

# Processing and sensory evaluation of germinated millets varieties grains flours

## Abstract

Five varieties of millet grown in Niger (HKP, ICMVIS99001, SOSAT, ZATIB and ICMVIS89305) were germinated in order to assess and compare the acceptability of their malting attributes by the five hedonic scale parameters. The germinated millet from these varieties was produced under the same conditions in triplicate. The germinated millet varieties flours were subjected to sensory evaluation attributes note ranging from 1 to 5 for taste, colour, flavour and texture attributes. The results of sensory analysis showed that the characters for SOSAT variety flour was the most appreciated, while that from ZATIB dominated for other characters flavour.

**Keywords:** millet, germination, varieties, nutraceutical, sensory evaluation

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## Introduction

The word millet is a generic term for several plant species of the family Poaceae (grasses). Non-precision millet often refers to common millet, but the most widely grown millet is pearl millet: *Pennisetum glaucum*. The main producing regions are the semi-arid plains of South Asia (particularly in India) and the Sahel region (south of the Sahara) in Africa. There are few millet-based industrial products and some authors attribute this to the low brand image that they would receive.<sup>1,2</sup> The grains are processed at the household level or small production workshops employing one to two people. The techniques used and the know-how are traditional and determine the characteristics, particularly organoleptic properties of these products,<sup>3</sup> Traditional methods of preparation are not standardized and are transmitted by family from generation to generation.

The total yield of millet is estimated to 28.385million tones, with Asia and Africa considered as the highest contributors, producing almost 95% of the global yield. India was reported as the highest producer of millet in Asia producing with 11.420million tones followed by Niger as the top producer in Africa producing 3.321 million tones, followed by China and Mali.<sup>4</sup> Regarding the diet, in

the city as in the country side, at the level of low income household as well as middle life income consumers of cereals, millet is at front side in the usage.<sup>5</sup>

As fact of matter, cereal grains germination is not a new trend yet, millet varieties produced locally in Niger have not been done. Therefore, the objective of this work is to evaluate the organoleptic properties of germinated millet grains flours produced locally; thus, one of the possibilities to improve the nutraceutical value of nutrients in complementary foods made from millet grains.

## Materials and methods

This work was part of undergraduate student project in fulfillment of requirement for the Bsc degree in food science and technology, Université Dan Dicko Dankoulodo de Maradi, BP 465 ADS Maradi-Niger.

## Materials

The different millet varieties were obtained from INRAN (Institut National de la Recherche Agronomique du Niger) authenticated by Dr Kassari Issoufou (Figure 1).



**Figure 1** The millet varieties used in processing germinated millet varieties flours.

## Methods

The grains of millet were sorted and soaked in clean water at room temperature and then kept wet for two days and then the sprouted grains were dried in oven at 65°C. The dried grains were then milled to get germinated millet varieties flours.<sup>6</sup>

Sensory analyses of germinated millet flours samples were carried out using 60 panelists (students from food science and technology major, Dan Dicko Dankoulodo University, Maradi, Niger). The samples were submitted for an acceptance test, applying a hedonic scale of 5 point.<sup>7</sup> The following sensory attributes were evaluated: taste, colour, flavor, texture and overall acceptability. Products were rated from 0 to 5 (0 means dislike and 5 means like very much).

The analysis of data was carried out by using one-way analysis of variance (ANOVA). Tukey LSD (Least Significant Difference) test and Paired-sample T test were done to determine the significant difference at P<0.05 level. The Software for statistical analysis SPSS version 20.0 (IBM-SPSS, Chicago, IL, USA) was used.

## Results and discussion

It is a fact that, the traditionally made millet products are attracting industry interest, along these lines, several studies have been reported about using millet varieties for enriching some food products for the interest of people suffering from celiac disease. Despite the interesting compounds, such as starch, sugar, minerals and oils or flavonoids.<sup>2,3</sup> In term of nutritional and health-promoting properties of millet a gluten-free and low-cost cereal increased interest toward its consumption.<sup>8</sup>

### Physical characterization

**Table 1** Sensory evaluation of germinated millet varieties flours

Millet samples	Taste	Color	Flavor	Texture	General acceptability
HKP	2.72±1.01 <sup>a</sup>	3.30±0.91 <sup>a</sup>	3.28±1.01 <sup>a</sup>	3.31±0.99 <sup>a</sup>	2.85±1.03 <sup>a</sup>
ICMVIS99001	3.38±1.03 <sup>ab</sup>	3.52±0.83 <sup>a</sup>	3.28±0.90 <sup>a</sup>	3.35±0.82 <sup>a</sup>	3.72±0.96 <sup>c</sup>
SOSAT	3.65±0.94 <sup>b</sup>	3.53±0.87 <sup>a</sup>	3.53±0.96 <sup>ab</sup>	3.32±0.95 <sup>a</sup>	4.04±0.91 <sup>c</sup>
ZATIB	3.38±0.92 <sup>ab</sup>	3.57±0.83 <sup>a</sup>	3.62±0.96 <sup>ab</sup>	3.58±0.81 <sup>ab</sup>	3.38±1.05 <sup>b</sup>
ICMVIS89305	3.43±0.96 <sup>b</sup>	3.42±0.91 <sup>a</sup>	3.33±0.95 <sup>a</sup>	3.50±0.93 <sup>ab</sup>	3.42±0.87 <sup>b</sup>

Values are mean±standard deviation of three repetitions. Mean values with different letters indicate statistical differences (P<0.05).

## Conclusion

This work allowed creating a product enriched by germination, and evaluating the acceptability of this product by the sensory evaluation method. The result found that the germinated millet varieties flours were acceptable for human consumption mind that germination increased the nutraceutical value of nutrients. More are yet to be done to promote more millet varieties through germination to the products.

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Slight variations were noted among the samples, in terms of taste there was almost no significant difference (P<0.05) between the different millet groups of ICMVIS99001, SOSAT, ZATIB and ICMVIS89305. Slightly significant difference (P<0.05) were found with the flavor characters of HKP, ICMVIS99001 and ICMVIS89305 to those of SOSAT, ZATIB. Similar trend was revealed with texture characteristics where ZATIB and ICMVIS89305 differed with HKP, ICMVIS99001 and SOSAT. Otherwise, the color character showed no significant difference (P<0.05) among the whole germinated millet varieties flours. As far the general acceptability the results revealed that the germinated millet variety flour VAR03 (SOSAT) is the one that scored the highest value on five hedonic scale (4.04), followed by the varieties VAR02 (ICMVIS99001); the VAR05 (ICMVIS89305) and VAR04 (ZATIB) were statistically the same (P<0.05) assessed by the panelists. Lastly, the variety VAR01 (HKP) is the least popular among the germinated millet flours samples (Table 1). This corroborate with the work of Inyang et al.<sup>9</sup> These differences among the millet varieties flours could be attributed to the variety, culture conditions and processing parameters.

The millet variety to another, the texture of millet grains can be highly variable depending on the structure of the starch granules constituting their albumen.<sup>10</sup> Buerkert et al.<sup>11</sup> and Sade<sup>6</sup> studied the proximate composition of millet grains varieties and different process, they found a wide variation in grain quality that they attributed to differences in soil influenced and processing applications.

Apart the efforts of various research institutions in Sahel region that came up with this pearl millet (*Pennisetum glaucum*) varieties that resist to harsh conditions of area. However, perspective the content evaluation of proximate composition of these varieties could be studied. Furthermore, the best storage conditions and their proper propagations could be found a new trend of valorizing them.

## Conflict of interest

The authors declare no conflict of interest.

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