



Dietary fibre intake in bread, cake and fermented vegetables

Dejana Trbović^{1*} , Danijela Vranić¹  and Vladimir Korićanac¹ 

¹ Institute of Meat Hygiene and Technology, Kačanskog 13, 11 000 Belgrade, Serbia

ARTICLE INFO

Keywords:

Dietary fibre
Bread
Cake
Pickled vegetables

ABSTRACT

White flour is sourced from the major storage tissue of the grain, which constitutes about 80% of its composition. Consuming pickled vegetables offers health benefits, including anti-cancer, anti-diabetic, and immune-regulatory effects. Our analysis examined 60 samples of bread, cake, and pickled vegetables using the total dietary fibre (TDF) method according to the AOAC standards. The confidence intervals for bread, desserts, and pickled vegetables were found to be relatively narrow: bread has a mean value of 3.02% (CI: 2.04-3.44), desserts have a mean value of 1.96% (CI: 1.39-2.52), and pickled vegetables have a mean value of 1.88% (CI: 1.68-2.08). However, despite containing significant amounts of total dietary fibre, bread, desserts, and pickled vegetables cannot be labelled as sources of fibre because they contain less than 1.5 grams per 100 kcal. Our results showed that bread has the highest dietary fibre content (3.02%). Pickled vegetables are also a source of fibre (1.88%), a finding confirmed in other studies. Dessert cakes vary greatly in fibre content (1.96%) depending on whether the cake is made of chocolate or another ingredient.

1. Introduction

Whole grain cereals, pulses, fruit and vegetables and potatoes are the main sources of dietary fibre. Nuts and seeds also contain high concentrations of fibre. Cellulose, along with hemicelluloses, is found in cereals (Arzami *et al.*, 2022). The lignified outer layers of whole grain products are the main source of fibre. Oats and barley are rich in a water-soluble, viscous type of polysaccharide known as β -glucan (Gajdošová *et al.*, 2007; Lante *et al.*, 2023). Pectins, another type of dietary fibre, are predominantly found in fruits and vegetables and share similar properties. (Dietary Guidelines for Americans, 2020). While dietary fibre is not an essential component of the diet, it plays a significant

role in bowel function and alleviating gastrointestinal issues such as constipation (EFSA, 2010). White flour is derived from the major storage tissue of the grain, which makes up about 80% of the grain's composition. The grain typically consists of 10-15% protein, 80% starch, around 4% dietary fibre, soluble sugar, and minor amounts of minerals and vitamins, particularly B vitamins (Shewry *et al.*, 2023). Pickled vegetables are preserved and flavoured by being submerged in a solution of vinegar, salt, and often sugar. This pickling process allows the vegetables to ferment, giving them their distinct tangy flavour and extending their shelf life. Common types of pickled vegetables include cucumbers, carrots, beets, onions, cabbage, and peppers (Featherstone, 2016; Tan *et al.*, 2024). Consuming pickled vegetables

*Corresponding author: Dejana Trbović, dejana.trbovic@inmes.rs

Paper received Jun 2nd 2025. Paper accepted July 1st 2025.

The paper was presented at the 63rd International Meat Industry Conference “Food for Thought: Innovations in Food and Nutrition” – Zlatibor, October 05th-08th 2025.

Published by Institute of Meat Hygiene and Technology – Belgrade, Serbia.

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benefits human health, such as anti-cancer effects, anti-diabetic effects and immune regulation (Tan et al., 2024). A study by Galena et al. (2022) suggests that positive changes in the abundance of certain bacterial species may be associated with consuming fermented vegetables. Future adequately powered human trials are needed to explore the relationship between fermented vegetables, health-related outcomes, and the microbial composition of the gut. In addition, dietary fibre intake is inversely associated with the risk of dementia (Yamagishi et al., 2022). Previously, published results for vegetables and meat products were reported (Bajčić et al., 2019, Trbović et al., 2023). However, a higher intake of total dietary fibre within the typical American diet is unlikely to significantly reduce the risk of colorectal cancer (He et al., 2019). This study aims to provide new insights into dietary fibre in bread, desserts, and pickled vegetables.

2. Materials and methods

2.1 Samples

We analysed 60 samples of bread, cake and pickled vegetables using a high-quality laboratory blender (Robot Coupe Blixer 2 of 2.9 L, France).

Following the manufacturer’s guidelines ensured reliable and trustworthy results. Samples were taken from the following pickled vegetables: cauliflower, pickled cucumbers, mixed salad, garlic peppers and sauerkraut. For dessert, the following cake samples were collected: Mađarica (layered chocolate cake), cream puffs (vanilla cake), Kotor krempita (vanilla cake), baklava (honey, sugar and vanilla cake), and Rigo Janchi (chocolate cake).

2.2 Methods

The total dietary fibre (TDF) method includes correcting residue for undigested protein and mineral contamination, following the AOAC method. Dietary fibre is expressed in g/100 kcal, calculated based on the estimated energy value of the tested samples.

2.3 Statistical analysis

Statistical analyses including mean, standard deviation, minimum and maximum, median, confidence interval and dietary fibre in g/100 kcal were conducted using Microsoft Office 2010 Excel software and its Data Analysis Tools.

Table 1. Dietary fibre and basic statistical parameters in food items (bread, dessert cake and pickled vegetables)

Samples	Dietary fibre, % Mean ± SD (min-max)	Median, %	Confidence interval 95%, CI	Dietary fibre g/100kcal
Bread (n=37)	3.02±1.20 (1.28-5.41)	2.98	2.04-3.44	1.14
Dessert cake (n=7)	1.96±0.61 (1.27-2.85)	1.7	1.39-2.52	0.59
Pickled vegetables (n=16)	1.88±0.37 (1.39-2.43)	1.81	1.68-2.08	0.71

2. Results and discussion

The median is used when a dataset includes a value that significantly deviates from the rest of the series. This outlier can greatly influence the mean, but it does not affect the median at all. The median accurately represents the true values for bread, dessert, and vegetable products. In frequentist statistics, a confidence interval (CI) is defined as an interval

that is expected to contain the estimated parameter. Typically, a confidence level of γ, such as 95% or 99%, is used. The confidence intervals for bread, dessert, and pickled vegetables are relatively narrow: bread has a mean value of 3.02%, which is close to the median value of 2.98% and CI 95% (2.04-3.44), dessert has a mean value of 1.96%, which is close to median value of 1.7% and CI 95% (1.39-2.52), and pickled vegetables have a mean value of 1.88%,

which is close to median value of 1.81% and CI 95% (1.68–2.08). According to the *FAO/WHO* (1998), the average energy factor for dietary fibre is 2 kcal per gram. As per the Regulation of EC (2006), food can be labelled as a source of fibre if it contains at least 1.5 grams of fibre per 100 kcal. However, bread, dessert, and pickled vegetables cannot be labelled as a source of fibre because they contain less than 1.5 grams per 100 kcal, despite having a significant amount of total dietary fibre, as noted in wheat by *Shewry et al.* (2023) (15.1% on dry basis), *Thebaudin et al.* (1997) (60% on dry basis), *Portugal et al.* (2013) (2.84%) and *Mongeau & Brassard* (white bread 2.10%). Our results showed that bread has the highest dietary fibre content (3.02%). Pickled vegetables are also a source of fibre, which has been confirmed in a study of *Knez et al.* (2023), pickled vegetables in fermented beetroot (0.8%), and red cabbage pickled (1.7%). Dessert cakes vary greatly in fibre

content from 2.4–3.2% (*Care Omnia*, 2025) to 1.3% (My Food Data, 2025), depending on whether the cake is made of chocolate or another ingredient.

3. Conclusion

White flour is sourced from the major storage tissue of the grain, which constitutes about 80% of its composition. Consuming pickled vegetables offers health benefits, including anti-cancer, anti-diabetic, and immune-regulatory effects. In our analysis, we examined 60 samples of bread, cake, and pickled vegetables using the total dietary fibre (TDF) method, which includes adjustments for undigested protein and mineral contamination, according to the AOAC standards. This study aims to provide new insights into dietary fibre in bread, desserts, and pickled vegetables. Our results showed that bread has the highest dietary fibre content.

Disclosure statement: No potential conflict of interest was reported by the authors.

Funding: The Ministry of Science, Technological Development and Innovation of the Republic of Serbia supported the research findings under the Agreement No. 451-03-136/2025-03/200050 from February 4, 2025.

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Authors info

Dejana Trbović, <https://orcid.org/0000-0001-9357-7789>

Danijela Vranić, <https://orcid.org/0000-0002-7192-488X>

Vladimir Korićanac, <https://orcid.org/0009-0001-7772-8636>