



Effect of Malting & Fermentation on the Functional & Rheological Properties of Sorghum Flour

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Authors' contributions

This work was carried out in collaboration between both authors. Author AVG designed the study, performed the statistical analysis, managed the analyses of the study and wrote the manuscript. Author KPB managed the literature searches. Both authors read and approved the final manuscript.

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ABSTRACT

Sorghum is widely grown in India, Maharashtra is the leading state in its production. Sorghum is popular for poor man's food. Sorghum-based product is composed of high nutritional value and acceptability. Although Sorghum has a number of benefits viz., it provides a high amount of carbohydrates, rather than it contains phenolic compounds and antioxidants which helps in managing diabetes, heart health, improves digestive health, beneficial in maintaining healthy bones and reduces the risk of cancer. Malting and fermentation are the two most important term which gets a huge impact on the rheological and functional behaviour of the sorghum flour. Malting and fermentation placed a good impact on the sorghum flour. Effect of this malting and fermentation varies with the various varieties of sorghum as they composed of different characteristics.

Keywords: Malting; fermentation; benefits; sorghum; rheology etc.

1. INTRODUCTION

Millets are the sixth most important cereal grains in the world, sustaining more than one-third of the world's population. Annually, India produces 42.04 million tonnes of coarse cereals of which sorghum accounts for nearly 63 per cent of production with a production of 11.85 million tonnes. Millets have a very high nutritional value, as majority of millet grain contains higher protein, fibre, calcium and minerals than wheat and rice. Therefore, these are now also being called the "Nutri-cereals". Sorghum is an important crop worldwide used for food (as grain and in sorghum syrup or "sorghum molasses"), animal fodder, the production of alcoholic beverages, and biofuels. Sorghum is an important food crop in Africa, Central America, and South Asia, and is the "fifth-most important cereal crop grown in the world" according to the U.S. Grains Council [1]. Sorghum contains anti-nutritional factors like tannin, cyanogenic-glucoside, phytic acid, trypsin inhibitor, and oxalate [2].

Sorghum is developed in about 9-10 varieties by Vasant Rao Naik Marathwada Krishi Vidyapeeth, Parbhani. Those are SPV-1411, SPV-1474, PVK-801, CSV 18 R etc. There are some of the varieties like RSSGV 46, RPASV, RSV 1098, CSV 1830 etc. are developed by the Mahatma Phule Krishi Vidyapeeth, Rahuri. These varieties have a various specification which provides a high amount of sorghum production.

Sorghum (*Sorghum bicolor*) is an important source of dietary energy and it is the staple food in semi-arid regions of Africa and Asia [3]. Traditionally this flour has been used as a cereal food to create pancakes, porridges, beer and flatbreads throughout different cultures, such as jowar roti in India. In Africa, India and China, sorghum comes third among cereals for human consumption after rice and wheat [4].

2. MALTING AND FERMENTATION

Fermentation of the composite flour resulted in an improvement in the protein content. Malting and fermentation are among the traditional processing methods that are widely used in Africa for the preparation of foods and beverages. Malting is the controlled germination followed by controlled drying of the kernels. The main objective of malting is to promote the development of hydrolytic enzymes, which are not present in the non-germinated grain. Malting has produced improvement in flavour profile and

colour [5]. Fermentation can increase in the concentrations of vitamins, minerals and protein. Fermentation can also improve mineral availability and increase vitamin B content particularly thiamine [6].

Cereals, millets and legumes are generally pre-processed by fermentation, germination (malting), cooking, milling etc. in order to enhance their functionality and nutritional value. Germination or sprouting or malting is a biochemical process which involves the transition of a seed from a dormant state to vital active state. It is a simple technique that has been reported to improve the nutritive value of foods. Several studies on the effect of germination on legumes have found that germination can increase protein content and dietary fibre and reduces tannin and phytic acid content and increase mineral bioavailability [7].

3. RHEOLOGY

Rheology is the study of material with its fluid and solid characteristics. Rheological properties of sorghum flour are being determined with the help of Farinograph, Amylograph, Extensograph. With the help of this instrument, the graph shows the behaviour of rheological characteristics of sorghum flour. This equipment is easily available at the Sorghum Research Station. Viscoelectric properties, gelatinization temperature, gelatinization maximum, dough development time, water absorption, enzymatic activity, baking behaviour etc. are the properties that before come under rheological aspects. Functional properties of sorghum flour are as important as rheological properties. Those are water & oil absorption, bulk density, solubility index etc. These functional property level increases with the effect of malting and fermentation on sorghum flour.

4. LITERATURE STUDY

Samuel A.O.A. [8] studied about the assessment of quality and sensory properties of sorghum flour and he concluded that after assessing the proper quality and sensory properties, a food product is achieved with desirable physical properties and chemical composition.

Opeyemi O. A. et al. [9] studied on effect of malted Sorghum on quality characteristics of wheat-sorghum-soybean flour, in their study they made composite flour of whole wheat, malted sorghum and soybean flour and they showed results of proximate analysis, functional

properties, antinutritional composition and pasting properties of whole wheat, malted sorghum and soybean flour respectively. They concluded malting could be ineffective in the degradation of antinutrients in sorghum grains and malting of sorghum can improve the nutritional quality of flours that can be used in food industries like confectionary.

Nkama I. et al. [10] examined Effects of Malting and Roasting of Millet and Sorghum on Protein Digestibility, Mineral Availability, Soluble Sugar Composition and Consumer Acceptability of Dakuwa. In this they prepared dakuwa with using both malted and unmalted sorghum flour. This study has revealed that an acceptable dakuwa with increased protein digestibility, soluble sugars and mineral availability can be produced from malted pearl millet and sorghum.

Adebayo-Oyetero, A. O. et al. [11] studied on Nutrient composition, functional and organoleptic properties of complementary food formulated from sorghum and they successfully concluded that sorghum is high in essential fatty acids, protein and other essential macro and micro minerals & thus fermented sorghum porridge is an important staple food items for people and also important weaning foods for infants.

Murugkar D. A. et al. [12] studied about effect of sprouting on physical properties and functional and nutritional components of cereals and they found that malting helps in increasing the nutritional components and reducing the anti-nutritional components of multi-nutrient mixes which further enhanced their nutritional, physical and functional properties.

Cheikh Ndiaye et al. [13] studied about malting germination effect on rheological properties and cooking time of sorghum flour and they observed that cooking time of product is being reduced and starch degradation is observed after 3 to 4 days of germination.

The Specific purpose of this study will carry out to investigate the effects of malting and fermentation on functional and rheological properties of sorghum flour. With the help of above contributor's study, we will reach to our objective i.e. impact or effect of malting and fermentation on the functional and rheological properties of sorghum flour very soon. For this particular study, we chose two separate varieties which is developed by MPKV, Rahuri and VNMKV, Parbhani. For rheological study we

used extensograph, farinograph and amylograph to study the effect which occurred on the sorghum flour. And we going to study different functional properties like bulk density, water absorption capacity, oil absorption capacity, dispersibility determination, solubility index and solubility power by the method as per given by the AOAC.

5. CONCLUSION

There is clear evidence that both malting and fermentation processing technologies can improve the nutritional quality in sorghum flour. Changes in the rheological and functionality in sorghum kernel components during malting and fermentation imply that these methods have beneficial effects on the sorghum foods. These methods may help to improve the nutritional quality and increase the consumption of sorghum food products. Increase in the consumption leads to increase in the production level. Thus, in this way this will leads to increase economic parameter of sorghum. Although Sorghum having some medicinal benefits will leads to a reduction of poverty and malnutrition. Malting process caused an increase in the amounts of reducing sugars in sorghum flour. Fermentation caused an increase in the amounts of soluble proteins and the free amino acids. Malting and fermentation pre-treatments can improve the composition and functionality of sorghum flour. All in one is malting & fermentation produces a good impact on the rheological and functional characteristics of sorghum flour.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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