Chickpea Production in Saskatchewan?

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Seven Saskatchewan farmers grew chickpeas in 1980 (29 ha) and 12 grew them in 1981 (90 ha) in a pilot project conducted jointly by the farmers, the Crop Development Centre, Saskatchewan Department of Agriculture and Agriculture Canada's New Crop Development Fund. Yields ranged from zero to 1500 kg/ha, but averaged about 500 kg/ha in 1980 and 600 kg/ha in 1981.

Chickpeas have an indeterminate growth habit and continue flowering until some environmental stress such as drought or frost terminates growth. Even then, they rarely mature much before September 1. They are drought tolerant and best adapted to the Brown and Dark Brown Soil Zones. They will not tolerate flooding or salt-affected soils.

The Biggest Problem: Inadequate Stands

The largest deterrant to successful chickpea production is poor stands. The desired stand under Saskatchewan conditions is about 4 plants/ft^2 or 43 plants/m^2; not one of the 19 fields grown in Saskatchewan has had a stand this good and many of them in 1981 had a stand of less than 20 plants/m^2. A seeding rate of 220 kg/ha (200 lbs/a), which most farmers used, will result in more than 43 seeds/m^2. Obviously, emergence was less than 50%, even less than 25% in some fields. Why?

Preliminary results suggest that poor emergence of chickpeas is caused primarily by two factors: mechanical damage to the seed and imbibition (uptake of moisture) at low temperatures, such that both together may even result in complete loss of the ability to germinate and emerge (Table 1). Thus, a hand threshed sample germinated 100%, while a combine threshed sample from the same field germinated only 70%. Some of these seedlings had a damaged root and would require a good fungicide if they were to emerge under field conditions. A combine-threshed sample of chickpeas from the same field was allowed to imbibe moisture overnight (16 hours) at $0^{o}C$ and then returned to room temperature for the remainder of the germination period. This sample was completely killed; not even fungicide could improve its germination. From these data we conclude that poor emergence of chickpeas arises as a result of seeding mechanically damaged seed into cold soil. A fungicide can help, but seed quality must be maintained.

Chickpeas have a large seed which is easily damaged during harvesting, augering, cleaning, treating with fungicide, augering into the seeder and even during seeding. Chickpeas also have a thin seed coat, making them even more liable to mechanical damage. The frequency of mechanically damaged seed is further increased by the fact that the seed is beaked, i.e., there is a pointed projection on the seed. This beak encloses the root tip and, if this beak is damaged, the root tip is damaged. Damaged root tips result in delayed emergence as adventitious roots must be formed; here is where fungicides are important. The fungicide protects the seed from seed-rotting organisms until new roots are formed and the plant emerges. Obviously,

some seeds are damaged so badly that the resulting seedling is not capable of regenerating new roots and continuing emergence, e.g., if the shoot is broken off, the plant will die.

These results suggest the following actions in an effort to increase emergence:

1. Handle the seed gently, during threshing, cleaning and seeding so as to minimize mechanical damage.
2. Apply fungicide to the seed to assist emergence of slightly damaged seedlings.
3. Seed into warmer soil than was the case in 1981 ($8^{o}C = 46^{o}F$ at seeding depth rather than $5^{o}C = 41^{o}F$ used in most cases in 1981). This means seeding about May 15 rather than May 5 in many areas.

Fungicide Studies

The effectiveness of thiram fungicide was shown in a series of tests at Saskatoon with four varieties of chickpeas (Table 2). However, emergence was only 40% with thiram, still not good enough.

A second fungicide test involved five chickpea varieties and the seeds were treated with thiram, captan or left untreated. Percent emergence was lower for the thiram treatment than in the previous test (23% vs 30%), but captan treatment increased average emergence to 40% (56% for captan treated Mission) (Table 3). Yield data in Table 4 further substantiate the superior effect of captan treatment of chickpea seed relative to thiram treatment. These data indicate that captan is more effective than thiram, but that even captan cannot compensate completely for planting mechanically damaged seed into cold soil.

Seeding Rate

A seeding rate study was conducted at Saskatoon in 1981. The suggested seeding rate of 43 s/m^2 or 220 kg/ha (200 lb/a) produced yields that were not much different from either higher or lower rates (Table 5), but there were large differences in stand density due to the low and variable emergence in many plots.

Three farmer cooperators also participated in a rate of seeding study and data are presented in Table 6. Results show little effect on seed yield of increasing seeding rate beyond the suggested 220 kg/ha (200 lb/a). Plant counts indicated an average emergence of about 50%.

Stubble vs. Fallow Seeding

All chickpeas in 1980 and most in 1981 were grown on stubble to insure a drought stress. Unfortunately, the abnormally dry seasons of 1980 and 1981 in most chickpea fields resulted in rather low yields. One farmer's field at Gravelbourg was sown half on fallow and half on stubble with the results shown in Table 7. The stubble field yielded only 58% of the fallow field under these conditions and the crop matured normally in early September. It appears that in most years chickpeas can be seeded on fallow in the Brown Soil Zone and in most of the Dark Brown Soil Zone and still undergo severe drought stress in August so as to mature them in early September before they get frost damaged.

Suggested Practices for Chickpea Production in the Brown and Dark Brown Soil Zones of Saskatchewan

1. Check germination of chickpea seed and make sure it germinates 70% or higher.
2. Treat seed with excess captan (9 oz actual material/100 lbs seed).
3. Plant with a seeder that keeps seed damage to a minimum.
4. Seed into summerfallow.
5. Seed at 220 kg/ha (200 lbs/a).
6. Seed after the soil at seeding depth has warmed up to 8°C (46°F) = about May 15 most years.
7. Control weeds with appropriate, but unregistered herbicides as used in lentils. (Trifluralin, triallate, diclofop methyl, metribuzin, barban).
8. Thresh gently, allowing immature pods to go over the sieves and keeping the return flow to a minimum.

This chickpea project has two more years to run and with the patient cooperation of a small group of farmer experimenters, we should be able to determine the economic feasibility of commercial chickpea production in Saskatchewan by the spring of 1984. So far the cooperating farmers have invested a lot of time, effort and money in the chickpea project and to date no one has shown a single dollar return.

Table 1. Effect of mechanical damage and cold temperature imbibition on germination of chickpeas

Seed treatment	Germination (%)
Hand Threshed	100
Combined Threshed	50-70
Combined and imbibed at $0^{o}C$ for 16 hours	0

Table 2. Effect of Thiram on emergence of four varieties of chickpeas at Saskatoon, 1981

	Plants per m^2		
Variety	Thiram	No Thiram	Variety mean
U.C.-5	16	8	12
Mission	18	6	12
Common	9	3	6
Macarena	8	2	5
Average	13	5	-
Number seeded	43 (30%)	43 (12%)	-

Table 3. Effect of captan and thiram on emergence of five chickpea varieties at Saskatoon, 1981

Variety	Plants per m^2 (43 seeded)			
	Captan	Thiram	None	Variety mean
Mission	24	16	6	15a
1C 7519	16	16	7	13a
Common	18	8	3	10b
1C 8288	13	8	4	8bc
Macarena	14	4	2	7c
Fungicide	17a	10b	4c	-
Mean	40%	23%	9%	

Table 4. Effect of captan and thiram on seed yield of five chickpea varieties as Saskatoon, 1981

Variety	Seed yield in kg/ha			
	Captan	Thiram	None	Variety mean
1C 7519	1125	1053	823	1000 a
Mission	1199	981	759	980 a
Common	1103	844	548	832 b
1C 8288	926	836	478	747 c
Macarena	723	396	240	453 d
Fungicide Mean	1015 a	822 b	570 c	-

Table 5. Effect of seeding rate and thiram on seed yield of chickpeas at Saskatoon, 1981

Seeding Rate		Seed Yield (kg/ha)		
seeds per m^2	kg/ha	Thiram	No Thiram	Seed Rate Mean
21	110	806	452	629
32	165	939	800?	870
43*	220	976	656	816
54	275	1054	688	871
65	330	1060	764	912

*Suggested rate

Table 6. Effect of seeding rate on stand density and seed yield of chickpeas, 1981

Seeding Rate kg/ha	Plants per m^2	Seed Yield kg/ha
Consul		
100	18	956
165	21	1096
Lucky Lake		
150	19	1034
300	27	1317
Rouleau		
150	16	450
200	18	377
400	41	502
Suggested:		
220	43	

Table 7. Effect of seeding chickpeas on stubble and fallow at Gravelbourg, 1981

Seedbed condition	Seed Yield (kg/ha)
Stubble	895 b
Fallow	1535 a