

BACKGROUND

- Increased concerns regarding allergies, health, nutrition, animal welfare and environmental issues have prompted a push towards plant-based diets and away from the use of eggs.
- Due to its functional versatility and nutritional quality, aquafaba (canned chickpea liquid) is an interesting egg alternative in egg avoidance diets [1-3].
- Proteins, low molecular weight surface active molecules (LMW-SAM) and viscosity increasing carbohydrates leached during processing are expected to contribute to the emulsifying/foaming properties of liquids from canned chickpeas and possibly other canned pulses [4-6].
- Despite aquafaba's success and canned beans making up 76% of pulse product purchases as of 2010 in Ontario, the discarded liquids of Ontario-Native beans, especially bioactive-rich colored pulses, remain to be valorized [7].

HYPOTHESIS and OBJECTIVES

We hypothesize that the canned liquids would exhibit emulsifying and foaming properties related to their protein and LMW-SAM composition.

The aims for the project are as follows:

- To optimize in-lab canned bean (liquid) production and characterizing the functionality of these "aquafabas" from Ontario native beans.
- To characterize bean liquid components and infer possible reasons behind the functional properties shown by these liquids.
- To assess the suitability of these liquids in cereal recipes and predict possible applications for other purposes/products.

PROJECT METHOD APPROACH



PRELIMINARY RESULTS and CONSIDERATIONS

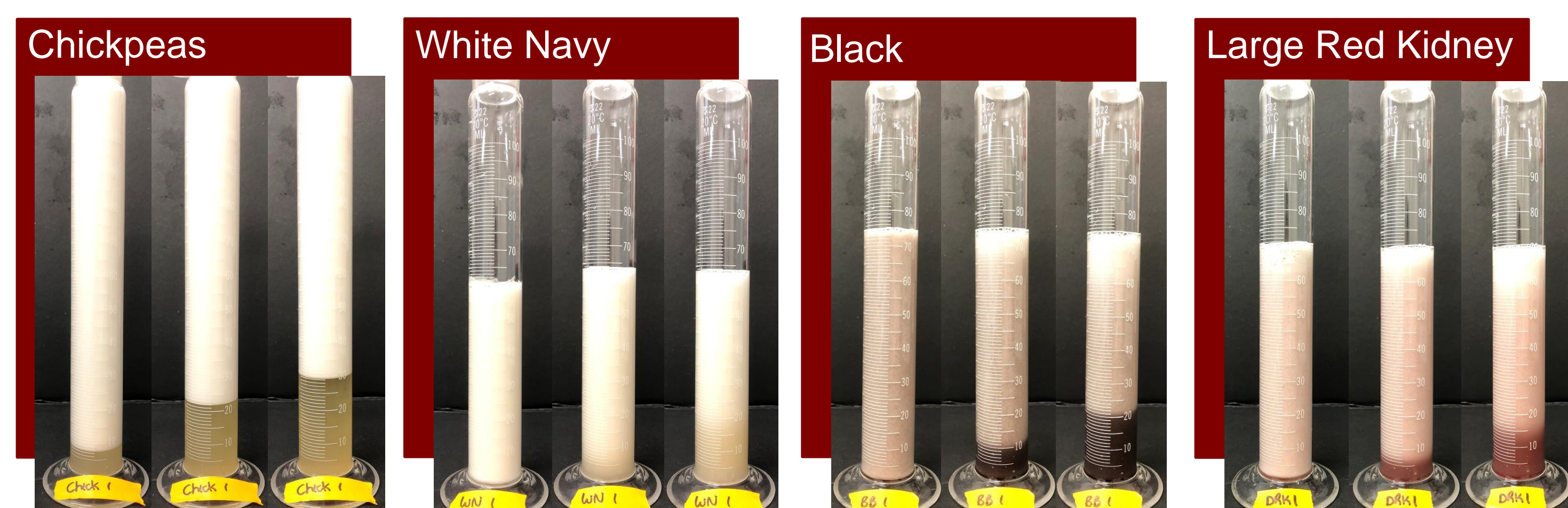
Protein Content and Foaming Behavior of Commercial "Aquafabas":

Table 1. Protein Content, Foaming Capacity and Foaming Stability of Commercially Canned (Great Value Brand) "Aquafabas" at Ambient Temperature

	Chickpeas ¹	White Navy beans	Black beans	Large Red Kidney beans
% Protein Content (DUMAS)	2.06 ± 0.18a	1.66 ± 0.11b	2.24 ± 0.24a	1.58 ± 0.05b
% Foaming Capacity ^{2,3}	231 ± 11a	129 ± 3b	149 ± 1b	140 ± 0b
% Foaming Stability ⁴	81 ± 2a	71 ± 1a	70 ± 4a	79 ± 0a

- Chickpea aquafaba was used as the golden standard to which novel "aquafabas" were compared.
- "Aquafabas" (50 mL) were mixed at 2000 rpm for 2 minutes by Caframo 2002 Compact Digital Mixer in duplicate.
- Average Initial Volumes: Chickpeas = 125 mL; White Navy beans = 65 mL; Black beans = 75 mL; Large Red beans = 70 mL.
- Foam stability was measured 60 minutes after the start of mixing.
- Different letters indicate significant difference ($p < 0.05$)

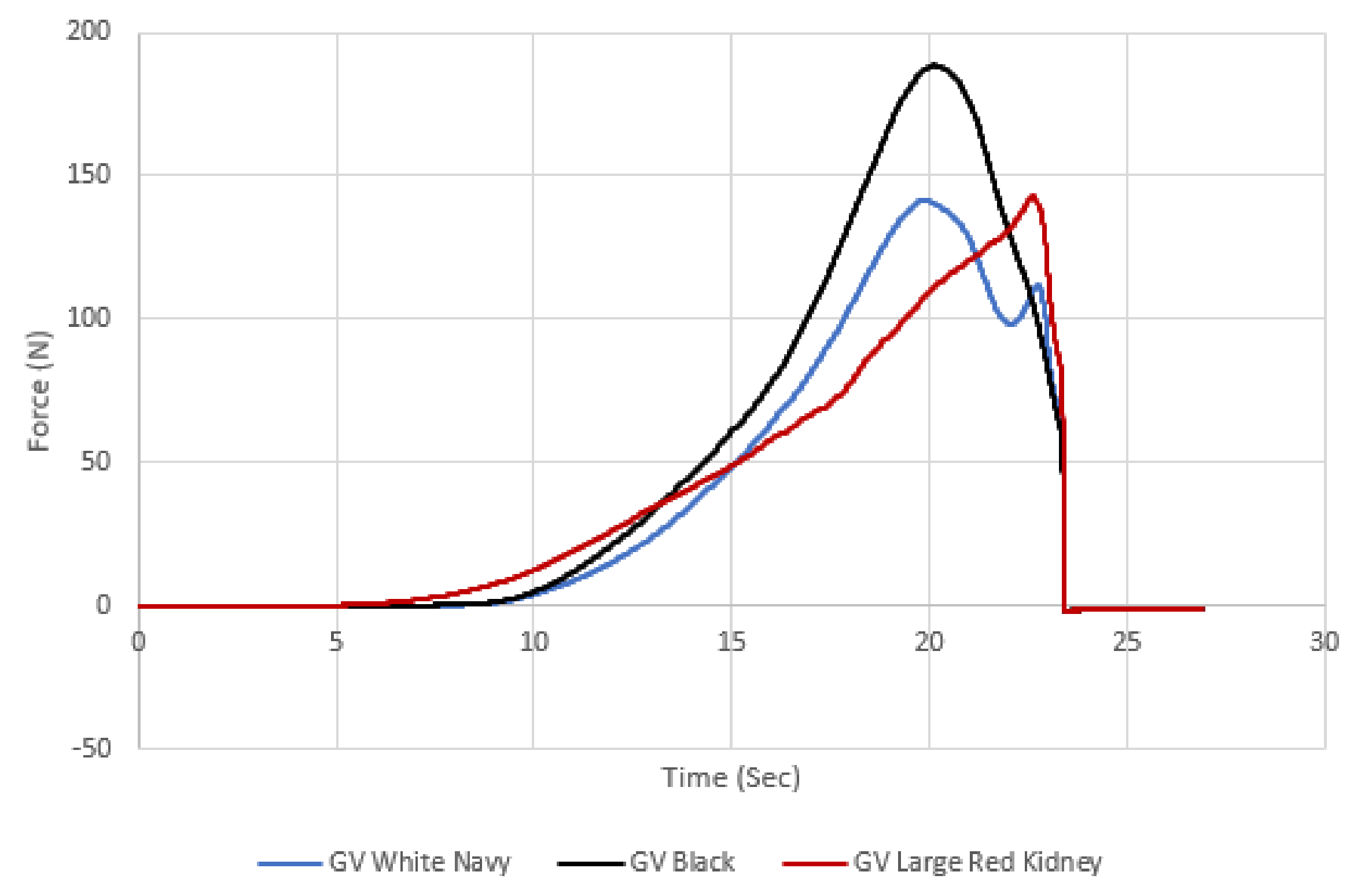
Figure 1. Visual Illustration of Foam Drainage Over Time of Great Value Brand Chickpea, White Navy, Black and Large Red Kidney Bean "Aquafabas" at Ambient Temperature¹



- Visual for each aquafaba type shows foam and liquid levels at $t = 2$ minutes (leftmost), $t = 30$ minutes (middle) and $t = 60$ minutes (rightmost) after the start of mixing.

Determining Parameters for In-Lab Bean Liquid Production:

Figure 2. Texture Analysis for Firmness of Great Value Canned Beans in Newtons Over Test Time (Sec) at Ambient Temperature



Considerations From Preliminary Results:

- Canned bean liquids do exhibit foaming potential which may allude to functional value in foam structure-dependent cereal products such as cakes.
- Protein content alone cannot explain the complex foaming behaviour of the liquids as foaming capacity and stability did not correlate with protein content.
- Characterization of and studying the interaction between the components found in the liquids will be crucial to understanding potential applications.
- Texture analysis (AACC-I 56-36.01) of commercial beans will be used to indirectly benchmark industry-simulating aquafaba production parameters.

SIGNIFICANCE and IMPACT

- This project will bring insight in the potential value of canned bean liquids that would otherwise be discarded as food waste by consumers.
- This investigation will allow a better understanding of utilizing bean liquids in cereal recipes and delve into the mechanisms behind their functionality by characterizing the liquid.
- Insight on how bean liquids act as a novel functional food ingredient may aid in developing future projects or finding other value-increasing applications.
- By increasing awareness of the value in bean liquids, our project may also create incentives to work towards repurposing other agri-food waste streams.

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Acknowledgments

The authors thank the Ontario Cereal Industry Research Council (OCIRC) and the Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA).