QUALITY EVALUATION OF SOME CEREAL PRODUCTS FROM NEW WHEAT VARIETIES

By

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B.Sc. Agric. Sc. (Food Science and Technology), Cairo University, 2001

M.Sc. Agric. Sc. (Food Science and Technology), Ain Shams University, 2008

A thesis submitted in partial fulfillment

of

the requirements for the degree of

DOCTOR OF PHILOSOPHY

In

Agricultural Science

(Food Science and Technology)

Food Science Department

Faculty of Agriculture

Ain Shams University

2015

Approval Sheet

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ABSTRACT

Seham Yehia Gebreil Salleh: Quality Evaluation of Some Cereal Products From New Wheat Varieties. Unpublished Doctor of Ph.D. Thesis, Department of Food Science, Faculty of Agricultural, Ain Shams University, 2015.

In this study, four soft wheat varieties (*T. aestivum*), i.e. Misr 1, Sids 12, Gemmiza 7 and Gemmiza 10, and two hard wheat varieties (*T. durum*), i.e. Beni Sweif 5 and Beni Sweif 1 and its fractions (whole meal, 82, 72% and semolina extraction) were evaluated for the physic-chemical and rheological properties to provide us with data that may employ as guidelines to produce some bakery products.

Beni sweif 5, Gemmiza 7 and Sids 12 grains varieties had a higher hectoliter and 1000 kernel weight than other tested varieties. However, hard wheat varieties characterized by high kernel hardness. Durum wheat flour varieties showed a higher yellowness values. This indicates the preferred color characteristics of durum wheat flour for pasta production. However, a slight difference in color values was observed between the bread wheat and durum wheat.

Results showed that Sids 12 and Beni sweif 5 varieties and its fractions had high protein and low total carbohydrate contents compared to other tested samples. Wheat variety Beni sweif 5 and Sids 12 contained relatively higher EAA and NEAA contents compared to other wheat varieties. All wheat verities are rich in unsaturated fatty acids particularly of linoleic acid (C18:2) content. New wheat variety Sids 12 had the highest Mg, Ca, Zn and Mn content (108.6, 359.8, 4.88 and 3.90 mg/ 100g, respectively).

Hard whole meal of Beni sweif 5 had significantly the highest β-carotene (8.31ppm) and tannins content (28.60 mg/100g) and their quantity were decreased as the extraction rate decrease. Also, the whole wheat meal contained higher phytic acid than refined flours (82 and 72% extraction)

Sids 12 and Gemmiza 7 whole meal had significantly the highest TPC (166.08 and 1 62.20 mg gallic /100g respectively), while Beni sweif 1 had the lowest TPC (124.76).

It was found that wheat flour dough Beni sweif 5 recorded the highest value of stability (8.5 min and 4.5 min. for 72 and 82% ext. respectively), but recorded low value of degree of softening (20 and 80 B.U. for 72 and 82%, respectively). Wheat flour dough Beni sweif 5 recorded the highest values of resistance to extension (480 and 290 B.U. at 72 and 82%, respectively), while wheat flour dough Gemmiza 10 and Misr 1 had the highest extensibility values.

Different wheat flour extractions samples and their blends were used to prepare and evaluate different wheat products (i.e. chapatti bread, balady bread, pan bread and macaroni).

Chapatti bread prepared from whole meal of Beni sweif 5 is distinguished by a significant high amount of protein (13.95%) and ash (1.79%) and low carbohydrate content (79.38%). In conclusion, it could be recommended the use of whole meal of new Egyptian wheat variety of Sids 12 and Beni sweif 5 and the blends of B5 with S12 or G10 for production chapatti bread.

Balady bread made from wheat flour 82% ext. Sids 12 recorded the highest value of protein followed by Beni sweif 5 and Misr 1. Bread loves of Beni sweif 5 durum wheat showed less change in moisture content per day than soft wheat. Balady bread prepared from new varieties Beni sweif 5 durum wheat flour recorded the highest score for overall acceptability followed by Sids 12 and Misr 1.

Protein contents in pan bread samples ranged from 12.86 (Beni Sweif 1 72% ext.) to 14.97% (Beni Sweif 5 72%). Pan bread prepared from old variety Gemmiza 7 flour recorded the highest total scores (97.99), followed by new varieties of Sids 12 and Misr 1 (96.98 and 96.48 respectively).

Macaroni which prepared from semolina of new variety Beni sweif 5 recorded the highest content of protein, ash and crude fiber and the

highest overall acceptability in comparison with that of semolina of old variety of Beni sweif.

Key words: Soft Wheat, Durum Wheat, Extraction Rate, Wheat Flour, Physical Properties, Chemical Analysis, Amino Acids, Fatty Acids, Minerals, Heavy Metals, Phytochemical, Bakery Products, Chapatti Bread, Balady Bread, Pan Bread, Macaroni.

ACKNOWLEDGMENT

All praises are due to Allah, who blessed me with kind professors and colleagues, and gave me the support to produce this thesis.

I wish to express my grateful appreciation and deepest thanks to Prof. **Dr. Nagwa M.H. Rasmy,** professor of Food Science and Technology, Food Sci. Dep., Fac. of Agric., Ain shams university for her direct supervision, greatest faithful, constructive criticism, valuable discussion and plentiful active for me to bring this investigation to its best shape.

Deepest thanks and sincere appreciation to **Dr. Hanan M.A. Al-Sayed** professor of Food Science and Technology, Food Sci. Dep., Fac. of Agric., Ain shams university for her direct supervision, careful guidance, willing cooperation, and valuable assistance and continuous encouragement through out the time of this study.

I would like to express my deepest thanks to Prof. **Dr. Hoda G. El-Amary** professor of Food Science and Technology, Food Technology Res. Ins., Agricultural Research Center for her supervision, valuable help throughout this work, and her unlimited help during preparing this thesis.

Thanks also extended to the all staff members and colleagues in the Food Sci. Dep., Fac. of Agric., Ain Shams University and in the Food Technology Res. Ins., Agricultural Research Center.

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LIST OF APPRIVIATIONS

%	Percentage
°C	Centigrade degree
µg	Microgram
AACC	American Association of Cereal Chemists
ANOVA	Analysis of Variance
AOAC	Association of Official Agricultural Chemists
AWRC	Alkaline Water Retention Capacity
B.U.	Brabender unit
Ca	Calcium
Cd	Cadmium
Cm	Centimeter
Co	Cobalt
Cr	Chromium
D.F.	Dietary fiber
Da	Dalton
Dwt	Dry weight
E	Extensibility
e.g	For example
Ed	Editor
et al	And others
Ext.	Extraction
F.N	Falling Number
FAO	Food and Agriculture Organization
Fe	Iron
Fig.	Figure
g	Gram
hr.	Hour
i.e	That is (id est)
J	Journal
K	Potassium
Kcal	Kilocalorie
Kg	Kilogram
mg	Milligram
Mg	Magnesium

Min.	Minute
ml	Milliliter
Mn	Manganese
Mt	Million ton
N	Newtin
N.D	Not detected
Na	Sodium
NFE	Nitrogen free extract
Ni	Nickel
No.	Number
P	Phosphorus
Pb	Lead
R	Resistant to extension
Resp	Respectively
S.F.A	Saturated fatty acids.
Sci.	Science
SDS	Sodium dodecyl sulfate
Sec.	Second
TCA	Tri-chloro acetic acid
TDF	Total dietary fiber
TEAA	Total essential amino acids.
TNEAA	Total non essential amino acids.
U	Unit
U.S.	United states
UnS.F.A	Unsaturated fatty acids.
UV	Ultraviolet
V	Volume
WHO	World health organization
Zn	Zinc
β	Beta

1. INTRODUCTION

Wheat (*Triticum aestivum L. em Thell.)* is the first important and strategic cereal crop for the majority of world's populations. It is the most important staple food of about two billion people (36% of the world population). Worldwide, wheat provides nearly 55% of the carbohydrates and 20% of the food calories consumed globally **(Breiman and Graur, 1995).** It exceeds in acreage and production every other grain crop (including rice, maize, etc.) and is therefore, the most important cereal grain crop of the world, which is cultivated over a wide range of climatic conditions and the understanding of genetics and genome organization using molecular markers is of great value for genetic and plant breeding purposes. Wheat varieties are classified into different classes which exhibit different applications. Those varieties differed in quantity and quality of proteins, mainly gluten. Wheat flour gluten results mainly the unique properties of dough **(Nowotna *et al.*, 2003).**

In Egypt, there is a gap between production and consumption of wheat. According to the limited area of cultivated land and the rapid increase in population, local production of soft wheat flour covers only 50% of consumer needs. This forced the government to import large quantities of wheat to solve the problem of insufficient local production and to cover the requirements of balady bread production **(Mekhael, 2005).** Many serious attempts have been made to narrow this gap. e.g. enhancing the yield/feddan, breeding higher yield varieties and blending of wheat flour with non-wheat cereals. In spite of all these efforts, we still import quite large amounts of wheat **(Mohy El-Din, 2004).** Therefore, In Egypt National Program for Wheat Research developed new wheat varieties characterized with its higher yield and persist pests, i.e. Misr 1, Sids 12, Gemmiza 10 and Beni sweif 5 **(Anonymous., 2005).**

Annual global wheat production exceeds 723.4 million tones, making the world wheat market valuable **(FAO, 2014).** The total area and production of wheat in 2013/2014 in Egypt were 3.5 million feddan, and 8.3 million tons, respectively. In 2014, 17.6 million tons of different