

# Modified Barley Starch for Rutin Loading in Subcritical Water Media

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## ABSTRACT

Starch is the most abundant carbohydrate polymer, and its structure can be modified to enhance its suitability for nutraceutical applications. Rutin, a yellow colour phenolic glycoside is known for its anticancer properties. The objective of this study was to form inclusion complexes between starch and rutin in subcritical water media. Barley starches (96% total starch) of different amylose content were treated with rutin in the ratio of 304:1 w/w under subcritical water conditions of 100, 120, 140, and 160°C at 70 bar for 30 min. The starch-rutin gels were precipitated with ethanol, and further lyophilized. Results showed 81-92% mass recovery with 86.1±0.5% to 99.8±0.2% total starch content. Further analysis of lyophilized samples for rutin content using UV spectrophotometric method showed that the highest rutin content was 0.87 mg/g recovered mass with the 0% amylose starch at 100°C. The rutin content decreased with increasing temperature to 0.25 mg/g recovered mass at 160°C. A similar trend was observed for the 22% amylose, with a decrease of rutin content from 0.53 mg/g recovered mass at 100°C to 0.19 mg/g recovered mass at 160°C. At all temperatures investigated, 0% amylose starch had the highest rutin content compared to the 22% amylose starch. The X-ray diffraction analysis of the starch-rutin samples showed no characteristic visible peaks of cereal starches at 2θ of 15, 17, 18, and 23°. The Fourier Transform Infrared Spectroscopy analysis showed that cyclohexane ring vibrations were involved in the newly formed starch-rutin chemical structure. These barley starch-rutin samples may be utilized as food ingredients for oral availability of rutin.