

Evaluation of crustless bread by elderly persons and students¹

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Summary

A number of elderly persons and students evaluated the popularity of standard rye-wheat bread, crustless rye-wheat bread and crustless rye-wheat bread with added faux crust on the basis of appearance, taste, consistency and overall impression. The elderly persons preferred rye-wheat bread with either a real crust or a faux crust. In contrast, the students preferred rye-wheat bread with a real crust or without a crust.

Keywords: crustless bread, rye-wheat bread, elderly persons, students, sensory sciences

Introduction and question

Bread is a staple food in Germany; the average bread consumption per household was 46.5 kg in 2013 [1]. Many elderly persons also enjoy eating bread. Owing to difficulties in chewing and swallowing [2–4], reduced salivation [5] and high usage of dentures, elderly persons often have problems chewing hard food [2, 6] such as bread crusts. It has therefore been suggested that elderly persons prefer foods which are easy to chew and swallow [5], such as crustless bread. In this context, we investigated how elderly persons evaluate crustless rye-wheat bread in comparison to standard rye-wheat bread. By way of comparison, the popularity of crustless rye-wheat bread was also tested among students.

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Methodology

Three types of rye-wheat bread were evaluated on a 5-tier scale (1: very bad, to 5: very good) according to appearance, taste, consistency and overall impression by 36 students (20 f, 16 m, ø age: 26) and by 41 elderly persons (33 f, 8 m, ø age: 85). All the elderly persons lived in retirement homes in the city of Hünfeld, were aged over 70 and did not suffer from dementia. Furthermore, neither the students nor the elderly persons suffered from digestive, renal or intestinal disorders or from coeliac disease or were pregnant or allergic to one of the ingredients. All the test persons participated in the tastings voluntarily.

The dough for all three breads had an identical recipe, and was produced and processed according to the same methods; the breads were only baked differently. The standard bread with a crust was baked in a multi-deck oven and both crustless breads were baked in a combi-steamer. The crustless bread with faux crust was also coated with a caramel/water mixture (1:5), thereby acquiring a faux crust. Loaves of the standard bread and both crust-

less breads are depicted in ♦ Figure 1, providing a better idea of the appearance of the three rye breads, including the faux crust. The different types of bread were given to the test persons with a 3-figure code in a random sequence. For each variant each participant received a slice of bread and water for neutralization. Statistical analysis of the data was carried out with SPSS Statistics 20.0; significant differences appeared when $p < 0.05$ in the Mann-Whitney U Test.



Fig. 1: From left: standard bread, bread with faux crust, crustless bread

After they had evaluated the breads, the participants also received a questionnaire which asked whether they experienced difficulties in chewing and whether they regarded the crust as important. The questionnaire also asked whether they would eat crustless bread in general and whether they would willingly eat the crustless rye-wheat bread without faux crust and the rye-wheat bread with faux crust which they had just tasted on a daily basis.

¹ Latest version of a poster displayed as part of the 20th International Scientific Conference organized by the *Institut für Getreideverarbeitung (IGV)* in 2015 “Healthy Grain for a Healthy Diet” (22–23 April 2015 in Nuthetal, Germany)

Results

The evaluations of the appearance, taste, consistency and overall impression of the standard bread and both crustless breads by elderly persons and students are compared in ♦ Table 1. The students evaluated the appearance of the standard bread as significantly better than did the elderly persons. The evaluations on ap-

pearance by the group of elderly persons showed significant differences between the standard bread and the crustless bread without faux crust, but not the crustless bread with faux crust. In contrast, the students rated the appearance of the standard bread much more positively than that of both crustless breads. The elderly persons evaluated the taste of the standard bread and the crustless bread without faux crust significantly worse than did the students. The latter evaluated the taste of the standard bread better than the crustless bread without faux crust. The students found the taste of the

standard bread significantly better than both crustless breads. There were significant differences between the students' and elderly persons' evaluations of the consistency for both crustless breads. There were also significant differences between the standard bread and the crustless bread without faux crust in the evaluations of consistency by the group of elderly persons. In contrast, there were no significant differences between all the breads in the students' evaluations of consistency.

Both elderly persons and students evaluated the overall impression of

both crustless breads significantly worse than the standard bread. The students also felt that the crustless breads differed significantly from each other. Both groups gave the same evaluation to the standard bread and the crustless bread with faux crust. However, there was a significant difference between elderly persons and students with regard to the crustless bread without faux crust.

Subsequent to the bread tasting, the participants were asked whether they encountered difficulties chewing when they ate bread crusts and whether the bread crust was an important criterion for good bread. In addition, they were asked whether they would willingly eat crustless bread in general and/or the tasted bread on a daily basis. The results of these questions are shown in ♦ Table 2.

	Appearance	Taste	Consistency	Overall impression
Standard bread				
Elderly persons	3.7 ± 0.8 b B	3.6 ± 0.8 b B	3.4 ± 0.8 b A	3.6 ± 0.8 b A
Students	4.2 ± 0.8 b A	4.0 ± 0.7 c A	3.8 ± 0.8 a A	3.9 ± 0.6 c A
Crustless bread without faux crust				
Elderly persons	3.2 ± 1.1 a A	3.0 ± 1.0 a B	2.8 ± 0.9 a B	3.0 ± 0.9 a B
Students	2.8 ± 0.8 a A	3.6 ± 0.8 a A	3.6 ± 0.8 a A	3.4 ± 0.7 a A
Crustless bread with faux crust				
Elderly persons	3.4 ± 0.6 ab B	3.3 ± 0.8 ab A	3.0 ± 0.8 ab B	3.1 ± 0.6 a A
Students	2.4 ± 0.9 a A	3.0 ± 0.9 b A	3.4 ± 0.9 a A	2.9 ± 0.7 b A

Tab. 1: Mean values with standard deviation for bread evaluations by 41 elderly persons and 36 students

If the letters are different after two compared values (e.g. appearance standard bread: "3.7 b" vs. appearance bread without faux crust: "3.2 a"), the difference between the values (here: 3.7 vs. 3.2) is significant ($p < 0.05$). If the letters are the same (in this case two letters may also appear), it is not significant. Small letters indicate a difference or lack of difference in the comparison of the three bread types; large letters in comparison of elderly persons and students (e.g. taste standard bread: elderly persons 3.6 B vs. students 4.0 A = difference is significant).

	Elderly persons	Students
Do you experience difficulties in chewing when you eat bread crusts?	42 %	0 %
Do you think the bread crust is an important criterion for good bread?	83 %	92 %
Would you eat crustless bread in general?	39 %	19 %
Would you willingly eat the crustless bread without faux crust that you have just tasted on a daily basis?	35 %	39 %
Would you willingly eat the crustless bread with faux crust that you have just tasted on a daily basis?	40 %	14 %

Tab. 2: Percentage of yes responses to questions on bread crusts by 41 elderly persons and 36 students

Discussion

Elderly persons evaluated the crustless bread with faux crust better than the crustless bread without faux crust in all areas, although both breads were identically manufactured and only differed in appearance, and thus ought to have been evaluated identically. This demonstrates that the faux crust on the crustless bread has a positive influence on the other features.

Furthermore, 40 % of elderly persons stated that they would willingly eat the bread with faux crust on a daily basis. Given that 83 % of elderly persons regarded the crust as an important criterion for good bread, the theory that a faux crust positively influenced the elderly persons' bread evaluations is hereby supported. This also suggests that the elderly persons perceived the "added" crust as a "real" crust due to age-related visual impairments, as opposed to e.g. the students who had no visual limitations. The students recognized that the "added" crust was not a real crust. As a result, they evaluated the appearance as well as the taste, consistency and overall impression of the crustless bread with faux crust worse than the crustless bread without faux crust. This indicates that the "added" crust was regarded as unsightly by this young age group and that it had a negative influence on the other features.

Although the rye breads without crusts were easier to chew, and 42 % of the elderly persons experienced difficulties in chewing, the elderly persons preferred the standard bread with crusts somewhat more. This contradicts the assumption by POPPER and KROLL [5] that elderly persons prefer foods which are easy to chew. The students evaluated the standard bread as clearly the best in all areas. This demonstrates that traditional rye-wheat bread was more popular among elderly persons and students than the crustless alternatives. This is probably because the crust is a very crucial criterion for the popularity of bread. But although none of the students had

chewing difficulties, and 92 % of students regarded the crust as a crucial bread criterion and only 19 % of students responded "yes" to the general question on crustless bread, 39 % of the students stated that they would willingly eat the crustless bread without faux crust on a daily basis. These results show that the students have a more positive view of the crustless breads than do the elderly persons, even though the students do not need crustless breads. For the elderly persons a preference for crustless bread is probably regarded as a sign of "being old", which this age group would not wish to admit. Elderly persons are therefore more likely to reject crustless alternatives than standard bread, even though they experience problems in chewing bread crusts.

Nevertheless, the overall impression of the standard rye-wheat bread obtained only 3.6 ± 0.8 . This demonstrates that the rye-wheat bread chosen was also not very popular among elderly persons. This could be, on the one hand, because the elderly persons perceived the bread less intensively due to age-specific olfactory [7–9] and gustatory impairments [10]. On the other hand, the elderly persons may have compared this rye-wheat bread to bread from their childhood [11], which probably tasted different and in their memories "better".

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Conflict of Interest

The authors declare no conflict of interest according to the guidelines of the International Committee of Medical Journal Editors.

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