

# Comparison of the Structural and Physicochemical Properties of $\beta$ -Glucans from Different Sources

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**Abstract:** Qingke (highland barley) and oats are rich sources of  $\beta$ -glucan; however, a systematic comparison of the structural and physicochemical properties of  $\beta$ -glucans across different species and varieties remains limited. This study investigated the structural characteristics, physicochemical properties, and bioactivities of  $\beta$ -glucans from blue qingke, commercially available qingke, and oats using infrared spectroscopy and rheological analysis. Infrared spectral characterization revealed that all three  $\beta$ -glucans exhibited similar plant polysaccharide structures with a  $\beta$ -configuration, yet significant differences in molecular structure were observed. Based on molecular structural differences, the physicochemical functional properties of  $\beta$ -glucans from different sources were further analyzed. Results showed that blue qingke  $\beta$ -glucan contained fewer hydroxyl groups and proteins but a greater variety of functional groups. Compared to the other two  $\beta$ -glucans, it exhibited higher oil-holding capacity, foaming ability, and foam stability, lower emulsifying ability but higher emulsion stability, and significantly lower water-holding capacity and solubility. Rheological analysis indicated that all three  $\beta$ -glucan solutions demonstrated non-Newtonian pseudoplastic shear-thinning behavior, with predominant solid-like properties. Additionally, blue qingke  $\beta$ -glucan exhibited superior ABTS<sup>+</sup> and DPPH radical scavenging activities compared to the other two  $\beta$ -glucans. This study provides fundamental insights into the practical applications of qingke and oat  $\beta$ -glucans and offers new perspectives for the development of functional foods.

**Keywords:** Qingke; oat;  $\beta$ -glucan; structural characterization; functional characteristics