Structural characteristics of high-moisture extrudates with oil-in-water emulsions

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Streszczenie

There is an increasing demand to produce high-quality plant-based meat analogs rich in tenderness and juiciness, presenting a significant challenge in creating oil-containing fibrous structures. A novel oil addition approach was developed by adding oil-in-water (O/W) emulsion during high-moisture extrusion processing. The current study investigated the effect of oil content using O/W emulsion on high-moisture extrudates prepared from soy protein isolate (SPI) and wheat gluten (WG) (SPI-WG). The oil content in fibrous SPI-WG extrudate could be up to 8.0% using O/W emulsion, whereas only 4.0% was possible by direct oil addition. O/W emulsion addition significantly decreased the extrusion response parameters of die pressure and specific mechanical energy. Confocal laser scanning microscopy indicated that oil was distributed to small droplets (0.5–15.0 μm) within the protein matrix in SPI-WG extrudates. Oil-free SPI-WG extrudate presented a close-meshed protein network. In contrast, higher oil contents led to more porous structures in SPI-WG extrudates with 3.0–8.0% oil. O/W emulsion addition reduced the rubber-like texture and rheological properties of SPI-WG extrudates, which improved the textural attributes (e.g., chewiness), making them similar to those of cooked chicken breast. In addition, the mobility of water and oil protons increased with increasing oil contents in SPI-WG extrudates, indicating the water and oil binding properties were reduced. Overall, this study demonstrated the potential of using O/W emulsions to promote fibrous structures of high-moisture extrudates.

Słowa kluczowe

Oil-in-water (O/W) emulsion, High-moisture extrusion, Fibrous structure, Oil content, Soy protein isolate-wheat gluten (SPI-WG) extrudates, Texture, Rheological properties, Water and oil distribution