
Canning Quality Traits of Kabuli Chickpea Cultivars Grown at Various Locations in Saskatchewan

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Introduction

There are two types of chickpeas. One type is called the desi chickpea, which is used whole or in snack foods. Its primary market is in the split or milled form used in ethnic foods (Saskatchewan Pulse Growers, 1998). It accounts for 85% of world production. They have the smaller seed size at less than 250 g per 1000 seeds. The intermediate sized desi chickpeas have sizes between 250 to 400 g per 1000 seeds.

Kabuli chickpeas, meanwhile, are used mainly in salad bars and vegetable mixes (Saskatchewan Pulse Growers, 1998). It has the larger seed size with seed sizes of 400 to 500 g per 1000 seeds for the intermediate sized kabulis and greater than 500 g per 1000 seeds for those used for canning.

Materials and Methods

Chickpea Regional Trials

The kabuli chickpeas used in this study were obtained from the 1996 and 1997 chickpea regional trials. In the data analyses, data for three cultivars, Sanford (the check), 92037-26 and 92066-25 from six locations (Brooks, Climax, Maple Creek, Oyen, Riverhurst and Weyburn) in 1996 and seven locations (Cadillac, Conquest, Elrose, Inverness, Saskatoon, Scott and Swift Current) in 1997 were combined.

Hundred-seed Weight

The hundred seed weights of each cultivar at each location were determined. Results were reported as 100-seed weights in g.

Hydration Coefficient

The hydration coefficient is defined as the weight of the chickpeas after soaking in tap water at room temperature for 18 hours divided by the weight of the chickpeas. The 18 hour soak time was chosen mainly for convenience. The chickpeas were soaked at around 4 p.m.

and thus would be ready for canning by 8 a.m. the following day.

Determination of Surface Colour of Dry Seeds

The colour of the chickpeas (seed coat on) was determined using the HunterLab colorimeter (ColorQUEST Model 45/0, Hunter Associates Laboratory, Inc., Reston, VA) using the white tile as standard (HunterLab Color Standard No. C49006). One hundred g of seeds were weighed and subsequently transferred to a Petri plate. Duplicate readings were obtained. The second reading was obtained after rotating the Petri plate 90°. Results were reported as 'L' (100 = white; 0 = black), 'a' (+a = red; -a = green) and 'b' (+b = green; -b = yellow).

Moisture Determination

Three samples from each location were selected at random. The moisture contents were determined using the Sartorius Moisture Analyzer (Model MA, Goettingen, Germany). The moisture contents for each location were used to calculate the total solids content for all the cultivars at each given location.

Thermal Processing

Based on preliminary studies, it was found that the 10 fl. oz. (284 ml) can was acceptable with 72 g total solids. Chickpeas containing the appropriate level of total solids were placed in ham nets. The ham nets were placed in appropriate containers containing tap water and allowed to soak for 18 hours at room temperature. After the soaking period, the ham nets were transferred to a preheated (70°C) water bath where the samples were blanched for 4 min. After blanching, the samples were transferred into their respective cans. The hydration coefficient was also calculated.

The blanched chickpeas were covered with brine (1.3% @ 90°C) until a 5 mm headspace was obtained. The cans were sealed (Dixie Double Seamer, Model 25D, Athens, GA) and processed at 121°C for 14 min. Cans were stored upside-down at room temperature for two weeks prior to analyses.

Determination of WDWT and PWDWT

After the two week storage period, the cans were opened after which the can contents were transferred to a S-mesh screen positioned at a 15° angle, rinsed with distilled water and allowed to drain for 5 min before the rinsed peas were weighed to give the washed drained weight (WDWT). The percent washed drained weight (PWDWT) was calculated by multiplying the ratio of the washed drained weight/weight of can contents by 100. WDWT is reported in g while PWDWT is reported as %

Determination of Surface Colour of Cooked Seeds

The surface colour of the cooked chickpeas (seed coat on) was determined following the procedure for raw chickpeas described above. After colour determination, the seeds were used for texture determination as described below.

Determination of Texture

One hundred g of the rinsed chickpeas were transferred to the Kramer shear cell which was then placed in the texture test system (Food Technology Corporation, Model TMS-90, Rockville, MD) equipped with a 454 kg transducer set at a speed of 0.60 cm/min. Results were expressed in kgs/100 g sample.

Results and Discussion

The effect of cultivar on the various canning quality traits are shown in Table 1. The results show that there were no differences between the three cultivars in terms of various canning quality traits with the exception of the texture value for 92037-26, which was significantly greater. This result may not necessarily be taken negatively since consumers seem to prefer canned chickpeas which are crunchier, i.e. have a higher texture value.

Table 1. Effect of cultivar on various canning quality traits¹.

Cultivar	HSW ²	HC ³	WDWT ⁴	PWDWT ⁵	Text ⁶
Sanford	41.5a	2.08a	185.1a	58.9a	155a
9203 7-26	41.5a	2.1 1a	182.4a	57.7a	173b
92066-25	44.5a	2.1 1a	185.9a	58.9a	158a

Values in the same column followed by the same letter are not significantly different (P>0.05).

² HS W=hundred seed weight.

³ HC=hydration coefficient=weight of seeds after 18 hours of soaking in tap water at room temperature/weight of dry bean seeds.

⁴ WDWT=washed drained weight=weight of rinsed bean seeds drained for 5 minutes on an 8-mesh screen positioned at a 15° angle.

⁵ PWDWT=percent washed drained weight=(washed drained weight* 1 00)/[(wt. of container and contents)-(wt. of container)].

⁶ Text=kg force/1 00 g.

Table 2 shows the effect of cultivar on the Hunter 'L', 'a' and 'b' values of both the uncooked and canned chickpeas. The 'L' value of the uncooked chickpeas of cultivar 92037-26 was significantly lower, i.e. darker, than the 'L' value of the Sanford check. In addition, the 'a' value of the uncooked 92037-26 was significantly greater, i.e. more red, than the 'a' value of the Sanford check. For the canned chickpeas, the 'L' value of the canned cultivar, 92037-26 was also significantly lower, i.e. darker, than the Sanford check.

Table 3 shows the effect of location on the canning quality traits. There were 13

locations used in the analyses, however, only five were tabulated in order to illustrate the extreme values. The largest chickpeas were obtained at Brooks while the smallest seeds were obtained at Saskatoon. The highest hydration coefficients (HC), washed drained weight (WDWT) and percent washed drained weight (PWDWT) were all obtained at Saskatoon. Meanwhile, the lowest HCs, WDWTs and PWDWTs were obtained at Scott. Finally, the highest texture readings were obtained at Conquest and Scott while the lowest readings were obtained at Swift Current.

There was a significant negative correlation between the HSWs and the HCs and a significant correlation between HSWs and PWDWTs. Larger seeds tend to have smaller hydration coefficients. A smaller number of large seeds would be needed for canning so that the minimum PWDWT required, 60%, would be attained. In addition, there were also significant correlations between HCs and WDWTs and PWDWTs and a significant negative correlation between HCs and the texture readings. A smaller number of chickpeas with high hydration coefficients would be needed to attain the minimum PWDWT.

Table 2. Effect of cultivar on Hunter L, a and b values of uncooked and cooked seeds¹.

Variety	UL ²	Ua ³	Ub ⁴	CL ⁵	Ca ⁶	Cb ⁷
Sanford	50.1a	7.3a	14.5a	48.5a	9.2a	19.3a
92037-26	47.1b	7.8b	14.6a	46.6b	10.1a	18.5a
92066-25	48.7ab	6.8c	14.5a	48.1a	9.5a	19.0a

Values in the same column followed by the same letter are not significantly different (P>0.05).

² UL=L value of uncooked seeds; +l OO=white; O=black.

³ Ua=a value of uncooked seeds, +a=red; -a=yellow.

⁴ Ub=b value of uncooked seeds; +b=yellow; -b=blue.

⁵ CL=L value of uncooked seeds; +l OO=white; O=black.

⁶ Ca=a value of uncooked seeds, +a=red; -a=yellow.

⁷ Cb=b value of uncooked seeds; +b=yellow; -b=blue.

Table 3. Effect of location on canning quality traits.

Location	HSW ¹	HC ²	WDWT ³	PWDWT ⁴	Text ⁵
Saskatoon	35.8	2.216	192.6	60.8	145.4
Swift Current	42.1	2.143	188.6	60.1	136.9
Conquest	43.1	2.055	179.7	57.2	191.5
Brooks	51.0	2.042	186.4	58.1	154.4
Scott	39.7	2.021	176.0	56.0	190.6

HSW=hundred seed weight. ² HC=hydration coefficient=weight of seeds after 18 hours of soaking in tap water at room temperature/weight of dry bean seeds.

³ WDWT=washed drained weight=weight of rinsed bean seeds drained for 5 minutes on an 8-mesh screen positioned at a 15° angle. ⁴ PWDWT=percent washed drained weight=(washed drained weight* 100)/[(wt. of container and contents)-(wt. of container)].

⁵ Text=kg force/100 g.

Table 4 shows the effect of location on the 'L', 'a' and 'b' values of both the uncooked and canned chickpeas. As with the data on canning quality traits, only the data from five of the thirteen locations were shown to illustrate the differences among locations. The highest 'L' values, i.e. lightest in colour, of the uncooked chickpeas were obtained at Oyen while the lowest 'L' values, i.e. darkest in colour, for uncooked seeds were obtained at Swift Current. The highest 'a' and 'b' values for the uncooked chickpeas were obtained at Climax while the lowest 'a' and 'b' values were obtained at Saskatoon. Meanwhile, for the canned seeds, the 'L' values were similar at Oyen, Climax and Saskatoon, giving the lightest coloured canned chickpeas. The 'a' and 'b' values for cooked chickpeas were highest at Oyen and Saskatoon while the lowest 'a' and 'b' values were obtained at Swift Current and Conquest. There was also a significant correlation between the 'L' values of the uncooked chickpeas with the 'L' values of the canned chickpeas. This means that the lighter coloured seeds tend to be the lightest coloured canned seeds as well.

Table 4. Effect of location on Hunter L, a and b values of uncooked and cooked seeds.

Location	UL ¹	Ua ²	Ub ³	CL ⁴	Ca ⁵	Cb ⁶
Oyen	54.6	7.2	15.1	48.7	10.5	19.5
Swift Current	45.5	7.2	14.1	47.0	8.4	18.5
Climax	50.7	8.2	15.8	48.3	9.4	18.8
Saskatoon	46.9	6.6	13.7	48.6	11.0	19.9
Conquest	47.2	7.1	14.1	46.3	8.7	18.1

¹ UL=L value of uncooked seeds; +1 OO=white; 0=black.

² Ua=a value of uncooked seeds, +a=red; -a=yellow.

³ Ub=b value of uncooked seeds; +b=yellow; -b=blue.

⁴ CL=L value of uncooked seeds; +1 OO=white; 0=black.

⁵ Ca=a value of uncooked seeds, +a=red; -a=yellow.

⁶ Cb=b value of uncooked seeds; +b=yellow; -b=blue.

Summary

The results have shown the effects of both cultivar and location on the various canning quality traits as well as the colour of both the uncooked and canned chickpeas. The conditions at each location would have to be identified to determine their specific effects on the various parameters studied. Hopefully, with this new information, the appropriate agronomic practices can be employed to ensure uniformity in quality of the seeds produced.

Reference

Saskatchewan Pulse Growers, 1998. <http://www.vsource.com/saskpulse/cindex.htm>.

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