz/ac; BASF, Florham Park, NJ), and Gramoxone SL 3.0 (40 fl oz/ac; Syngenta, Wilmington, DE). Soil testing recommended no additional fertilizer.

Insect damage, disease prevalence, leaf yellowing and canopy cover ratings were taken twice during the season—once in May and again in June.

All varieties were harvested by hand on July 13, 2023. Due to the short stature of the plants, we were not able to harvest using a combine. Therefore, a five foot by five foot square within each plot was harvested using pruning shears.

After harvest, the total number of pods per sample were counted, all samples were threshed to remove seeds, sifted to remove large seed hulls and twigs, and all seeds were rated for marketability. We used a mechanical belt thresher to remove seeds from the pods which significantly improved threshing speed. Unmarketable seeds were removed from the samples. Marketable seeds were placed in a drier for four days at 95 F. The average dry weight of each sample was used to determine yield in pounds per acre for each variety.

Results

There were no significant differences between any of the varieties planted in this project. All five varieties performed equally compared to each other.

May Ratings

In May, none of the varieties had begun to turn yellow, and all still had full canopy cover. In each plot, regardless of variety, 3-6 percent of plants were showing signs or symptoms of disease, suspected to be Ascochyta blight. No insect damage was observed in any plot.

June Ratings

In June, all plots had been reduced to medium canopy cover with 40 percent yellowing of the leaves as the crop began to dry down. All plots had 25 percent of plants showing disease signs or symptoms. No substantial insect damage was observed in the plots. The average height of each variety ranged from 14 to 24 inches (Table 1).

Table 1. Chickpea heights by variety

Variety	Height (inches)
UC 27	14.75
CDC Frontier	16.25
CDC Leader	13.75
CDC Orion	16.00
CDC New Hope	23.75

Harvest

The percentage of marketable pods per sample was high for each variety, ranging from 80 to 95 percent (Table 2). There were no statistical differences in marketability between the varieties.

Chickpeas typically have 1 to 3 seeds per pod [5]. There were no three-seeded pods in this trial. The percentage of single-seeded pods per sample is listed in Table 2.

Table 2. The percentage of marketable chickpea pods per sample and the percentage of chickpea pods per sample that contained one pea per pod by variety.

Variety	% Marketable	% Single-seeded
UC 27	91.9	80.1
CDC Frontier	80.7	89.7
CDC Leader	91.5	85.3
CDC Orion	94.8	80.7
CDC New Hope	86.1	77.4

Yields were fairly consistent with the average marketable yields reported in Florida and Nebraska (1,300 lbs/ac) [4, 8] (Table 3). While CDC New Hope tended to have the most two-seeded pods, its overall yield was lower than the other four varieties. While this difference was not statistically significant, it does demonstrate the plot-to-plot variability among the varieties in our trial.

Table 3. Average marketable yield in pounds per acre by chickpea variety.

Variety	Average marketable yield (lbs/ac)
UC 27	1,214
CDC Frontier	1,388
CDC Leader	1,339
CDC Orion	1,219
CDC New Hope	898

Conclusion

While the goal of this project was to see if chickpeas could fill a niche for small, diversified growers or fit into large scale soybean rotations, our results show that the growing season is too long and labor intensive to fit that niche in Tennessee (Fig. 4). Growers with equipment used for typical soybean or canola production may be able to diversify their crop rotations without substantial investments needed in new equipment, however, the chickpea growing season overlaps with both canola harvest and soybean planting. The short plant height of chickpeas makes using standard equipment more difficult as well. Small, diversified growers may be able to hand harvest and hand shell small plantings of chickpeas, avoiding equipment investments but increasing labor costs and time commitment. The purchase of an inexpensive thresher would speed up the shelling process and be a worthy investment. Although we obtained similar yields in Tennessee as other chickpea growing locations, the long growing season of chickpea overlaps with the majority of well-established crops and crop rotations currently in place in the region that likely provide better economic returns than chickpeas. If growing chickpeas on your Tennessee farm, start with a small plot area to determine if this crop is right for your operation.

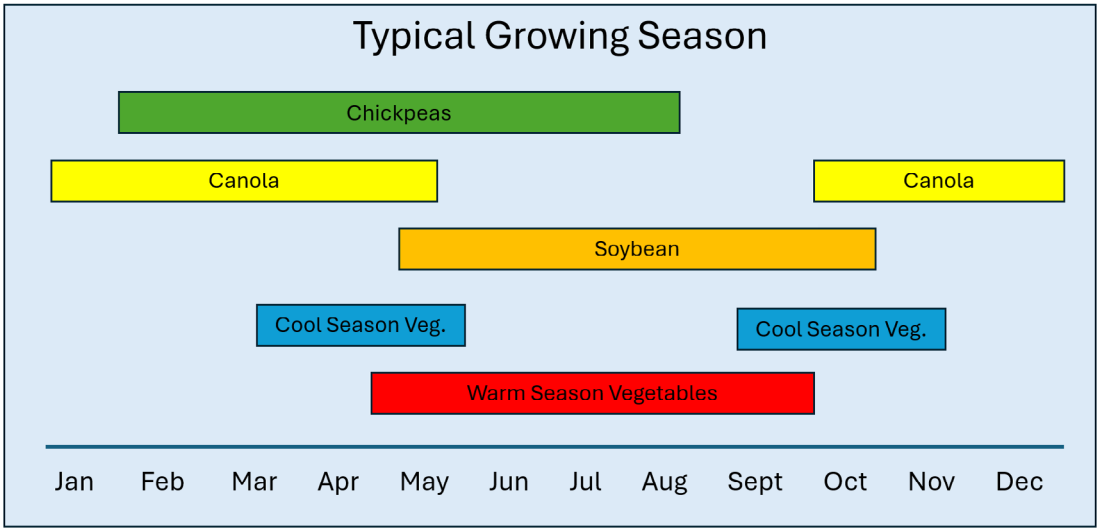

Figure 4: *Typical growing seasons for standard crops in Tennessee compared to chickpeas. Chickpeas overlap large portions of other cropping systems.*

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