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Do classical wheat quality assessments deliver relevant results for modern wheat cultuvars?

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For cereal food production, quality assessment of wheat is targeted at specific processing demands among which those for yeast leavened goods, especially bread, play a crucial role. In this regard, a baking test would deliver the most comprehensive information. A baking test, e.g. according to ICC Standard No. 131, however, is time consuming and affords a respective technical equipment which is mostly not available on most of the levels of the cereal production and processing chain (breeders, traders, etc.). Further, in labour-intensive time periods, like harvest and collection of the bulk goods, there is no time for a long duration baking procedure. Therefore, it is a world-wide common practice to make use of indirect quality criteria for predicting the tentative processing, especially baking performance, of an individual wheat lot.

Adapted to the specific quality expectations of baked goods in different parts and/or countries of the world, respective favoured analytical quality-related methodologies may vary. But due to the significant role gluten plays in wheat baking, all quality assessment systems have protein/gluten related methods in common, such as ICC Standards No. 105/2 (crude protein content), 106/2 (wet gluten content) or 116/1 (Zeleny sedimentation value), respectively. With examples from the German wheat market, it can be outlined that prediction of the baking behaviour of a specific wheat cultivar, of bulk wheat raw material or flour prepared thereof, respectively, has been well established and accepted as being sufficiently precise for decades, based on traditional quality parameters resulting from respective internationally standardized methods. Thus, knowing the cultivar was sufficient so far to analyse the total protein content plus the sedimentation value of a sample to calculate the baking volume to be expected of the baked good. This theoretical result calculated by means of a specific equation has been well in accordance with the real volume as result of a standardized baking test (RMT = Rapid Mix Test). This established system worked well with "traditional" wheat cultivars having "classical" gluten functionality. In very modern wheat varieties, however, a distinct discrepancy between theoretical volume prediction and the real baking result becomes obvious as these varieties are characterized by lower total protein (and gluten) content but much improved gluten functionality, i.e. volume forming capacity.

The meaning of these findings for wheat breeding, trading (payment!) as well as processing, are important. In consequence, the question has to be answered if novel (rapid) quality assessment methods will be needed or if existing standard methods will have to be improved or adapted.

Keywords
wheat, quality assessment, baking performance, standard methods.

Changes in the properties of starch, nutrients and antioxidants in cereal flakes

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Ready to Eat (RTE) cereal flakes from maize, wheat, rice, oats, sorghum, pearl millet, and barley were prepared by an appropriate method of processing. Steps involved in the flaking process were: cleaning, dehulling (oats), conditioning, hydrothermal treatment, drying and tempering, pearling, flaking, drying, sizing and blistering. Studies on the properties and behavior of starch, nutritional and antioxidant properties of these cereal flakes were conducted. Moisture content ranged between 11 to 12%; 9 to 11% and 4 to 5% (w.b) for grains, flakes and blistered flakes respectively. Equilibrium moisture content on soaking at room temperature (RT) was between 30 and 46% for grains, 64 and 81% for flakes and 72 and 78% for blistered flakes. Hydration behavior at room temperature indicated that grains absorbed up to 30 – 35% moisture, flakes: 65 to 80% and blistered flakes: 50 to 80%. Soluble amylose in these grains varied between 13 and 18%; total amylose between 20 and 29% (d.b). For flakes, soluble and total amylose ranged from 12 to 16% and 19 to 27% (d.b) respectively, whereas for blistered flakes it was 11 to 14% and 19 to 26% respectively. Swelling power and Solubility studies between 30 and 100 °C varied from 2 to 16; 2 to 29% respectively for the grains. For flakes, the values were 6 to 14%; and 7 to 46%, whereas for blistered flakes they ranged from 10 to 14%; and 8 to 49%. Pasting profile indicated that the peak viscosity varied from ~360 to 924 BU for grains, while this parameter decreased for flakes as well as for blistered flakes. Microstructure of grains, flakes and blistered flakes studied by scanning electron microscopy will be discussed.

On flaking, loss (%) of polyphenols, free radical scavenging activity and total antioxidant activity were 26–54, 24–66 and 30–44, respectively in some of the above mentioned grains. Ultimately the soluble polyphenols in flakes varied from 30 to 61 mg Ferulic Acid Eq: (FAE) per 100 g; bound polyphenols from 21 to 59 mg FAE: total polyphenols ranged from 52 to 121 mg FAE / 100 g. Free radical scavenging activity (% reduction of DPPH+) varied from 16 to 54 and total antioxidant activity (mM alpha Tocopherol Eq:/g) from 8.5 to 11.1. Flaking process results changes in functional and antioxidant properties and these properties vary from grain to grain.