CHAPTER 1

INTRODUCTION

1.1. Background

With the increase in demand of plant-based food and high protein food products, protein isolates are high in demand. Alternatives for commercial protein isolates are being sought after to obtain alternative sources of protein, improve protein isolate quality, improve nutritional content and various other reasons. Quinoa is a potential alternative to commercially available protein isolate, especially due to its high nutritional value and enhanced growing traits. Quinoa is a pseudo-cereal belonging to the Chenopodiaceae family. It has a relatively high protein content and potentially beneficial source for protein due its balanced amino acid content.

The process of protein isolation usually involves grinding of the quinoa grains into flour and defatting the flour using an organic solvent, followed by the addition of sodium hydroxide to solubilize the proteins. The proteins in the solution are separated and then precipitated out through the addition of hydrochloric acid to reach the isoelectric point. The proteins are neutralized with the addition of sodium hydroxide and dried (Aluko et al., 2003). Toapanta et al. (2016) conducted a study to analyze quinoa protein isolate where they described defatted quinoa flour with a protein content of 13%. The protein content of quinoa protein isolate was reported to have a crude protein content of 65.01% and 73.65%, and a yield of 5.66% and 6.29% when precipitated between pH of 4 and 5 respectively.

There are various studies on other grains and legumes concerning various optimization of protein isolate production, however there are limited studies on optimizing the process of quinoa protein isolate production. The use of enzymes is a process that has not been explored in quinoa protein isolate production which may help to liberate bound proteins as demonstrated in studies involving other cereals such as rice bran (Ansharullah et.al., 1997) and soybean (Rosset et. al.,2012). The use of enzymes may be relevant towards protein

extraction as protein in quinoa, which exists as protein bodies, may be bound in polysaccharide matrices which may not completely break down during the protein isolation process.

Ansharullah et. al. (1997) described that the nitrogen extracted with the enzymatic method increased in yield and had better nutritional quality. The use of enzymes in rice bran was described to liberate protein from the polysaccharide matrix without having to increase the pH too much which has been described to convert cysteine and serine residues to lysinoalanine which may be toxic and cause loss of nutritive value (Struthers, 1981; Williams, 2003). Rosset et al. (2012) described optimum conditions of the enzymatic process allowed an increase of 50.3% of proteins extracted. Both studies utilize Viscozyme L which include a variety of cell wall degrading enzymes to liberate the proteins which may also be applicable in quinoa protein extraction.

The study would involve preparation of quinoa protein isolate through alkaline-acid precipitation method and quinoa protein isolate prepared with a pre-treatment of Viscozyme L prior to alkaline solubilization. The use of such enzymes has not been previously explored in quinoa protein isolate production, therefore analyzing the nutritional composition, and protein yield would show the effectiveness of the enzymes towards quinoa protein isolate production.

1.2. Objectives

The experiments performed aim to investigate the effect of enzymatic pre-treatment to the proximate and protein yield of quinoa protein isolate extracted from defatted quinoa flour.

1.3. Problem Formulation

What is the effect of Viscozyme L pre-treatment towards the yield and composition of the quinoa protein isolate?

1.4. Hypothesis

H_0= Enzymatic-treated quinoa protein isolate and untreated quinoa protein isolate have the same yield and proximate composition.

H_1=Enzymatic-treated quinoa protein isolate and untreated quinoa protein isolate have different yields and proximate composition.

1.5. Scope of Research

The scope of research of the project involve:

- Sample preparation
    - Defatted Quinoa Flour
    - Non-enzyme-treated quinoa flour solubilized at pH 9
    - Enzyme-treated quinoa flour solubilized at pH 9
- Protein Composition Analysis
    - Protein yield
    - Proximate analysis

The sample preparation involves the preparation of the quinoa protein isolate samples along with defatted quinoa flour. Defatted quinoa flour was measured along with the sample as a supporting data to understand the effect of enzymatic pre-treatment and non-enzymatic pre-treatment to the composition of QPI. Proximate analysis which includes, protein, fat, moisture, ash, and carbohydrate content to determine the change in nutritional composition from the defatted flour to the protein isolate.