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Title: Evaluating the effect of barley Beta-glucan on mechanical properties of white salted and yellow alkaline noodles using ultrasound

Body:

The effect of barley β -glucan (BBG) on the mechanical properties of two most commonly consumed Asian noodles, White Salted Noodle (WSN) and Yellow Alkaline Noodle (YAN), has been studied using longitudinal ultrasound at a frequency of 1 MHz. Raw WSN and YAN samples were prepared at three BBG levels (0, 2.5 & 5%). A TA.XT Plus Texture Analyser, fitted with custom ultrasonic transducer holders, was used to test noodle dough sheets while subjecting them to a 20% strain. Ultrasonic and stress relaxation measurements were performed simultaneously over a time interval of 300 seconds. Using the measured ultrasonic properties of phase velocity and attenuation coefficient, as well as the density of the samples, the mechanical moduli M' (longitudinal storage modulus) and M'' (longitudinal loss modulus) were calculated. For WSN samples, M' (elastic component) and M'' (loss component) increased with an increase in BBG content. Loss tangent ($\tan\delta = M''/M'$), an indicator of relative losses during longitudinal ultrasound propagation in the samples, decreased with increasing BBG content. This indicates that WSN noodles with greater BBG content are firmer (less compressible) due to the corresponding increase in storage modulus. Compressive stress relaxation parameters, including k_1 , k_2 and SR20, were also calculated and showed that WSN relaxed at a slower rate with an increase in BBG content. For YAN samples, no significant effect of BBG on mechanical properties was observed. The outcome was the same for both SR parameters and mechanical moduli calculated from ultrasonic properties. The reason is likely the presence of the Kansui salt used to make YAN samples, as it is an alkaline ingredient that increases dough's pH (> 9), which itself affects wheat starch properties. Hence, the function of BBG in making firmer noodles is altered by a high pH caused by the presence of the Kansui salt.