
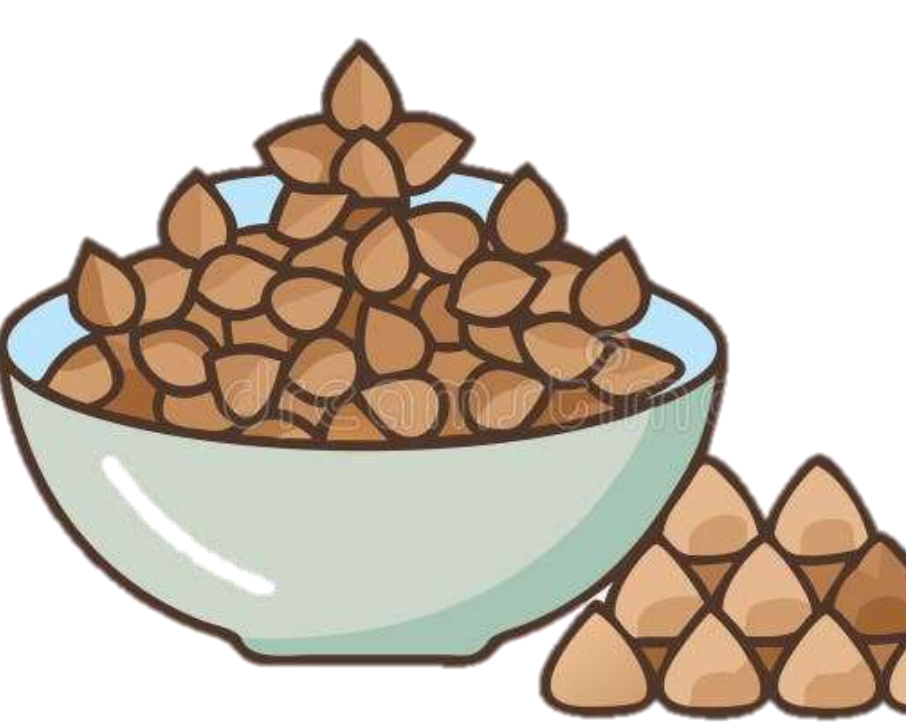




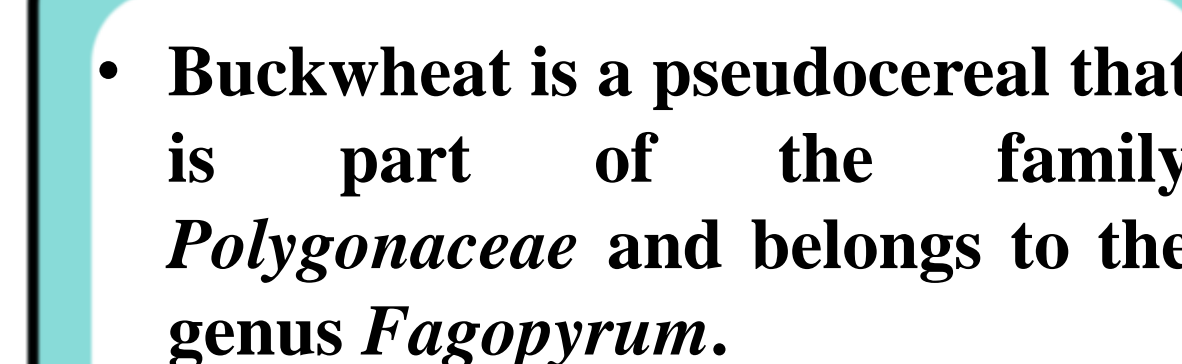

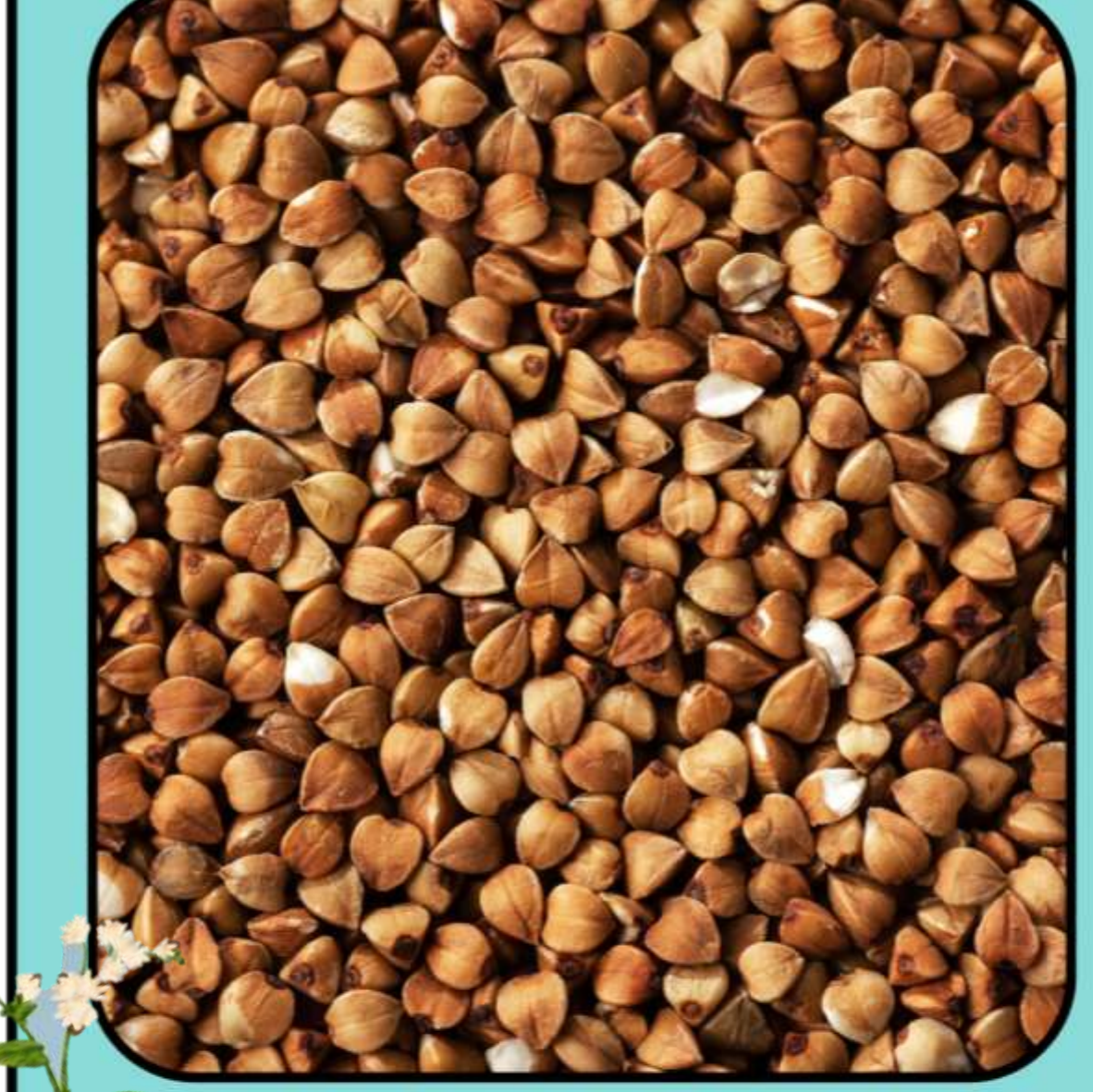
# POSSIBILITIES OF USING DIFFERENT GERMINATED PSEUDOCEREALS IN BREAD MAKING

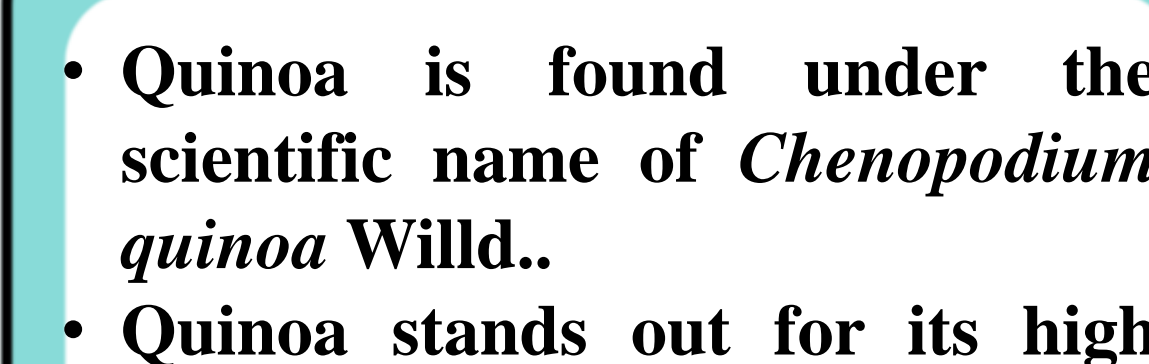


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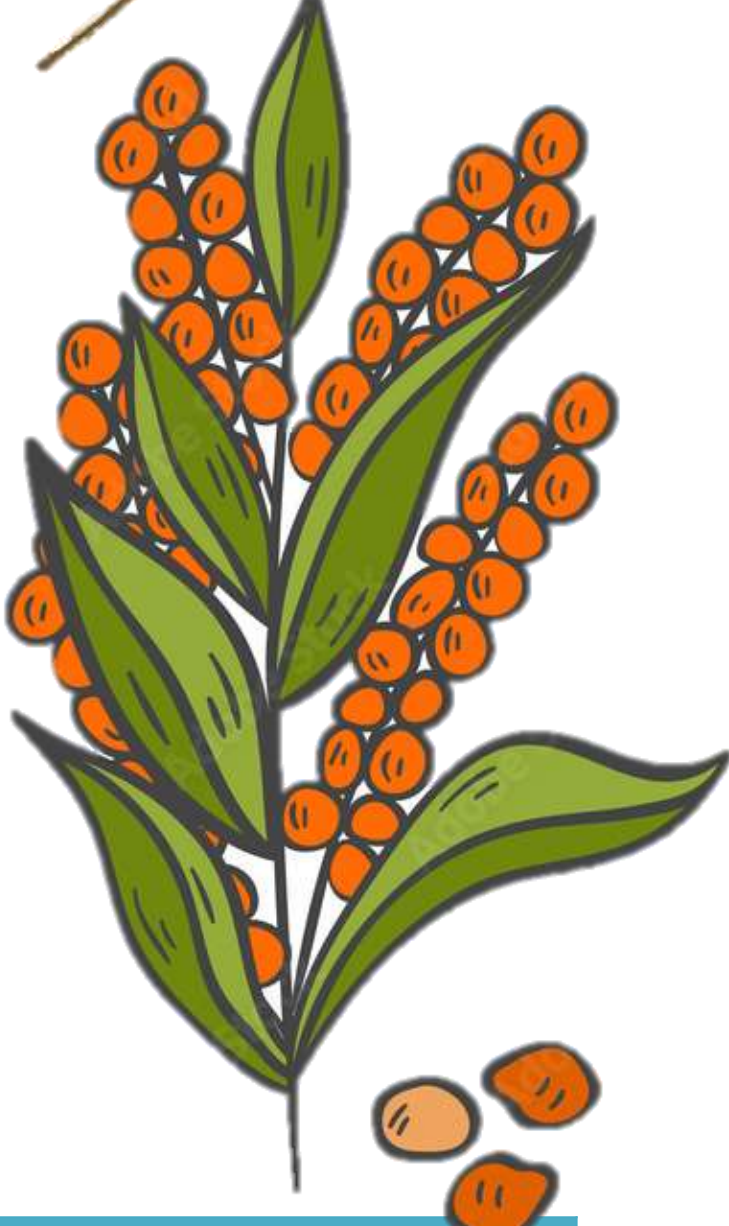




Bread is one of the most consumed food products. For this reason, researchers in the field is increasingly looking for ways to improve the original recipe or to modify it, so that it can be consumed by people suffering from celiac disease or to improve the nutritional value of bread. This study aims to analyze the possibilities of using germinated pseudocereals in bread making and the effects of their addition on bread quality, without the contribution of chemical additives to improve its nutritional value.









**Amaranth**

- Amaranth is a pseudocereal belonging to the genus *Amaranthus caudatus* L. of the family *Amaranthaceae*.
- Amaranth is a pseudocereal with a very balanced nutritional profile. Studies in the field have shown that amaranth has a high content of essential micronutrients, namely: vitamin C, iron, calcium, folic acid,  $\beta$ -carotene.
- Amaranth is a pseudocereal that can be used by people with gluten intolerance or that who want to treat certain diseases and conditions due to its rich nutritional composition and the lack of gluten in its structure.

**Buckwheat**

- Buckwheat is a pseudocereal that is part of the family *Polygonaceae* and belongs to the genus *Fagopyrum*.
- Buckwheat has an advantage over cereals due to its nutritional composition. Buckwheat, for example, has an optimal composition of amino acids, an increased content of protein, dietary fiber, vitamins, minerals and bioactive compounds.
- The addition of buckwheat to other food products leads to the improvement of the finished product due to the presence of essential amino acids needed by the body.

**Quinoa**

- Quinoa is found under the scientific name of *Chenopodium quinoa* Willd..
- Quinoa stands out for its high content of proteins and important amino acids.
- The nutritional value of quinoa varies depending on the type of grain (variety) and the origins of the soil in which it was grown. Studies in the field have shown that the nutritional profile of quinoa grains is characterized by a balanced profile in amino acids such as lysine, methionine and threonine. It contains important values of lipids (1.8-9.5%), dietary fiber (7-14%), phenolic compounds, vitamins, minerals.

## Advantages brought by the germination process on the nutritional profile of pseudocereals

Type of pseudocereal	The influence of the germination process
Amaranth	<ul style="list-style-type: none"><li>A 46.08% decrease in lipid content was revealed in the case of grains subjected to germination for 48 hours.</li><li>The fiber content of amaranth grains increased significantly from 3.83 to 6.69% after soaking and germination. Thus, there was a 74.67% increase in fiber content after germination.</li></ul>
Buckwheat	<ul style="list-style-type: none"><li>A slight decrease in ash content was noted.</li><li>The lipid content decreased from 6.66 g/100 g to 4.89 g/100 g, for samples subjected to ultrasound treatment, followed by the germination process. The decrease in lipid content is attributed to the intensification of lipase activity during germination. This is explained by the fact that during the germination process lipids and carbohydrates are used as a source of energy for the development of the germ.</li><li>A decrease in starch content was recorded, from 59.94 g/100 g to 54.99 g/100 g, after 72 hours of germination. This is explained by the fact that , during germination, starch becomes more accessible to hydrolytic enzymes.</li><li>Samples of germinated buckwheat subjected to ultrasound treatment recorded an 18.6% decrease in the amount of protein.</li></ul>
Quinoa	<ul style="list-style-type: none"><li>There was a decrease in ash content from 2.15 g/100 g to 1.90 g/100 g</li><li>Germination resulted in decreased starch content.</li><li>After subjecting the quinoa grains to germination for 48 hours, a slight decrease in the amount of protein was revealed, from <math>14.40 \pm 0.00</math> g/100 g, to <math>13.04 \pm 0.24</math> g/100 g (for samples subjected to ultrasound treatment).</li></ul>

## CONCLUSIONS

Pseudocereals (amaranth, buckwheat, chia and quinoa) present a rich nutritional composition and are of interest in terms of their potential for consumer health. Also, pseudocereals can be successfully incorporated into various food products (bread, cakes, biscuits, fruit juices, yogurts, etc.) in order to improve them from a nutritional point of view, but without negatively influencing consumer acceptability. Currently, numerous studies have highlighted the nutritional and health benefits of pseudocereals for consumers. However, further research is needed to determine how to maximize the use of their nutritional compounds. Germination process leads to a decrease in the amount of antinutritive factors, the bioavailability of some nutrient compounds increases, the specific enzymes are activated. In the case of bread, the low degree of extraction leads to a low nutritional value. Starting from the fact that white bread is the most consumed, the researchers thought that a handy solution to bring a nutritional boost would be to incorporate pseudocereal flours into white wheat flour . However, it was taken into account that the dose of the additive must not negatively influence the food product from a sensory point of view.