

Second Harmonic Generation (SHG) and Coherent anti-Stoke Raman Scattering Microscopy of Rice Starch Granules

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Abstract: Starch is a plant polysaccharide that constitutes for the majority of carbohydrate and energy in our diet. It is important to understand the structural and functional characteristics of starch as well its composition because it plays a vital role in food industries and human nutrition. Nonlinear optical microscopy has been widely applied for high contrast imaging from the subcellular to tissue level with sub-millimetre depths within a sample employing ultra-fast pulsed lasers. Second harmonic generation (SHG) microscopy is an effective analytical tool for detailed investigation of microscopic structure of non-centrosymmetric molecules. CARS microscopy provides label-free chemical contrast of the sample under study. SHG is used to visualize the structural distribution in highly ordered samples including starch granules and CARS microscopy for quantification of amylose present. In this work, we describe the application of SHG and CARS microscope to determine the molecular interpretation of Northeast Indian rice starch granules, where the SHG and CARS signal originate from amylopectin (crystalline) and amylose (amorphous) respectively.

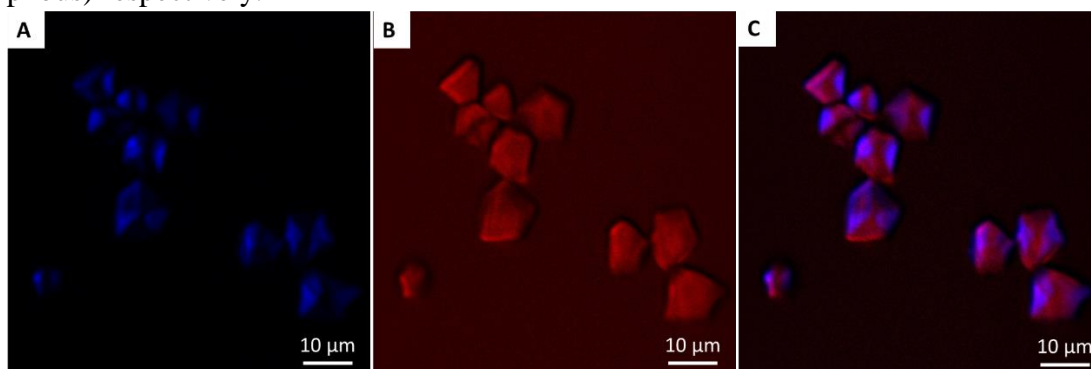


Figure: Non linear optical microscopy images of North east Indian rice starch granules; A) SHG image showing crystalline regions, B) CARS image showing amorphous regions, C) Composite image of SHG (blue) and CARS (red).

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