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MPSG FINAL EXTENSION REPORT

PROJECT TITLE: Investigating Factors Influencing the Quality of Cooked Whole Beans

PROJECT START DATE: 20 April 2017 **PROJECT END DATE: 15 December 2017**

DATE SUBMITTED: 19 December 2017

PART 1: PRINCIPAL RESEARCHER

PRINCIPAL

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PART 2: EXECUTIVE SUMMARY

Outline the project objectives, a summary of the activities and results, and their relevancy to pulse and soybean farmers.

The project examined the factors that could influence a properly cooked bean including the effects of salt addition, salt brine soaking and water quality (e.g. water hardness) as it all relates to the final desired qualities of a cooked bean. Conflicting information is extensive in bean cookery; from cookbooks, industry guidelines, chefs and even packaging directions, providing different options to adding salt. This project reviewed the average cook times, changes in flavour development, textural changes with varying amounts and additions of salt. Quantitative evaluation was done using the Mattson cooker and methodology developed by the Canadian International Grains Institute. The equipment measures the time it takes to puncture 80% of the beans with weighted plungers to determine the cook time. This method was compared to an in kitchen chef evaluation of doneness. Finally consumer testing was conducted with two salt treatments - salted brine and salt in the cook water against a control (no salt) to determine if salt negatively affected sensory characteristics when added during cooking. The result were: Water chemistry (soft and hard) played a significant role in the increase cook time and decreased texture of finished cooked beans; salt plays a role in the finished texture and flavour development of beans; brined, 1% and 2% salt trials improved the flavour and texture of the beans but too much salt had a negative impact on the beans. An increase of salt, in the 2-3% range, toughened the seed coat and or changed the texture negatively. These results can be used to improve the consumer experience with dried pulses as a healthy protein source.

PART 3: EXPERIMENT DESCRIPTION & RESULTS

Concisely describe the experimental methods and results to date. You may include up to 3 graphs/tables/pictures in the Appendix.

Five Bean types; navy beans, black beans, pinto beans, fava beans and kidney beans were soaked and cooked in distilled water with following inclusion rates of salt based on weight of water. Control (0%), 1%, 2% and 3% and brined. Brined beans had a 2% inclusion of salt per weight of soaking water (w/w). Soaking ratio 4:1 (w/w) distilled water to dry bean. Analysis done in triplicate. Soaking occurred at room temperature (22 ± 2°C) for 24 hours as per method CIGI: Determination of Pulse Cooking Time using the Automated Mattson Cooker (updated 04/06). (Mattson method). Cooking occurred with the soaked sorted beans placed in1.2 Liters of distilled water. Salt was added with the beans once the water fraction had achieved the required temperature.

Modifications made to the Mattson method were made for in kitchen testing referred to the PGI: Qualitative Cooking Method of Beans as to represent a culinary approach to cooking beans. (PGI method) The method change was a drop in the cooking temperature from a rolling boil (100°C) to a targeted range of 94-96°C. This is representative of a simmer as taught in the culinary school. Beans were considered average cooked in a tactile tasting rating of 3 and time was stopped (PGI method). The qualitative characteristics and number of complete/whole intact beans play an important role in the acceptability of the finished bean. By linking the two methods as in PGI in kitchen method, there may an opportunity to get more accurate qualitative cook times for different bean types by following the initial Mattson cooker trends.

Kidney beans and black beans were soaked and cooked in soft water or hard water. Soft water is defined 30 mg/L calcium carbonate and hard water as 120mg/L of calcium carbonate as per Health Canada's range on water hardness in the Canadian Drinking Water Guidelines on Hardness . Analysis on the two bean types was performed in triplicate with a control sample cooked in distilled water.

Beans were soaked at a ratio 3:1 (w/w) distilled water to dry bean and cooked at a ratio of 4:1 (w:w) distilled water to dry bean. Consumer acceptance survey was performed with three treatments - Control, 1% salt addition and 2% brined. Beans selected were navy, kidney, black and pinto beans.

The Culinary Research team conducted a ranking survey in which untrained tasters from the general population were asked to pick a favourite and least favourite bean sample from two treatments and one control sample. A table was set up in the Annex of RRC's Paterson GlobalFoods Institute and people were asked to take part in the survey by tasting two types of beans cooked using the three test treatments in return for a $5 gift card. Ranking questions ask respondents to compare items to each other by placing them in order of preference. An average ranking is then calculated through SurveyMonkey™ software for each answer choice, allowing for a quick evaluation the most preferred answer choice. Out of three samples, top preference (1) receives a score of 3, and the least preferred (3) receives a score of 1.

Results: The length of cook time varied between methods but showed that brined beans and 1% salt addition had the largest influence on reducing the mean cook time. The cook time decreased by 12-14%. At the 3% salt inclusions, the seed coat became firmer, the texture of the flesh became gritty and the bean tasted overly salty. Soft water trials using the Mattson method increased cooking by 47% and 17% for the PGI method. Soft and hard water trials had a significant impact on the seed coat. In taste trials the least favourite texture was the control or unsalted dispelling the notion that salt in the cook water creates an undesirable texture. Consumers preferred the salted beans over the control, which is not suprising. It would be interesting to try the salted beans in recipes to see if the taste was perceived as more balanced compared to unsalted beans.

PART 4: RELEVANCE TO FARMERS AND FUTURE RESEARCH

Describe how the project results can be captured to benefit pulse and soybean farmers (production recommendations, innovation items, marketing plans, commercialization of technology etc). Identify any future research opportunities.

This research is relevant to the marketing, consumer acceptance, and increase incorporation of pulses into every day cooking and food service. Consumers often develop negative perceptions of pulses when they aren't cooked properly or the consumer has an unpleasant taste experience. Cooking time of dried beans is cited as a deterrent to using more pulses in recipes and some people are concerned with the sodium content of canned beans. This project set out to create a better guideline for cooking dried pulses in different water conditions. Although the preferred method by chefs is a pressure cooker, home preparation by boiling is still the most accesible preparation methods. With the current populatity of the Instapot™ that may change. The instructions on pulse websites, recipe books and packages could be modified to give the consumer the best pulse experience including adding some salt to balance the taste in the final dishes.

The results can be further refined to include other cooking scenarios such as acidic ingredients with hard and soft water, the use of cooking aids such as baking soda or cookign methods such as pressure cookers. Creating a definitive guide to cooking pulses could spark an interest in trying different pulses and different treatments to suit the consumers taste for texture and salt content of different pulses.

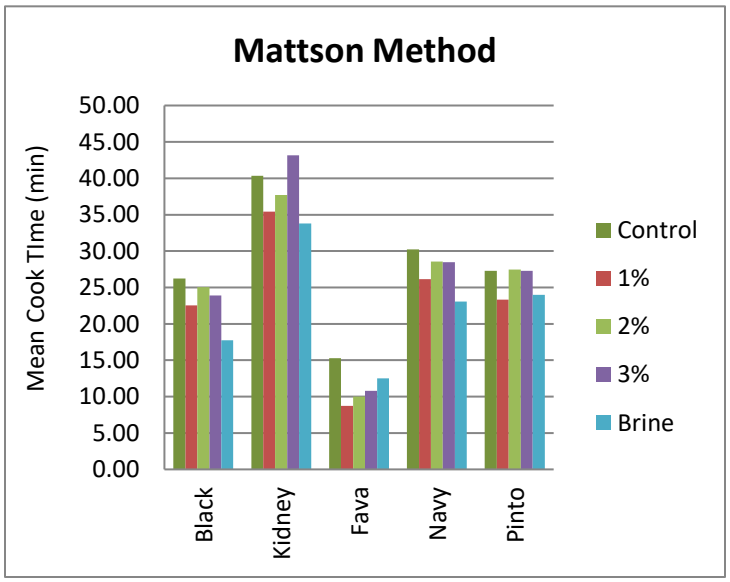
PART 5: COMMUNICATION

List extension meetings, papers produced, conference presentations made, project materials developed.

Red River College has a strong communications team to help write and design print and web material to promote the research. We will use our very active social media outlets (blog and twitter) to alert the general public. We have a mandate to bring industry research to the classroom therefore will send results and updates to instructors, including offers to present the results in class to culinary students. There are plans to submit a poster at the upcoming Crop Connect conference in Winnipeg February 2018.

APPENDIX

Average Cooking Time per Treatment



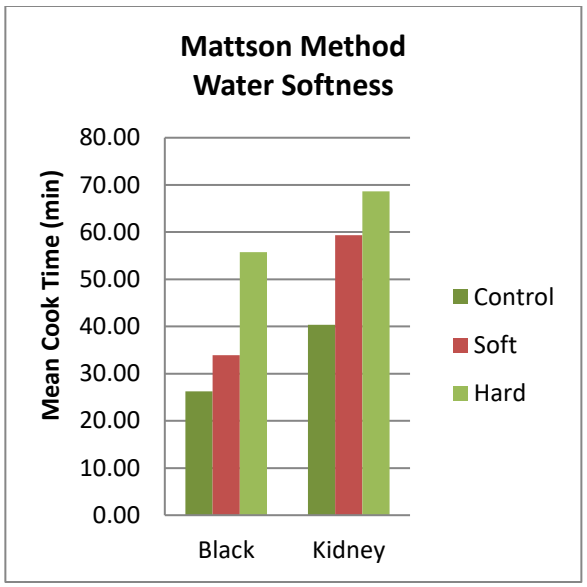


Table : Texture Preference (3 is highest possible score)

	1% Salt Cook Water	2% Soaking Brine	Control (no salt)
White Bean	**2.20**	2.08	1.71
Kidney Bean	1.99	**2.22**	1.76
Black Bean	2.19	**2.37**	1.48
Pinto Bean	**2.29**	2.08	1.65

Table 2.3: Taste Preference (3 is highest possible score)

	1% Salt Cook Water	2% Soaking Brine	Control (no salt)
White Bean	2.44	2.10	1.44
Kidney Bean	2.44	2.03	1.53
Black Bean	2.26	2.34	1.40
Pinto Bean	2.49	2.16	1.37