CHICKPEAS FOR SASKATCHEWAN

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Chickpea (Cicer) *arietinum)* consists of two major types: 1) the kabuli chickpea or garbanzo has extremely large seed (40 to 55 g/100 seeds) and is canned for the salad bar trade, and 2) the desi chickpea has a smaller seed size (20 to 40 g/100 seeds) and is used as split chickpea or as chickpea flour in various food applications, especially in ethnic dishes. The kabuli chickpea commands a premium price, but is more difficult to produce. The seed coat of the kabuli chickpea is white (tannin-free) and membraneceous. Accordingly, it affords little protection against seed-rotting fungi, such as *Pythium.* Seed rot is further enhanced by imbibitional damage when the extra large seed takes up water rapidly, but the inside is still hard and dry. This results in pressure buildup, rupturing tissues and cells, and then extrusion of soluble nutrients occurs, stimulating growth and development of the seed-rotting organisms. However, the desi chickpea has a dense, coloured (tannin-containing) seed coat which restricts the initial rate of water uptake. The tannins also are water soluble and fungistatic, thus reducing the problem with seed rotting organisms. Thus, they are much easier to grow.

The Crop Development Centre (CDC), first started evaluating the potential of chickpea for western Canada in the early 1970s. Unfortunately, some of these early introductions carried seedbome ascochyta infection and many of the early seedings were destroyed by ascochyta. Ascochyta blight of chickpea is caused by *Ascochyta radiei* and is specific to chickpea. This is a very devastating disease in that an infected plant of a susceptible cultivar will be killed over a three to four week period. The spores are spread by raindrop splash, but can still be wind blown for several hundred meters and initiate another cycle of infection. The only method of control is the use of resistant cultivars (resistant parental lines have recently been identified) or by introducing seed tested as free of seedbome ascochyta infection and growing increase fields in isolation.

Nevertheless, the CDC developed a package of agronomic practices suitable for chickpea production on fallow in the Brown soil zone and on stubble in the drier part of the Dark Brown soil zone. Saskatchewan Agriculture supported field scale demonstrations in the early 1980s. Seed of UC5 kabuli chickpea was imported and seeded on about 200 acres with excellent results except for seed size specifications. The canning trade demands a minimum of 52 g/100 seeds and the imported seed met this specification. However, the Saskatchewan-grown seed of UC5 averaged only 46 g/100 seeds due to the drought stress required to induce early maturity. Early maturity was required since canning standards allow a maximum of one percent green seed and any frozen immature seed stays green. Successful fields were grown near Gravelbourg, Ponteix and Consul on fallow and yields averaged 1500 kg/ha. Canning tests were conducted by Libbys in Ontario with excellent results except that the seed size was substandard. At that time no market for split chickpeas and chickpea flour was known and these farmers could not sell their chickpeas. This experience reemphasized the importance of having a market available for a new crop.

Recent Developments

In 1991 several farmers in the Regina and Eston areas tried desi chickpea. The soils and precipitation in the Regina area were too favourable for chickpea production and the crop failed to mature in most years. However, the brown desi chickpea grew fairly well in the Eston area and the desi chickpea market started developing slowly. In recent years Australia has been producing excess desi chickpeas and flooding the market, making it difficult for a new producer to find and develop the market. However, the drought in Australia in 1993 and 1994 and the chickpea crop

failure in Pakistan in 1993 has resulted in a world shortage of desi and kabuli chickpea. As a result, markets have been easier to access and the price is about double the long term average price.

Meanwhile chickpea acreage has been increasing in the Eston area. About 200 acres were grown in 1993, increasing to 800 acres in 1994 and about 3,000 acres are anticipated for 1995. Furthermore, acreage should increase to 75,000 acres by the year 2000.

Chickpea has excellent drought tolerance, due primarily to its deep taproot system enabling it to extract moisture from the 2 to 2 112 meter depth. Thus, it is uniquely adapted to fallow in the Brown soil zone and stubble in the Dark Brown soil zone. Crop diversification to date has ignored the Brown soil zone because most new crops do not have an adequate level of drought tolerance. However, chickpea will enable crop producers in the Brown soil zone to diversify and add a nitrogen-fixing legume to their rotation.

In 1995 the CDC released the first Canadian cultivar of desi chickpea. It is ascochyta susceptible and thus all fields will have to be monitored for the presence of ascochyta blight. Strict sanitation must be practiced and any field with any infected plants in it must not be used for seed since seedborne ascochyta infection is the primary means of long distance spread of this devastating disease. As a further precaution, no chickpea field within three miles of the infected field should be used for seed and no chickpea should be grown within three miles of the infected field for three years (the 333 rule). Even then, ascochyta infection may still occur, but this precaution will help reduce the risk of ascochyta development and spread.

Future Developments

Ascochyta resistant kabuli and desi chickpea cultivars are being developed at the CDC. The first ascochyta resistant desi chickpea should be available by the spring of 1998. Most kabuli chickpea cultivars are extremely late maturing and so an early maturing ascochyta resistant kabuli chickpea cultivar is being developed and should be available by 1999 or before. Meanwhile, we are introducing two ascochyta-resistant chickpea cultivars developed by Dr. Muehlbauer, USDA at Pulhnan, WA. No agronomic data are available on these, but they obviously will be late maturing and must be planted on stubble in the Brown or Dark Brown soil zone, avoiding the lower areas of the field with extra nitrogen and moisture. These two varieties are called Sanford and Dwelley.

Recommended Production Practices

The large-seeded kabuli chickpea presents some extra production hazards and so production practices for it will be covered separately.

A. Kabuli Chickpea The large-seeded kabuli chickpeas have a thin, delicate, white (zero tannin) seed coat making it extremely susceptible to seed rotting. Tannins occurs in the seed coat of desi chickpea, are water soluble and have a fungistatic effect on seed rotting microorganisms. However, the zero tannin kabuli chickpea lacks these tannins and thus a fungicidal seed treatment is an absolute requirement. The best fungicide for seed rots is metalaxyl (Apron), but it is not available at the present time. A second choice is Vitavax or Crown (Vitavax plus thiabendazole). Crown also is fairly effective in controlling seedbome ascochyta infection and seedbome Botrytis infection. The large-seeded kabuli chickpea is also susceptible to low temperature imbibitional injury. Rapid uptake of moisture during the first 24 hours, especially at low soil temperatures, will result in a high moisture level in the outside of the seed while the inside of the seed is still hard and dry. Consequently, the cotyledons may even crack, but in all cases cell membranes are ruptured and soluble nutrients forcibly extruded into the soil. Seed rotting microorganisms start multiplying and rot the seed unless it is protected by a fungicide. Planting about May 10 after the soil has

warmed up to about 10°C at seeding depth is also beneficial as this promotes rapid germination and emergence.

The desired stand is about three plants/ft^2, but since Vitavax is only about 60% effective, the seeding rate for kabuli chickpea should be about five seeds/ft^2. With the large seeded kabuli chickpeas, this is a seeding rate of about 150 kg/ha.

Weeds can be controlled by soil incorporated trifluralin or ethalfluralin (non-registered). The remaining mustard-type weeds can be controlled by a split application of metribuzin - 213 rate when the chickpea seedling is only about one inch tall and a second treatment at 1/2 rate 10 to 14 days later, if needed. Metribuzin at the full (lentil) rate will burn all the leaves off and severely stunt the chickpeas and thin the stand. The early application is done before the leaves expand and little damage occurs. Alternatively, metribuzin can be soil incorporated with the trifluralin in the fall. Grass herbicides, such as Poast, also can be used if needed.

Kabuli chickpeas also present another problem in that most seeders cannot feed the extra large seeds without breaking them. Producers should check ahead of seeding time to see if the kabuli chickpeas will feed through their seed cups. The Melroe and Morris seedcups and some of the air seeders work fairly well, but they should still be checked out ahead of time. In addition, kabuli chickpeas are very susceptible to mechanical damage due to their thin seedcoat. Mechanical damage also increases if the seed moisture level is below 14%.

The seed should also be inoculated with the chickpea strain of legume inoculant.

B. Desi Chickpeas: Most practices used on kabuli chickpeas are also used for desi chickpeas. The main differences are that fungicidal seed treatment is not required for the small-seeded, desi chickpea with a hard, tannin-containing seed coat. In addition it can and should be seeded in April if possible, even April 15 to 20 if the soil temperature at seeding depth is up to 5°C. Most seedcups can handle the smaller, harder desi chickpea seed. Good emergence usually occurs and so the seeding rate can be reduced to about 3 1/2 seeds/ft^2 or about 80 kg/ha, depending on seed size. The new CDC desi chickpea has larger seed than most desi chickpea varieties and the seeding rate will be about 100 kg/ha.

Summary

Chickpea is a new crop especially well adapted to fallow in the Brown soil zone and stubble in the drier part of the Dark Brown soil zone. It has excellent drought resistance as a result of its deep ranging tap root system. Ascochyta blight is a major production hazard, but resistant cultivars are under development. It is likely that about 75,000 acres of chickpea will be grown in western Canada by the year 2000.