CHEMICAL, PHYSICAL AND TECHNOLOGICAL EVALUATIONS OF AUSTRALIAN WHEAT MILLING STREAMS

By

AHMED ATEF ADLY
B.Sc. Agric. Sci. (Poultry), Fac. Agric., Menoufia Univ., 2003

THESIS
Submitted in Partial Fulfillment of the Requirements for the Degree of

MASTER OF SCIENCE

In

Agricultural Sciences
(Food Science)

Department of Food Science
Faculty of Agriculture
Cairo University
EGYPT

2018

APPROVAL SHEET

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Approval: 30 / 06 / 2018

ABSTRACT

This research was conducted to study the chemical and physical characteristics of Australian soft and hard wheat and their flour (76% extraction) as well as their break and reduction flour streams. The obtained results indicated that protein and ash contents were increased as the number of stream was increased .All stream samples showed falling number more than the optimum values (250 sec), which indicates the low α- amylase activity. Different color values were found for the streams from both soft and hard flours. The results indicated that the wet and dry gluten contents of all hard flour streams were higher than those of soft flour streams. The results of farinograph and extensograph tests showed that dough of all streams of the Australian hard flour was stronger than those of Australian soft flour. The steams of both types of flour have been divided to three groups according to gluten content and rheological characteristics .The variation in all the studied characteristics could be utilized in production of different types of flour from the parent flour for production of different bakery products with high quality and nutritive values.

Key words: Hard wheat – soft wheat - flour – milling – streams

Dedication

I dedicate this work to my Father for supports and subsidized and mother and wife for all support the lovely offered during my post-graduate studies

Acknowledgment

I wish to express my sincere thanks, deepest gratitude and appreciation to ***dr. Ahmed Mahmoud Alian****, professor of food science faculty of agriculture Cairo university, and* ***dr. Mahmoud Aly Ahmed Bekheet*** *associate professor of food science faculty of agriculture Cairo university, for suggesting the problem, supervision continued assistance, and guidance through the study and their revision of manuscript of this thesis and for all helps*

Grateful appreciation is also extended to all staff members of the food science department, science faculty of agriculture Cairo University.

Grateful appreciation is given to my father, mother, wife ,my brother and sister's .Also I feel deeply grateful to my country Egypt.

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INTRODUCTION

Wrigley (2009) reviewed wheat as widely cultivated as a cash crop because it produces a good yield per unit area, grows well in a temperate climate even with a moderately short growing season, and yields a versatile flour. In the United States, wheat is classified based on kernel hardness such as hard or soft, growing season such as spring or winter, and grain color such as white or red. The characteristics of each class of wheat affect milling and baking when used in food products. Most wheat is mainly consumed in the form of baked goods; therefore, wheat grains must be milled to produce flour prior to consumption. Wheat is also used as an ingredient in compound feedstuffs, starch production and as a feed stock in ethanol production. Flour milling has two objectives. First, it is a process that separates the endosperm from bran and germ. Second, it involves grinding the endosperm to fine flour. Wheat kernels have three main parts, the endosperm, the germ, and the bran. Wheat flour is obtained from the endosperm.

The wheat grain (Fig.1) contains 2-3% germ, 13-17% bran and 80-85% mealy endosperm (all constituents converted to a dry matter basis).The bran (outer layers of wheat grain) is made up of several layers, which protect the main part of the grain. Bran is rich in B vitamins and minerals; it is separated from the starchy endosperm during the first stage of milling. In order to protect the grain and endosperm material, the bran comprises water-insoluble fiber. More than half the bran consists of fiber components (53%). Chemical composition of wheat bran fiber is complex, but it contains, essentially,

cellulose and pentose's, polymers based on xylose and arabinose, which are tightly bound to proteins. These substances are typical polymers present in the cell walls of wheat and layers of cells such as aleurone layer. Proteins and carbohydrates each represent 16% of total dry matter of bran. The mineral content is rather high (7.2%). The two external layers of the grain (pericarp and seed coat) are made up of dead empty cells. The cells of the inner bran layer- aleurone layer are filled with living protoplasts. This explains the rather high levels of protein and carbohydrate in the bran. There are large differences from the levels of certain amino acids in the aleurone layer and those in flour. Glutamine and proline levels are only about one half, while arginine is treble and alanine, asparagine, glycine, histidine and lysine are double those in wheat flour (Sramkovaa*et al.* 2009)

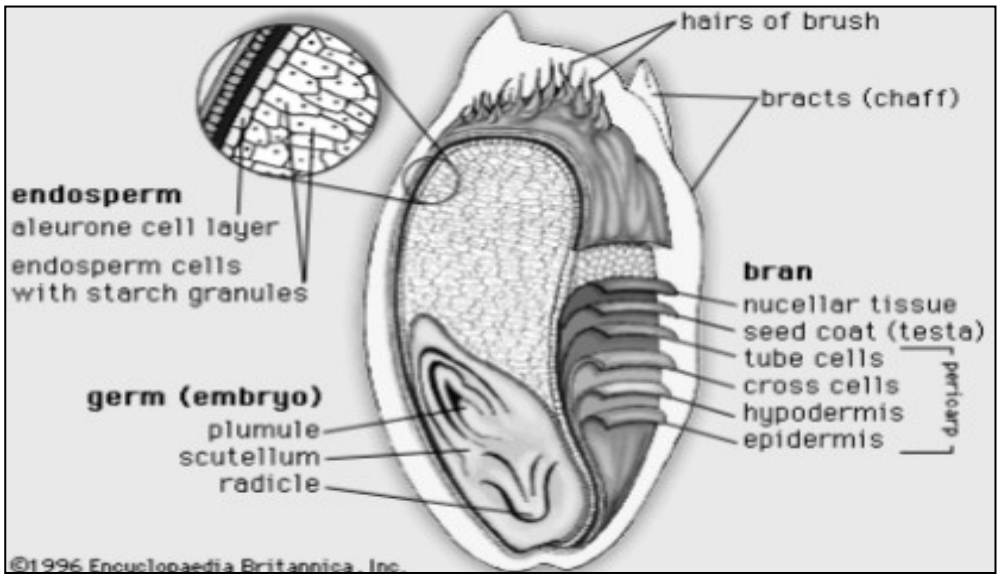

Fig. 1.Wheat grain composition.

Ziegler and Greer (1978) reported that the first stage of the modern flour milling process is the break system, in which wheat kernel is opened up and the contents released so that the endosperm may be separated from the bran. The best way for opening up wheat kernels has been to pass them through succession of pairs of spirally corrugated rolls driven at different speeds. The rolls are progressively closer together and more finely corrugated throughout the four or five breaks common in the modern flour milling process.

Wheat milling by roller mills (Fig.2) aimed to obtain mainly refined wheat flour. Particle size reduction in roller milling is achieved by passing cleaned and conditioned wheat through break and reduction rolls. The flour obtained from each roll is blended to obtain straight run flour (Prabhasankar *et al*.2000). However, increasing roll gap changed the balance towards more large particles, but had little effect on the quantity of particles in the middle size range.

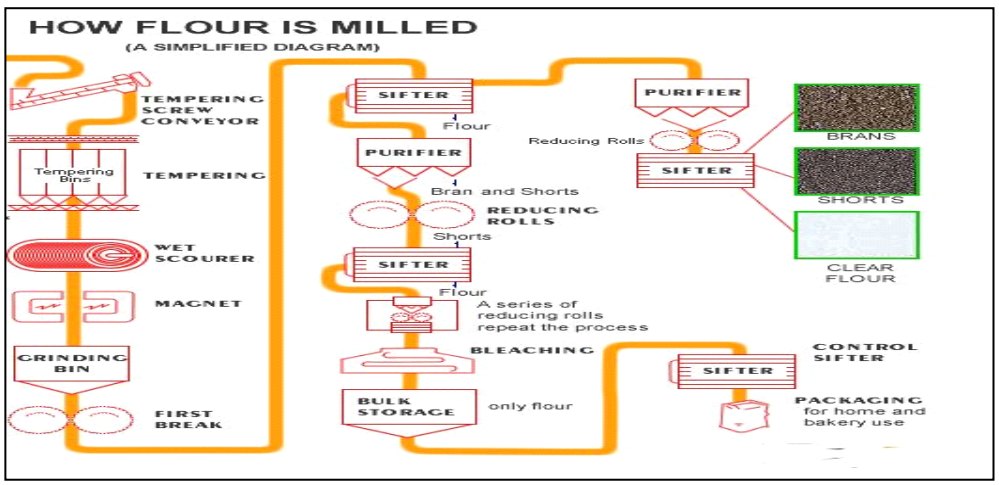

Fig.2.Milling of wheat grains.