Starch retrogradation and storage modulus

The retrogradation of starch is an inevitable change that occurs in starchy food during processing and storage, in which gelatinized starch rearranges into an ordered state.

Starch after cellulose is the second most abundant semicrystalline biopolymer present on earth and a major storage form of polysaccharide in different parts of plants such as roots, tubers, stems, seeds, fruits and legumes, and grains (Carciofi et al., 2012, Cuesta-Seijo et al., 2013, Özaslan and ?bano?lu, 2022, Waterschoot et al., 2015) is mainly composed of two ...

The objective of the present work was to study the effect of bread storage temperature on starch retrogradation, using water activity measurement and X-ray diffractometry technique to analyse the ...

The Avrami equation was used to express starch retrogradation kinetics based on gelatinization enthalpy (DH). ... Dynamic time sweep analysis confirmed that the storage modulus (G?) of corn ...

Retrogradation affects acceptability of starchy foods; however, it is preferred in some products such as rice noodles. Amylose content, gelatinization temperature, and storage condition were reported to affect retrogradation but with disputed data. The joint effects of ...

Retrogradation of starch is a very complex process that plays a key role in the processing of starch foods such as vermicelli and Chinese starch ... (equivalent to 6.283-62.83 rad/s). The energy storage modulus (G?), loss modulus (G?) and loss factor (tan d) of potato starch gel changed with the angular frequency. The experiment was ...

This study investigated the effects of adding different concentrations of TP (tremella polysaccharide) on the water distribution, rheological, thermal, microstructure, and retrogradation properties of WS (wheat starch) gels. The results showed that the starch aging increased during storage, and the addition of TP reduced the rate of change of the elastic ...

The impact of storage temperature on the starch retrogradation properties and digestibility of CSB also depended on the wheat variety, attributed to differences in the starch molecular structure.

Amylopectin is only minimally involved in starch retrogradation ... Rheological techniques are suited to monitor gel firmness (rigidity) on ageing and are usually carried by measuring the storage modulus (G`). These techniques do not evaluate the role of one component or process only, but the combined effect of all the components of the gel. ...

Starch retrogradation and storage modulus

The gelatinization, pasting, and retrogradation of starch influence texture, quality, and shelf-life attributes of many foods. The purpose of this work was to document the effects of a 50:50 glucose:fructose (glc:fru) mixture and sucrose solutions on these starch traits to provide a fundamental basis to explain the different texture and shelf-life attributes of baked ...

Starch retrogradation is important in controlling many properties of starch-rich foods, while many crucial issues remain to be answered in this field. This review for the first ...

Starch, a complex polysaccharide, exists in plants in the form of granules and is composed of two major components, amylose and amylopectin (Tester, Karkalas, & Qi, 2004) starch-based foods, retrogradation takes place in gelatinized starch during storage, and involves the aggregation and reorganization of starch molecules.

Amylose retrogradation is observed as changes in rheological parameters, such as storage modulus (G?) and shear modulus (G) (Ellis and Ring, 1985, Lewen et al., 2003). The gelation of amylose and the crystallinity is often described as being irreversible, as the melting temperature of the amylose crystallites is above 100 °C (Eliasson, 1985 ...

Starch shows different deformation and flow characteristics under the action of external forces, which is called the rheological behavior of starch [].The elastic or storage modulus (G?), viscous or loss modulus (G?), and loss tangent (tan d) are the main parameters that describe the rheological behavior of starch.A tan d value of <1 means a more elastic and solid material, ...

Starch retrogradation was attributed to the reassociation of the amylose and amylopectin in the gelatinized starch at a low temperature to form a more ordered and compact structure. Thus, the hardness of starch hydrogels increased over the process of retrogradation. ... Variation of storage modulus (G?, solid symbols) and loss modulus (G ...

The effect of starch surface proteins on retrogradation of wheat starches were evaluated by rheometer, RVA, XRD, DSC, and TPA. An increase of the storage modulus and setback viscosity of starch ...

The rate of retrogradation depended on the storage temperature (23 °C and 4 °C) and the botanical origin of the starch. The least crystallization was observed in HHP treated wheat starch stored at 23 °C. The storage modulus increased with crystallization of starch.

The storage modulus G? of the starch paste is related to the short-term retrogradation of starch pastes (Li et al., 2016), which is presented in Fig. 4 (C). With the temperature decreasing, the G? values of the sample pastes increased slightly. The G? values of CS, CS-GG, CS-LBG, and CS-TG pastes increased 54.6 %, 36.9 %, 37.4 %, and 39.9 ...

Starch retrogradation and storage modulus

G" and G" in Fig. 2 represent the storage modulus (elastic properties) and loss modulus (viscous ... 5, 17, 20, 22, and 24 showing the characteristics of a B-type crystal structure. TP-CS and TC-CS treatment lead to starch retrogradation, which was manifested by the transformation of the crystalline structure of starch from A-type ...

To produce cooked rice that can be stored under a chilled condition, the effect of maltotriose syrup on the retrogradation of gelatinized rice starch and cooked rice was investigated using dynamic mechanical thermal analysis, rheometer, differential scanning calorimetry, and sensory analysis. The storage modulus (G") of gelatinized rice starch increased considerably ...

In this study, it was evident that extending storage duration from 6 to 12 h and lowering temperature from 4 to -20 °C impact retrogradation of rice starch, which in turn ...

Starch retrogradation is one of the significant properties of starch wherein the reassociation or recrystallization of the polysaccharides in gelatinized starch (amylose and amylopectin) occurs. Though, the process is desirable in terms of nutritional and textural properties for some starchy foods, it tends to exhibit many undesirable effects on storage and ...

Instrumental texture profile analysis (TPA), developed by Bourne and co-workers (27, 24, 25) using an Instron Universal Testing Machine, has been widely adapted to the study of starch retrogradation in actual food and model starch gel systems (93, 189) a TPA test, a sample of specific dimensions is compressed uniaxially; the compressive force is then ...

In this review, we describe the structure-function relationship of starch on the view point of rheological aspects and discuss gelatinization and retrogradation mechanism including water molecules ...

starch retrogradation and digestion properties of CSB is important for the development of CSB products with both desirable textural and nutritional properties. This study...

Waxy rice starch (WRS) is characterized by high viscosity, soft texture and good transparency, and is mainly used for making dumplings, sliced cakes, etc. (Fu et al., 2023).The investigation of gelatinization and retrogradation behavior of commercial starch is essential for determining its processing characteristics and application prospects (Liu et al., 2023a, Liu et al., 2023b).

Results showed that the most important parameter that affected retrogradation was storage time followed by storage condition and gelatinization temperature. ... Resistant starch produced from retrograded starch depended largely on storage time than storage condition. This finding can be applied to improve rice noodle qualities (by increasing ...

The starch retrogradation occurs during the storage of gelatinized starch, ... The storage modulus (G?), loss

modulus (G??) and loss factor (tan d) of the samples were obtained. 2.7. Attenuated total reflectance fourier transform infrared spectroscopy (ATR-FTIR)

The storage modulus of the yogurt was also higher with 1% and 2.5% starch addition (G? = 244 and 330, ... The self-aggregation of amylose during extrusion will likely result in enhanced retrogradation of starch during storage, which ...

These could be confirmed by the decreased storage modulus and viscosity, the relative crystallinity (1.54%, 3.56%), and the retrogradation degree (9.99%, 20.18%) of CS during storage for 1, 14 days after PG synergizing with EGCG and EC, respectively. ... previous studies have demonstrated that polyphenols inhibited starch retrogradation by ...

The starch retrogradation is favored o affected by some characteristics of the starch and the process by which it is subjected. The amylose content and the amylose-lipid complex are two of the factors that limit starch retrogradation (Stevenebø et al., Citation 2006).

Starch retrogradation is important in controlling many properties of starch-rich foods, while many crucial issues remain to be answered in this field. ... elastic modulus (G?) is determined by the quantities and strength of starch intermolecular bonds ... O. H.; Hamaker, B. R. Storage Retrogradation Behavior of Sorghum, Maize and Rice Starch ...

Starch retrogradation is a consequential part of food processing that greatly impacts the texture and acceptability of products containing both starch and proteins, but the effect of proteins on ...

While it is well known that starch retrogradation is affected by many factors, such as amylose content, storage conditions, water content, and food additives (Bello-Pérez, Ottenhof, Agama-Acevedo, & Farhat, 2005; Miles, Morris, Orford, & Ring, 1985; Wang et al., 2015; Wang, Li, Zhang, Copeland, & Wang, 2016), the mechanism that controls the rate and ...

2 · The variations in the storage modulus (G?) were observed in an isothermal time sweep at 4 °C for 60 min with a constant frequency of 1 Hz and a constant strain of 1 %. 2.6.3. ...