



University of Zabol

Graduate School

Faculty of Agriculture

Department of Food Science and Technology

The Thesis Submitted for the Degree of Master of Science

(In the field of Food Science and Technology)

## **Title**

**The effect of quinoa flour substitution on the functional properties of traditional Aashi noodle and optimization of the formulation**

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## **Abstract**

In this study, the effect of quinoa replacement on the organoleptic and qualitative characteristics of the sample was investigated. Noodles made from wheat flour were prepared along with a sample containing 3% quinoa flour substitute (10, 20, 30%) and these samples were tested to evaluate the physical, textural and organoleptic properties. The experiments performed included the starch content, total polyphenol content, antioxidant properties, texture analysis, water and oil absorption capacity, solubility and swelling index, microstructure study and FTIR spectroscopy. In this study, sensory evaluation was used to evaluate the acceptability of the product by the consumer. The results showed that with increasing the quinoa replacement percentage, the amount of starch, moisture, protein, fiber and ash in the sample increased and the amount of carbohydrates decreased. It was also found that with increasing the replacement percentage of quinoa flour, a significant difference of 5% was observed between different samples in terms of all physical parameters. The results showed that with increasing the percentage of quinoa substitution, water and oil absorption capacity and swelling index increased due to the combination of starch and protein structure in these samples. The amount of total polyphenols also increased, which is due to the higher amount of polyphenols in quinoa seeds than wheat, and this factor led to an increase in the antioxidant properties of the sample, with an increase in the percentage of quinoa replacement. The microstructural study showed that with increasing the quinoa replacement percentage, the granulation of the compounds became finer, which is attributed to the finer diameter of the quinoa particles. Examination of the FTIR spectrum showed that at 11000 to 1250  $\text{cm}^{-1}$ , differences in composition were observed in samples containing quinoa and control flour, which were related to the vibrational states of the CN and S = O groups, probably due to a set of groups. Saponin or sulfate is present in the structure of samples containing quinoa. With increasing quinoa replacement percentage in both samples before and after cooking, stiffness, hardness, springiness, adhesiveness, chewiness and fracture force decreased. The sensory evaluation results showed that the panellist had the highest probability of the evaluators towards the sample with 10% and 20% quinoa.

**Keywords:** Quinoa, Nodel, Texture, Sensory evaluation