Quality Evaluation of Bread Supplemented with Millet (*Panicum Miliaceum L.*) Flour

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Abstract. Bread baking from wheat and millet flours in different ratios was investigated. For this purpose, four experimental variants obtained by substituting wheat flour with different proportions (0%, 10%, 20%, and 30%) of millet flour were used. The bread with millet flour and the control samples were subjected to physicochemical and organoleptic analyses. Addition of millet flour in bread has improved its physicochemical and sensory attributes. Acceptable volume and crumb structure (porosity and elasticity) were achieved. The present study indicated that 30% millet flour addition in the bread formulation led to an accepted product by consumers.

Keywords: bread quality, chemical composition, *Panicum miliaceum* L.

Introduction. Millets represent a diverse group of plants from the species *Sorghum, Panicum, Setaria, Pennisetum, Paspalum,* or *Eleusine.* While sorghum species are a staple food in Africa, proso millet (*Panicum miliaceum L. Subsp. miliaceum*) is the only species, which is grown on a larger scale for food consumption in Northern Countries (USA, Canada, and Europe) and offer a range of health benefits to the consumer (Regine et al., 2013). Millet is rich in protein, fibre, mineral (iron, calcium, phosphorus) and vitamin content (Amir et al., 2015). Millet has been mostly used for foods in Africa and Asia or central and contributed significantly to protein nutrition in these areas. The protein of millet varies in the range of 9.3 – 12.7% (Nadia, 2013).

Aims and objectives. This study was conducted to assess the acceptability of wheat bread produced by addition of millet flour (MLF) in varying proportions (10%, 20% and 30%). Bread produced from 100% wheat flour served as the control.

Materials and methods. Experimental breads were obtained from wheat flour blends containing 0% (100% wheat flour) and 10%, 20% and 30% of MLF (as wheat flour replacement). The bread prepared from wheat flour without MLF substitution served as control. The bread dough was obtained in a laboratory mixer by kneading 1000 g flour, 18 g iodized salt and 50 g fresh yeast (Pakmaya Yeast Rompak, Romania) with water 590 ml for control

![Mix ingredients and weighing → Kneading (3–10 min) → Fermentation (90 min)](image)

Baking (35–40 min. at 220° C) → Proofing (30–40 min. at 35–40° C) → Dividing and shaping the dough

Fig. 1. Bread technological flow
Substituting wheat flour with 10%, 20% and 30% millet flour improved the sensory analysis (fig.2) and physicochemical properties of the bread. Acceptable volume and crumb structure (porosity and elasticity) were achieved.

**Conclusion.** Millet flour offers several health benefits (increased content of polyphenols or dietary fibre, blood cholesterol lowering and anti-carcinogenic properties, etc.). Bread produced from millet/wheat composite flour would be a valuable contribution to a healthy diet.

**REFERENCES**


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**Tab. 1. Physicochemical characteristics of bread with millet flour**

<table>
<thead>
<tr>
<th>Sample</th>
<th>Quality parameters</th>
<th>Volume, cm$^3$</th>
<th>Specific volume, cm$^3$/100g</th>
<th>Crumb Porosity, %</th>
<th>Elasticity, %</th>
<th>Protein content, %</th>
<th>Moisture,%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control (0% MLF)</td>
<td></td>
<td>898</td>
<td>275</td>
<td>72.90</td>
<td>98.90</td>
<td>10.30</td>
<td>49.10</td>
</tr>
<tr>
<td>10% MLF</td>
<td></td>
<td>890</td>
<td>270</td>
<td>69.73</td>
<td>97.77</td>
<td>10.80</td>
<td>48.68</td>
</tr>
<tr>
<td>20% MLF</td>
<td></td>
<td>884</td>
<td>267</td>
<td>64.07</td>
<td>96.12</td>
<td>11.90</td>
<td>46.37</td>
</tr>
<tr>
<td>30% MLF</td>
<td></td>
<td>868</td>
<td>260</td>
<td>59.37</td>
<td>94.63</td>
<td>12.30</td>
<td>44.74</td>
</tr>
</tbody>
</table>

*MFL = millet flour; All values are means of three replications*