

**UTILIZATION OF MORINGA PLANT IN THE
FORTIFICATION OF SOME BAKERY
PRODUCTS**

By

AHMED ROBY KHALAF ABO-SEIF

B.Sc. Agric. Sci. (Food Technology), Fayoum University, 2011

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ABSTRACT

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The aim of this study was to utilize moringa leaves (MLP), seeds powder (MSP) and seeds oil that can be promising source of functional compounds, proteins, mineral, amino acids, fatty acids and fiber. Moreover, wheat flour (WF) (72%) was supplemented with MLP at levels (3, 6, 9 and 12%) and MSP at levels (5, 10, 15 and 20%). Also, the prepared formulas were used to manufacture pan breads. Chemical composition, minerals content, amino acids, fiber fractions, fatty acids, total phenols, total flavonoids and antioxidant activity were determined. Pasting profile and rheological properties of WF and their blends with MLP and MSP were studied. Moringa seeds oil utilize to prepare cake as replacement of shortening at different levels (20, 40, 60, 80 and 100% moringa oil) and evaluated this cake for chemically, baking quality, color, texture and organoleptical evaluation.

The results revealed that, MLP had high ash and fiber contents (8.87 and 7.91%), respectively, while protein and fat contents were high in MSP (70.32%) and in moringa seeds (MS) (39.02%). Mineral contents in MLP were high in Ca, K, Mg, P, Na and Fe, while MSP was high in Zn than those of other samples. Fiber fractions of WF were lower than that of MLP and MSP. Total essential amino acids in MSP (19.25%) were higher than that in MLP and WF (12.45 and 4.16%, respectively). Palmitoleic acid (1.33%) and oleic acid (66.85%) were the least and predominant fatty acids, respectively. MLP had highest value of total

phenolic, total flavonoid and antioxidant activity (12.64, 8.47 and 16.75 mg/g, respectively).

Substitution of MLP and MSP to wheat flour 72% at all levels decreased the values of peak viscosity, trough, breakdown, final and setback viscosities of wheat flour 72%. MLP and MSP at all levels increased water absorption, dough development time, mixing tolerance index and dough weakening. On contrary, arrival time and dough stability decreased. MLP and MSP decreased the extensibility, resistance to extension, maximum resistance to extension energy of dough and the proportional number at all levels compared with the control.

The Chemical composition of pan bread showed that protein, ash, fiber and fat content of the fortified bread was increased. While, total carbohydrate of the fortified pan bread were decreased as fortifying level increased. Also, fortifying pan bread with MLP and MSP up to 9% and 20 % led to obtain high quality pan bread with good technological, physical and sensory characteristics properties. Therefore, it could be recommended to fortify wheat flour with MLP and MSP up to 9% and 20% for preparing high quality pan bread.

The effect of replacing moringa seed oil at different level on moisture content, color attributes, baking quality, chemical quality attributes, staling, texture, and sensory evaluation of cake samples stored at room temperature were also studied. It was also noted that no significant effect ($P < 0.05$) in acid value, peroxide value and TBA, as well as sensory evaluation of the cakes produced by replacing the Shorting with moringa oil.

Key words: Moringa leaves and seed powders, chemical composition, amino acids, fatty acid profile, antioxidant activity, rheological properties, sensory characteristics, pan bread and cake.

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LIST OF ABBREVIATIONS

a*	: Redness
AlCl ₃	: Aluminum chloride
ADF	: Acid detergent fiber
ADL	: Acid detergent lignin
ANOVA	: Analysis of variance
AWRC	: Alkaline water retention capacity
AV	: Acid value
b*	: Yellowness
BU	: Brabender Units
DMSP	: Debittered moringa seed powder
DDT	: Dough development time
DML	: Dry moringa leaves
DMLP	: Dried <i>Moringa oleifera</i> leaves powder
DMSP	: Defatted moringa seeds powder
DPPH	: 2,2 diphenyl-1-picrylhydrazyl
ΔE	: Total color differences
E	: Extensibility
GAE	: Gallic acid equivalent
L*	: Lightness
MeOH	: Methanol
MLP	: Moringa leaves powder
MS	: Moringa seeds
MOLP	: <i>Moringa oleifera</i> leaf powder
MOO	: <i>Moringa oleifera</i> oil
Na ₂ CO ₃	: Sodium carbonate
NaNO ₂	: Sodium nitrite
NaOH	: Sodium hydroxide
NDF	: Neutral detergent fiber
ND	: Not detected
PV	: Peroxide value

R	: Resistance to extension
R/E	: Proportional number
TBA	: Thiobarbituric acid
TCA	: Trichloroacetic acid
TE	: Trolox equivalent
TEP	: 1,1,3,3, -tetraethoxypropane
TFC	: Total flavonoids content
TPC	: Total phenolics content
WA	: Water absorption
WF	: Wheat Flour 72%