INTRODUCTION
Chapter 1

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The rising global population is estimated to reach 9 billion people by the middle of this century. One of the consequences of this expansion in population is a higher consumption and a larger demand for processed food such as bread. An increase in bread consumption will direct to a greater demand for wheat and as a result wheat is a reserve likely to be in global short supply in the near future. This highlights the necessity for substitute sources of starch and flour. Cereals and cereal-based products have represented the crucial part of the human diet all around the world since the earliest times. Cereal crops are energy concentrated, providing approximately 10-20 times more energy than most fruits and vegetables. There is an emerging demand in many sections of the world for variation and innovation in cereal based foods. Bread is such a cereal food product which is consumed more due to the population expansion, urbanization and the expediency factor of bread. In the past few decades, research attempts have been aimed towards the feasibility of incorporating flour from various sources other than wheat in bread production. This is most noticeable in developing and tropical countries, where indigenous crops are being cultivated with the target of augmenting their utilization in national food systems, thereby defending food security. The partial substitution of wheat flour by the local crops for the bread production could increase nutritional intake and positive health outcomes among consumers, basing on the reports of nutritive value of local crops and their linked health benefits.

Composite flours are flours made by combining cereal, root, tuber, or legume flours at a fixed ratio. These are then utilized to make novel food products, including fermented flat breads, biscuits and tortillas. An important inspiration for the development of composite foods is to upgrade nutritional quality. Compositing influences nutritional, functional, sensory, and phytochemical properties of finished food products. Different aspects play a role, including preprocessing steps used in the development of the flours, the ratio of flours used, as well as the recipe followed for the preparation of the end product. Composite flours are occasionally outlined as blends of various vegetable flours, packed with starch, protein, and/or other nutrients with or without wheat flour. Composite flour of unlike cereals is one prospective to intensify the nutritional composition of finished bread products. The ingredients used in composite flours depend on the accessibility of raw materials in the concerned
country. The aim is to lessen the cost of production compared to the cost of imported wheat to warrant affordability to the final product by consumers. Quality assessment of nutritious bread using composite flour has certainly been a subject in all the facets related to health and cost effectiveness.

Some institutions, including the Food and Agriculture Organization (FAO), have been associated with research drafted to investigate procedures of partly substituting wheat flour with flours from alternative origin or replacing wheat altogether. The technology of composite flours portray an interesting possibility for the management of charges linked with importation of wheat flour in countries where wheat is not grown for unfavorable climatic conditions (Olaoye et al., 2006). With the consistency in increase in demand of bread and various baked foods in many developing countries, coupled with ever-growing urban populations, the composite flour/bread technology could be very handy. Many crops in developing countries, such as millets and legumes, possess inherent nutritional values and therapeutic properties that could be exploited for boosting human nutrition and well-being.

Millets have diverse nutrition qualities, and have correctly been called “nutri-cereals”. Millets have been utilized as important staples worldwide for centuries. Apart from health benefits, millets are also good source of energy, protein, vitamins and minerals (Rao, 1986). Millet grains comprise appreciable levels of phenolic compounds that could encourage antioxidant activities; moreover use of these whole grains gives an extra advantage of dietary fiber. Development of appropriate processing methods for small millets and nutritious food products is crucial to promote utilization of these millets in countries where most children under five years of age are malnourished.

Legumes are protein rich relative to cereals and are also predominantly better sources of essential amino acids, particularly lysine. On the contrary, cereals, although lysine-deficient, are relatively better sources of amino acids with sulfur like methionine. The benefit of developing cereal-legume composite foods may be examined as twofold: There is a comprehensive enhancement in the protein amount of the composite food compared to only cereal base, and there is better amino acid stability because of the donation of lysine from legumes and the contribution of methionine from cereals. Legumes such as red kidney beans are major sources of proteins, they hold high quantity of lysine, leucine, aspartic acid, glutamic acid and
arginine, providing counterbalanced essential amino acid outline when taken with cereals abundant in sulfur-containing amino acids and tryptophan.

Additionally, industrial processing of fruits produces plenty of co-products abundant in bioactive compounds which can be appropriately added to food. One example is Pomegranate bagasse powder which possesses prospective applications in baked foods demanding hydration, viscosity development and firmness maintenance. Pomegranate bagasse may be also thought about as fine source of natural compounds with a remarkable antioxidant activity (Viuda- Martos et al., 2010). Such nutritional and functional values could be converted into human use by wheat-composite flour technology for bread production. These novel food product advancements have been labeled as ‘functional foods’.

Functional foods have the capacity to boost population health in keeping with the intentions recognized by national public health approach, because the enhanced consumption of functional ingredients in bakery products implies increase in the amount of fiber in the diet. Functional food is considered to be a food constituent that provides health benefits surpassing fundamental nutrition. Although consumers and health experts have presented positive inclination for functional food in common, there is proof that consumers vary in the degree to which they purchase particular food commodities with functional ingredients, mainly bakery products. Bread has lately become a medium for functional ingredients. Recently, natural compounds as functional ingredients in diets are a great deal of interest among consumers due to various health benefits. Substitutions for wheat flour like germinated and non-germinated soy bean flour (Dominguez et al., 2008), composite flours of wheat, plantain and soybeans (Olaoye et al., 2006), maize- soybean flour blends (Edema et al., 2006), rice flour, corn starch and cassava starch (Lopez et al., 2004), rice, corn and soy flour (Sabanis et al., 2009) and rice flour (Gujral et al., 2004) have been reported.

However there are minute issues incorporating functional ingredients in bakery products, whether the final functional baked product faces consumer demands is barely understandable. When related to dairy products present consumption of functional bread is comparatively low. Certainly, even with promotion in bread as a ‘functional food’ there are various causes why consumers might be hesitant to select these products. One possible reason may be baked products being perishable foods experience critical physical, physiochemical, sensory and microbial alterations
throughout storage, hence requires an optimized recipe and process to improve quality and extended shelf life.

With all the above considerations, this research work was carried out based on optimization and evaluation of the incorporation of each functional ingredient including millets, legumes, and fruit bagasse in quality characteristics of yeast leavened bread. The present study was undertaken with the following objectives:

1. Optimization of the baking parameters in the preparation of yeast leavened bread.
2. Optimization of the level of incorporation of functional ingredients in yeast leavened bread.
3. Characterization of flour and dough properties with the effect of optimized incorporation of functional ingredients.
4. Quality characteristics and storage life evaluation of bread optimized with functional ingredients.