



GARBANZO CULTURE IN ARIZONA

The chick pea, better known as "garbanzo" in Spanish-speaking countries, is a leguminous, winter-growing crop, which succeeds best at low altitudes in the southwestern United States, in northern Mexico and in the countries contiguous to the Mediterranean Sea. This pea is much used by Mediterranean peoples and by Spanish-Americans as a foodstuff, especially in soups, and is grown in large quantities for export in the arid subtropical portions of Mexico, particularly in Sonora and Sinaloa. Because of the unsettled conditions in Mexico at this time, the garbanzo crop is but half the usual quantity, and attention is therefore directed to the culture of this crop in that portion of the United States having suitable climatic and cultural conditions.*

Climatic requirements: The garbanzo requires an arid or semi-arid subtropical or tropical climate to yield maximum crops of the most desirable market quality. When grown under climatic conditions where the humidity is too great, the quality of the garbanzo is inferior. While the garbanzo has yielded well in the northwestern United States and in Ontario, Canada, it gives the best results as a winter crop in countries having a mild, cool winter climate. It is reported that the garbanzo has experienced a minimum temperature of 13° F. without being injured. Garbanzos of the best quality are raised in Spain, Turkey, northern Africa, Turkestan, Persia and northwestern Mexico. This crop has been grown in southern California, but the higher humidity produces an inferior quality of pea which has a very low market value. The successful growing of garbanzos in a limited way, and the fact that the climatic conditions resemble very closely those of the regions already mentioned, indicates that this crop may be profitably raised at elevations of 2500 feet and under, in southern Arizona and southeastern California. Garbanzos should succeed with proper culture in the Rillito and Lower Santa Cruz Valleys, the Casa Grande, Salt River, Lower Gila, Yuma, Imperial and Coachella Valleys.

Soil: Garbanzos are stated by Mexican, Spanish and Italian growers to do best on heavy, rich soils, such as are found in river bottoms, although fair

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yields have been grown in the sandy soils of the Yuma experimental plots. In general, a first-class garbanzo soil should contain sufficient quantities of silt and clay to cause it to retain the moisture well, and yet sufficient sand to ameliorate the clay and silt so that the drainage is good and so that the soil works nicely. In addition to this, the soil should contain a fair supply of organic matter, but not so much humus and nitrogen as to cause the crop to run to vines instead of fruit. Before desert soils, which are deficient in humus, are suitable for garbanzos they should be improved by plowing under alfalfa, green manure crops or corral manure. The best wheat soils are well adapted to garbanzo culture. The garbanzo requires a richer soil than does the cowpea.

Preparation: One point upon which all garbanzo raisers agree is that the best way to prepare the land for garbanzos is to irrigate by heavy flooding in the fall, applying sufficient water so that the crop may be made without further irrigation. The method of procedure is to plow the land 8 to 12 inches deep, throw up high borders or levees, apply from $1\frac{1}{2}$ to 2 acre-feet of water, allow it to soak in, and then put a mulch on the soil by the use of disk and spike-tooth harrows. The work of preparation should be so planned and executed that the crop may be planted early.

Planting: The best time to plant garbanzos seems to be from October 1 to December 1 in southern Arizona. The early-planted crop usually gives the heaviest yield. The seed should be planted in hills 18 to 24 inches apart in the row, the rows being 3 to $3\frac{1}{2}$ feet apart. They may be drilled in with a planter by arranging the drop to place the seeds the proper distance apart in the row. Corn planters (1 or 2-row) with plates properly perforated for the purpose, or bean planters, may be used. The seed should be planted underneath the dry mulch down into the moist soil at least $1\frac{1}{2}$ inches deep. Sometimes this crop is planted broadcast in checks or borders which are later to be irrigated by flooding.

Irrigation: Being a winter crop the garbanzo does not require much irrigating water, and it is generally claimed by the best garbanzo raisers that where it is necessary to irrigate after planting, the crop produces an inferior pea, both in quality and size. This means that under southern Arizona conditions a large quantity of water will have to be applied previous to planting. Furthermore it seems to be detrimental to irrigate while the crop is in bloom or afterwards. If the crop must be irrigated at all after it has been planted, this must be done before blooming time. When planted in rows, temporary furrows are opened with a double mold-board plow and the irrigating water is run in these furrows which are afterwards filled in by cultivation. Irrigation by flooding in checks or between borders is sometimes practiced, but does not seem to be so desirable as the furrow method. Growers should occasionally dig down and examine the moisture content of their soils to determine whether irrigation is needed or not.

Cultivation: After planting, careful cultivation should be practiced, keeping the land clean and maintaining a mulch until the plants have covered the ground. After that, no further cultivation is usually necessary.

Varieties: Several varieties of garbanzos have been tested at the Yuma Date Orchard during the last two years. Some of them have come from Mexican and southern Arizona growers; and others have been procured from the United States Department of Agriculture gardens at Chico, California.

The best varieties are grown in Spain and are classified as follows:

1. Fuentesauco, which has 40 to 42 seeds per 30 grams weight,
2. Castilla primera.
3. Andalucía.

It is said that there is very little difference between these varieties although they rank in about the order named. The Spanish seed crop is usually ready for shipment about September 1st. This seed is sold in 100-kilo sacks which weight includes the weight of the sack. It is expected that the various seed houses in Arizona will carry a stock of the best seed garbanzos.

Yields: The following table of yields secured in tests made at Yuma in 1915, gives a means of comparing the productiveness of the varieties tested and suggests crop yields on a larger scale.

YIELDS OF GARBANZOS AT YUMA, 1914-1915

SOURCE	TYPE	DATE PLANTED	METHOD	YIELD PER ACRE
Tucson Seed Co	Ordinary	Nov. 14	Rows 3 ft. apart	1426 lb.
Tucson Seed Co	Extra large	Nov. 14	Rows 3 ft. apart	936 lb.
Yuma grown		Nov. 14	Rows 3 ft. apart	1680 lb.
Yumagrown		Nov. 14	Broadcast	2656 lb.
Tucson Seed Co	Extra large	Oct. 7-9	Rows 2½ ft. apart	1047 lb.
Tucson & Yuma grown	Ordinary, mixed	Oct. 7-9	Rows 2½ ft. apart	2114 lb.
Tucson grown	Ordinary	Oct. 7-9	Rows 2½ ft. apart	1487 lb.
Tucson grown	Extra large	Oct. 7-9	Rows 2½ ft. apart	676 lb.
Yuma grown		Oct. 7-9	Rows 2½ ft. apart	1777 lb.
Indian Oasis grown		Oct. 7-9	Rows 2½ ft. apart	2047 lb.
Bu. Plant Ind. No. 21786		Oct. 7-9	Rows 2½ ft. apart	1197 lb.
" " " No. 24564		Oct. 7-9	Rows 2½ ft. apart	2240 lb.
" " " No. 28620		Oct. 7-9	Rows 2½ ft. apart	2395 lb.
" " " No. 26898		Oct. 7-9	Rows 2½ ft. apart	2125 lb.

These yields compare well with those obtained by Mexican growers who report crops of from 1500 to 2000 pounds per acre. On good soil a safe estimate of yield is 1000 pounds per acre. A broadcast plot cut for hay yielded at the rate of 3.59 tons per acre.

Market grades: The quality of the test crops tabulated above varies greatly. Samples of each variety grown at Yuma were submitted to a garbanzo expert who reported that while most of them were too small to meet the market requirements, the quality of some indicated that excellent marketable garbanzos could be grown in southern Arizona provided the right varieties of seed were planted. *Small garbanzos have no market value.* The garbanzo which is the most suitable for market purposes is classified by the fact that it has from 48 to 54 seeds per 30 grams of weight. The four principal classes of garbanzos which are sold in Cuba and which represent foreign market conditions are as follows: (1) Thirty percent has from 38 to 40 seeds per 30 grams; (2) forty percent has from 42 to 44 seeds; (3) twenty-five percent has from 45 to 60 seeds; and (4) five percent has the smallest seeds of all. The percentages show the proportions of the total crop as found on the Cuban market.

The market requirements, then, are for a large seed. In addition another requirement which must be met is that of the texture of the pea. The garbanzo which is produced in Spain, (which is said to have a climate very similar to that of southern Arizona) has a hard texture and a very high food value. This seems to be caused by the lack of humidity and by the fact that

a minimum amount of irrigating water is used. While the hard garbanzo is prized as having a high food value and is very much liked in Spain, it has the disadvantage of cooking very slowly. The garbanzo which is produced on the west coast of Mexico where the conditions are somewhat more humid, has what is known as the soft texture, and is prized in New York and the Cuban markets because it is easy to cook. However, in food value it is not so high as the hard varieties. It is believed that the hardness is due more to the amount of water used than to the variety. However, it is also probable that the size and the hardness of the garbanzo may be determined not only by the cultural methods, richness of soil, amount of water used and humidity of the atmosphere, but also by variety, selection and breeding. The test for garbanzo quality is to keep the sample in boiling water for two hours. At the end of that time each grain should retain its shape, be smooth in appearance, and yet be soft enough to crush with the mouth without actually chewing.

Harvesting: When planted in rows the crop may be harvested by means of a bean harvester. It may be threshed with a bean threshing machine.

Grading and packing: In preparing the garbanzo for market, the peas should be graded uniformly according to size and hardness or softness. The standard sack used in the garbanzo trade is 27½ inches wide by 44 inches long, weighs 2½ pounds and is made of jute. These sacks are usually purchased in Calcutta, India, but might be secured of local jobbers.

Production and prices: The last year's crop of garbanzo in Spain was 8,000,000 sacks, in Mexico 200,000 sacks. In addition to these, large crops of garbanzos are produced in Turkey, northern Africa and Turkestan. However, a great deal of this production is used locally, except in Mexico. Spain consumes her entire crop and even then does not have nearly enough to supply the demand. The market demand for garbanzos comes not only from Spain, but also from Cuba, New York City, and many other American cities with a large foreign population. In normal years Mexico produces about 400,000 sacks.

The normal price offered for garbanzos in Mexico is \$6.50 gold, per sack of 100 kilos (220 lbs.). Garbanzos are quoted today in the Los Angeles market at about \$7.50 per 100 lbs. The crop in Arizona should ordinarily bring 4 to 5 cents per pound. The cost of production is about \$20 per acre.

Uses: The garbanzo crop is valued for several purposes. It may serve as a winter growing cover and green manure crop, preparing the soil for subsequent spring and summer planting of crops; it produces a staple human food; and it makes excellent hay. It is stated in some standard works that the forage is poisonous to horses and cattle. It is commonly fed in Mexico, however, and the Station team at Yuma has just consumed a half ton of garbanzo hay with excellent results, usually preferring it even to alfalfa.

Enemies and pests: The worst enemy thus far known to us is rabbits, which browse upon exposed edges of garbanzo fields. Birds attack the young peas.

Insect pests and plant diseases have not thus far appeared upon this crop within our observation in Arizona. It is said to be very free from pests in Mexico where it has been grown for a long time.

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