Effect of Addition of Doum Fruits Powder on Chemical, Rheological and Nutritional Properties of Toast Bread

Abstract

Four toastwere prepared; by substituting wheat flour with 0, 10, 20 and 30% by doum fruit powder (DFP). The chemical, physical, sensory and rheological properties of dough prepared for making toast have been studied. The results showed that replacement of (WF-DFP) toast dough led to an increase in water absorption (%), dough softening (B.U), dough development (min) and water holding capacity. Regarding to extensograph, elasticity (B.U) and the proportional number of dough toast made from doum fruit powder. Meanwhile, extensibility (mm) decreased in all doughs of DFP (10, 20 and 30%). Energy was decreased by addition of DFP at levels of 20 and 30% of DFP were (15 and 20cm^2), respectively. The results showed that increasing the levels of replacement increased ether extract, ash and crude fiber contents in prepared toast bread compared with control. Minerals of the prepared toast bread showed an increment in Ca, K or Mg, while slightly increment in Zn and Fe with increasing the ratios of replacement. The sensory evaluation results showed a significantly increase in the taste,odor, crumb grain and crumb texture by increasing the DFP substitution comparing with control. Meanwhile, crust color, appearance and overall acceptability decreased than control.Na/K ratios of DFP toast bread less than one have a great importance in the body for the of high blood pressure.

Keywords: Doum fruit powder, Toast dough, Farinograph, Extentsograph, mineral.

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Introduction

In rising useful bakery produces (for example, bread), it is essential to change a produce with physiological efficiency and consumer's acceptance in terms of texture, appearance and taste [1]. Bread is a vital staple nutrition made of wheat

flour, yeast and salt and consumed around world [2]. Today people desire to eat healthier diets in order to prevent non-communicable diseases. For this purpose, manufacturing and investigators are involved in optimizing bread making technology to increment the quality, taste,variety and availability of food products such as bread [3]. Among the ingredients that could be included in bread preparation there are spices and herbs, which are essential portion of the human food. They have been used for thousands of years to improve the odor, aroma and color of food and also for their antimicrobial, anti-oxidative, preservative and other medicinal values. For example,[4] processed gluten free biscuits and flat bread with high quality for celiac patients. [5]produces biscuits from pomace olive to glycemic rat.[6]prepared resistant starch for corn and rice starches, resistant starch R Sare a good source of dietary fiber with neutral characteristics and considered the important sources of starch in food manufacturing.

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Wheat (*Triticum aestivum*) is main of the essential edible grains around the world [7]. It is used in many forms consist of flat or pan style leavened bread. Wheat is depression in indispensable amino acids, for example, lysine and methionine, which reduces its nutritious value when utilization in foods produces[8].

Doum (*Hyphaenethebaica* L.) is one of the palm trees grow in Africa in Sudan and Egypt along the Nile. Trees are used in manufacturing and fruits in human feeding [9]. Fruits nutritionally is an excellent source of fiber and the carbohydrates. In addition, ~~O~~other nutrients like minerals including phosphorus, calcium, sodium, magnesium, potassium and vitamins (especially B vitamins). It helps revitalize and regulate vital processes in the body and Improve health [10]. Numerous studies have proven that the doum fruits are a source of richness of flavonoids, phenols and antimicrobial activities and possess significant antioxidant[11].

The doum fruits are comparatively source of essential minerals and proteins. ~~t~~The doum contains more essential mineral elements than a person's daily need. Thus, a balance may occur in the body's needs for mineral elements [12]. When conducting biological experiments on experimental rats, it was found that lowering blood pressure by consuming doum [13]. Ratio of Na/K is less than one, this is beneficial for patients with blood pressure[14].

Recently, researchers focused on studying dietary fiber because of its nutritional and health importance on the human body, as the fiber works to reduce the Symptoms of some diseases such as hypocholesterolemic, coronary heart disease, hypoglycemic, some s~~S~~ymptoms of cancer and also health promotion of consumers through a decrease in fat and cholesterol, As a result of the high doum content of

fiber to add to the manufacture of many bakery goods, such as bread, cakes, cookies and biscuits. to In addition to producing products rich in fiber acceptable to the sensory attributes properties of the consumer[15].

This study was conducted to utilize DFP as a functional component and as a high source of fiber in toast bread preparing and to estimate the impact of fortified of wheat flour (82% extraction) with the DFP on physicochemical, rheological of dough and sensory properties of toast bread.

Material and Methods

Materials

The doum fruit was obtained from local market in Luxor, Egypt.Wheat flourF (82% extraction), sugar, shortening, yeastYeast Ffaure, and table salt were obtained from the market at Kafrelsheikh city, Egypt. The chemicals used in the study get from El-Gamhouria to sell Chemicals and Drugs Company, Egypt.

Doum fruits powder preparation

Doum fruit (DF) were milled electrically in laboratory mill (JKA-Labora technic, Janke and Kunkel Type: MFC, Germany) to pass through 80 mesh sieve, then packed and kept in a refrigerator (4˚C) until used.

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Chemical analysis

The chemical analysis comprises i.e. crude protein, ash, ether extract and crude fiber of raw materials and toast bread blends were estimated according to [16].Total carbohydrates content was calculated by difference as reported by [17].The energy value (on dry weight basis) was calculate using the Atwater formula as: Caloric value = (ether extract × 9) +(protein × 4) + (carbohydrates ×4).The energy value was estimated according to [18].

Determination of minerals content

Minerals were determined according to the methods of [16].

Toast bread processing:

Toast bread is prepared according to the method[19] with some modifications. The baking formula was 100g of flour,1.5g of yeast, 2g of salt ,3g of vegetable shortening, 5g of sugar, and water as needed. Blends 2, 3 and 4 containing DFP as partially substitute for wheat flour at different levels (10, 20, and 30 %) (Table 1).The flour mixture is kneaded in the perineum until the homogeneity is complete .then leave the dough for fermentation for 90 min, then put it in a toast mold, then leave it for another 90 min to ferment, finally it baked in the oven at 250°C, for 30 min.

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Table 1. Toast formula prepared with DFP at different ratios of substitutions.

Ingredients	Control1	Blend 2	Blend 3	Blend 4
WF(82%ext)	100	90	80	70
DFP	0	10	20	30
Yeast	1.5	1.5	1.5	1.5
Salt	2	2	2	2
Butter	3	3	3	3
Sugar	5	5	5	5
Fresh egg	24	24	24	24

Rheological properties of WF and WF-DFP toast dough

Farinograph properties of prepared WF and WF-DFP toast dough:

The farinograph test was performed to estimate the saturation of the dough with water, arrival time, stability time, dough development time, degree of softening (B.U) of wheat flour ~~Estimation~~ estimation was~~is~~ done according to [20].

Extensographproperties of preparedWF and WF-DFP toastdough:

[20]Method was used to estimate the extensor test on wheat flour (82%extraction) for studyingflour extensibility, proportional number, elasticity and energy**.**

Sensory evaluation of toast dough

Panelists from the staff of Sakha food Technology Research Laboratory., Agric. Res. Center. Egypt. were asked for sensory evaluation of toast bread appearance, overall acceptability, crumb grain, crumb texture, odor, crust color and taste according to the method of [21]**.**

Statistical Analysis:

Statistical analysis was done using SPSS software (version 15) and Duncan's multiple range tests was used for mean comparison.

Results and Discussion

Chemical composition of WF 82%extraction and DFP (on dry weight basis).

The mean value of crude protein, crude ether extract, ash, fiber, total carbohydrates, available carbohydrates and caloric values (kcal/100g) are shown in Table 2. The results indicate that the crude protein, available carbohydrates and total carbohydrate contents in the DFP is less than wheat flour, whereas the doum content of crude fiber, crude ether extract and ash is higher than wheat flour. These results are consistent with [22] revealed that DFP contain 5.68% protein,6.80%fat, 5.1%ash, 24.30% crude fiber and available carbohydrates 46.20%, respectively.

Table 2: Chemical composition of WF 82% and DFP(on dry weigh basis)

Raw materials	WF	DFP

Crude protein	12.60±0.22	7.00±0.11
Ether extract	1.80±0.15	6.33±0.22
Ash	1.47±0.01	6.79±0.02
Total carbohydrates	84.13±0.55	79.88±0.24
Crude fiber	1.50±0.01	25.00±0.11
Available carbohydrates	82.63±0.75	54.88±0.95
Caloric value (kcal/100g)	397.12±3.22	304.49±2.55

WF: Wheat flour**; DFP:** Doum Fruit Powder

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Farinograph parameters of prepared WF and WF-DFPtoast breaddough

Rheological properties of dough formula made from different levels of DFP were determined by farinograph tests and the results were presented in Table (3), Fig. (1). Farinograph parameter revealed that water absorption of three doughs-DFP increased compared with control dough, where it was found that the absorption of water in the dough added to the DFP proportions (0,10,20 and 30%) increased water absorption (60,63,66 and 68.8%), respectively. Increased absorption of dough with water due to the high percentage of fibers in the DFP. As the fibers have the ability water holding capacity as reported by [23]**and**[24]**.**With regarded to the arrival time, dough development time and dough stability values were directly affected by the addition of DFP ratios. Dough with 30% DFP was the highest arrival time and development time values as ~~(~~4.00 and~~,~~ 5.00min~~),~~ respectively. Similar findings were mentioned by [23]and [24]. They mentioned that arrival time and water absorption increment as DFP level increased in dough. Dough stability values were found to be higher in toast dough prepared by 30% DFP than the control dough, while dough softening value increased for all doughs of fortified with DFP samples as comparing to the control.This may also be due tothe fibers that interacts with the gluten, which affects the dough mixing properties [25].

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Table 3: Farinographparameters for prepared (WF) and WF-DFP toast bread dough.

Samples	Water absorption (%)	Arrival time (min)	development Dough (min)	Stability (min)	Degree of softening (B.U)
Control	60.0	1.0	1.5	12	10
Doum 10%	63.0	1.0	1.5	10.0	60
Doum 20%	66.0	2.0	2.5	12.0	40
Doum30%	68.8	4.0	5.0	13.0	30

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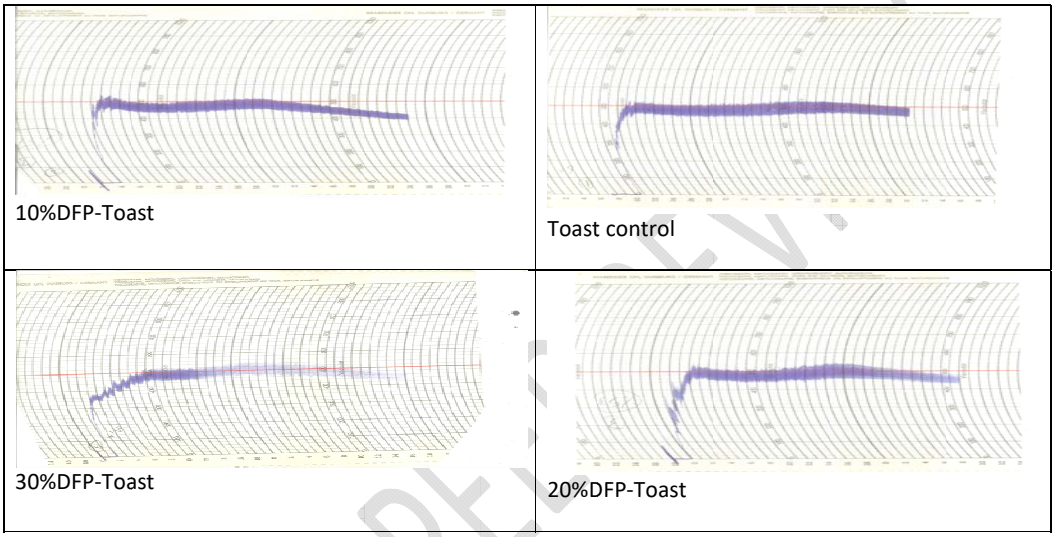

Fig. 1: Rheological properties of preparedWF and WF-DEP toastbread dough by farinograph

Extensograph parameters of prepared WF and WF-DFP toast breaddough

Data presented in Ttable (4) and fFigure (2) show that the effect of adding doum fruit powder DFP at three ratios on the rheological properties of dough as evaluated by a extensograph -elasticity (B.U) and Proportional increased as DFP ratios increased of dough toast processed DFP.Meanwhile, extensibility(mm) was 140 mm in control dough and decreased in all doughs of DFP (10, 20 and 30%). Regarding to extensograph, the 10% substitution of wheat flour by DFP induced an increase in energy to (38 cm^2) comparing with control dough (35cm^2). Energy was decreased by addition of DFP at levels of 20 and 30% of DFP were (15 and 20cm^2), respectively.

Table 4:Extensograph properties for preparedWF and WF-DFPtoast breaddough

Dough	Elasticity	Extensibility	Proportional	Energy

properties	(B.U)	(min)	number	(cm^2)
Control	230	140	1.64	35
Doum 10%	330	130	2.53	38
Doum 20%	320	90	3.55	15
Doum30%	380	75	5.06	20

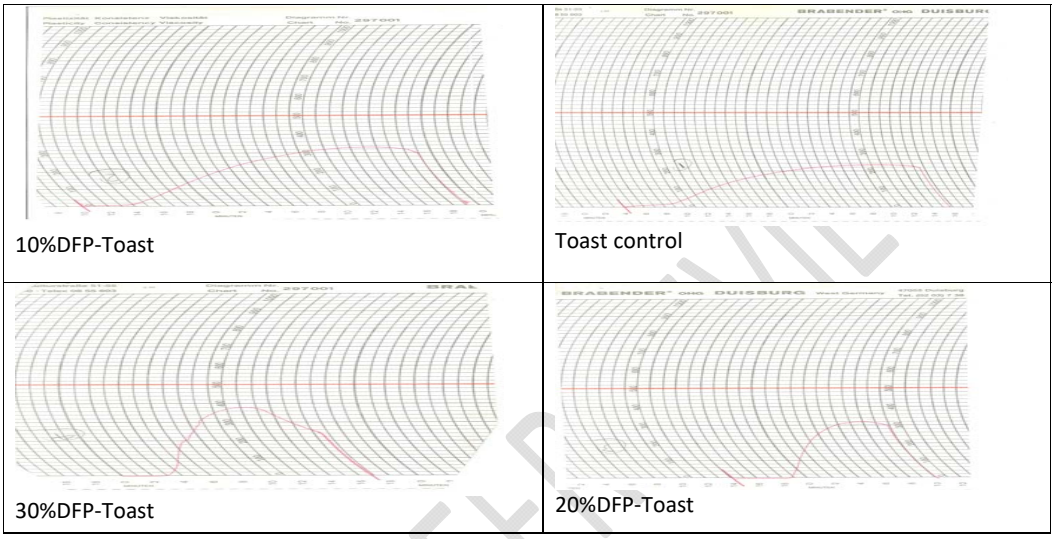

Fig. 2: Effect on rheological properties of prepared WF and WF-DFPtoast breaddough by extensogragh

Chemical composition of prepared WF and WF-DFP composite toast bread (on dry weight basis)

Table 5showed the mean value content of crude protein,crudeether extract, ash, crudefiber and total carbohydratesof the produced toast breadfortifiedwith 10%, 20% and 30% ofDFP. Crude fiber, total fat and ash increased significant intoast bread fortified with DFPcompared withcontrol. while there was a decrease crude protein, available carbohydrates caloric valueand total carbohydrates.This may be due to increased amount of crude fiber, total fat and ash in DFP compared with WF. This clearly indicates that DFP can be an alternative source of dietary fiber in toast bread processing.This study is consistent with hose obtained by [24]cleared that DFP cake decrement in protein and total carbohydrates. On the other hand, cake made from DFP cake increase in ash, crude fiber and ether extract.

Table 5: Chemical composition of prepared WF andWF-DFP composite toast bread

Samples	Crude protein	Ether extract	Ash	T C(full name)	Crude fiber	A C	Caloric value
Control	13.50^{a}±0.02	3.80^{d}±0.10	1.65^{d}±0.03	81.05^{d}±0.03	1.50^{d}±0.02	79.55^{a}±0.77	406.40^{a}±0.44
DFP 10%	13.04^{b}±0.01	4.25^{c}±0.03	2.03^{c}±0.06	80.68^{c}±0.06	3.85^{c}±0.02	76.83^{b}±0.23	397.73^{b}±0.35
DFP 20%	12.48^{c}±0.08	4.71^{b}±0.01	2.54^{b}±0.04	80.27^{b}±0.04	6.20^{b}±0.01	74.07^{c}±0.44	388.59^{c}±0.25
DFP 30%	11.92^{d}±0.03	5.16^{a}±0.06	3.07^{a}±0.07	79.85^{a}±0.01	8.55^{a}±0.05	71.30^{d}±0.55	379.32^{c}±0.35

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- Each value was an average of three determinations ± standard deviation.
- T.C = Total carbohydrates -Caloric value= Kilo Calories A C = Available carbohydrates

Mineral contentsin WF andWF-DFPtoast bread.

The data in Fig 3 and 4 show that content of major and minor mineral elements of control toast without DFP and WF- DFPtoast bread. It is clear from the study that toast bread enriched with the DFP has a highly content of potassium (K), sodium (Na), calcium (Ca), magnesium (Mg) and iron compare with control. The data show a decrease in elements phosphorus (P), zinc(Zn) and manganese (Mn) compared with control.It is clear from the results that the toast bread content of mineral elements depends content toast bread of DFP. The DFP are comparatively source of essential minerals. The DFP contains more essential mineral elements than a person's daily need. Thus, a balance may occur in the body's needs for mineral elements.[26]indispensable minerals elements are divided up to trace minerals (micro minerals) and major minerals (macro minerals). These minerals are similarlyindispensable, but trace minerals are desirable in minor amounts than major minerals. The amounts wantedto the human are not an indication of their importance. The biochemical functions of micro elements seem to be as constituents of prosthetic groups or as cofactors for enzymes. Deficiency syndromes for numerous of the indispensable trace elements were not recognized until recently because of their extremely small supplies and because of the ubiquitous nature of these elements in foods

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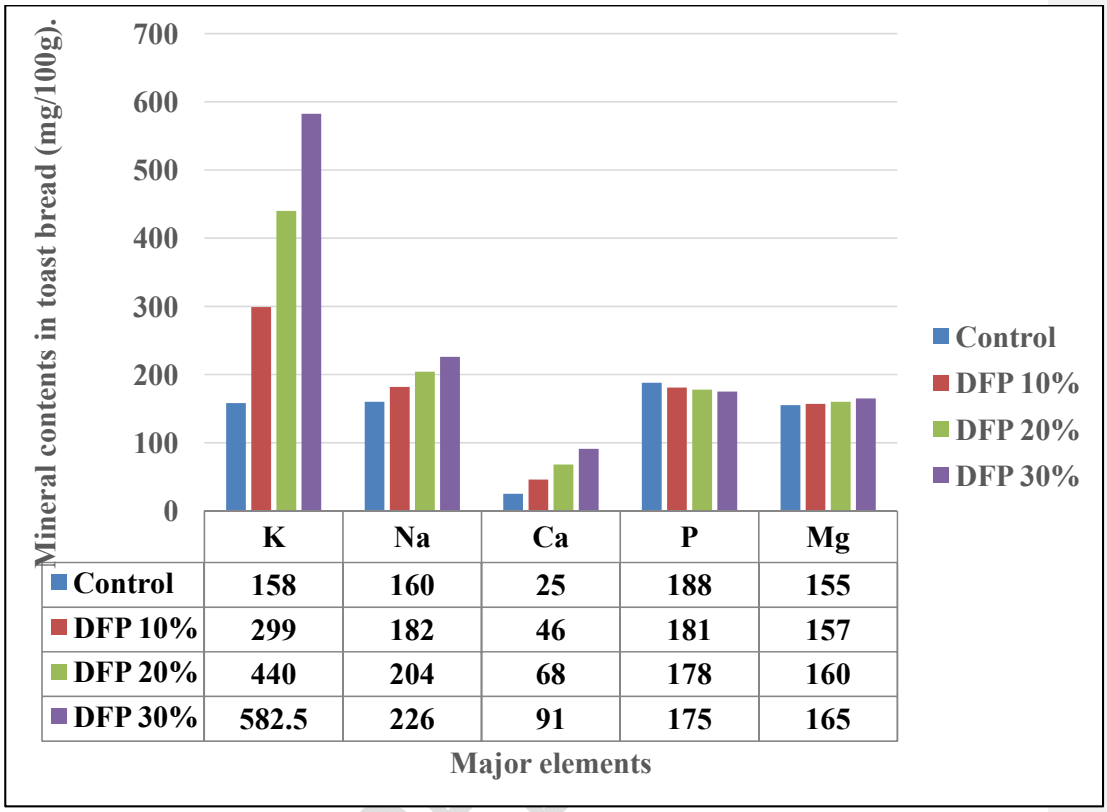
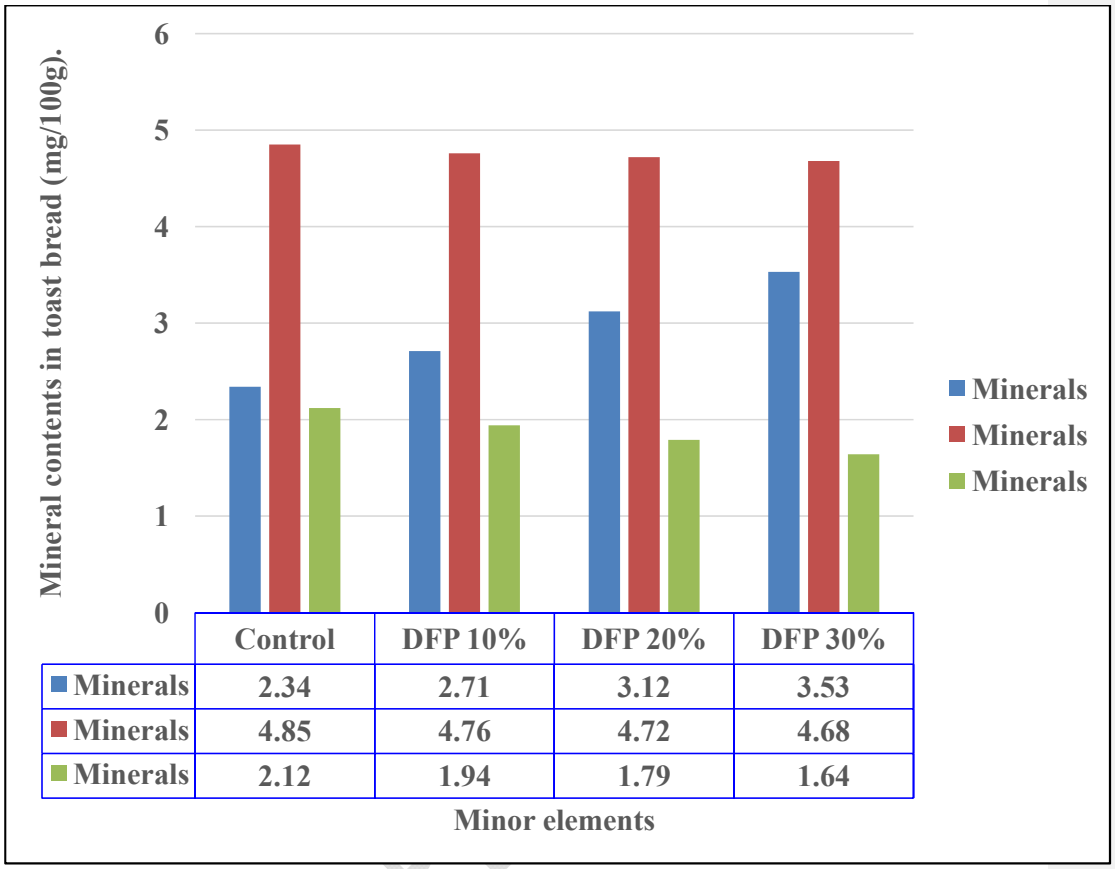


	K	Na	Ca	P	Mg
Control	158	160	25	188	155
DFP 10%	299	182	46	181	157
DFP 20%	440	204	68	178	160
DFP 30%	582.5	226	91	175	165

Fig. 3: The major mineral contents in WF andWF-DFP toast bread (mg/100g)

[27] stated that magnesium is essential for the activation of more than 300 enzymes in the body. Also, beneficial for the use of some minerals and vitamins and necessary for normal function and building of the heart, arteries, bone kidney, and for the neuromuscular system.



	Control	DFP 10%	DFP 20%	DFP 30%
Minerals	2.34	2.71	3.12	3.53
Minerals	4.85	4.76	4.72	4.68
Minerals	2.12	1.94	1.79	1.64

Fig. 4: The minor mineral contents in WF and WF-DFP toast bread (mg/100g)

The Na/k ratio of prepared WF and WF-DFPtoast bread

Fig 5record The Na/K ratio of prepare WFand WF-DFPtoast bread process different level of DFP. The Na/K ratioof WF-DFPhashighly in comparative with toast bread without of DFP. The Na/K ratio lessthan one with increasing the levels of substitution (10%, 20% and 20%) of DFPtoast bread. These results agree with**Aremu, (2006)**illustrated that Na/K ratio less than one have a great importance in the body for high blood pressure

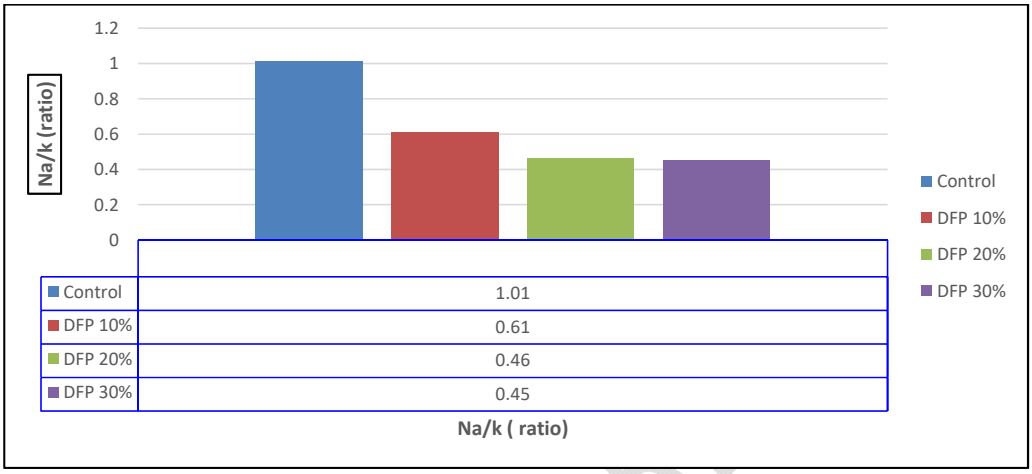


Fig. 5: The Na/K ratio contents in WF and WF-DFP toast bread (mg/100g)

Sensory Evaluation of WF and WF-DFPtoast bread

Table 6 and fig 6 illustrates that the sensory properties of toast bread processedWF (82%extraction) only as a control and the toast bread preparedWF-DFP. The results indicate that the taste,odor, crumb grain and crumb texture value were increases with the increase in the percentage of DFP in toast bread.Meanwhile, othervaluedecreases in crust color samples compared with control.Also, the appearance increased at the level of the addition of 10%DFP and then decreases at the level of 20%or30% DFP-toast bread compared to the control. Data showed an increasing the acceptability in control of toast bread thanblends 10, 20 or 30% of DFP substituted toast were decrease. These results are in agreement with **Hussein *et al.*, (2010)** and **Seleem (2015)**.

Table 6: Organoleptic properties of WF and WF-DFPtoast bread

Samples	Taste	Crust color	Odor	Crumb grain	Crumb texture	Appearance	Overall acceptability
Control	$8.00^{b}\pm0.40$	$8.50^{ab}\pm0.50$	$7.33^{b}\pm0.58$	$8.00^{d}\pm0.20$	$8.00^{d}\pm0.14$	$7.70^{a}\pm0.25$	$8.00^{a}\pm1.00$
10%DFP	$8.30^{b}\pm0.30$	$8.17^{ab}\pm0.29$	$7.7^{b}\pm0.57$	$8.50^{c}\pm0.38$	$8.33^{c}\pm0.33$	$8.33^{a}\pm0.58$	$7.33^{ab}\pm0.60$
20% DFP	$8.23^{b}\pm0.25$	$7.66^{ab}\pm0.58$	$8.7^{b}\pm0.23$	$8.80^{b}\pm0.28$	$8.90^{b}\pm0.33$	$7.33^{b}\pm0.57$	$7.00^{ab}\pm0.00$
30%DFP	$9.00^{a}\pm0.00$	$7.33^{b}\pm0.58$	$9.00^{a}\pm0.00$	$9.40^{a}\pm0.23$	$9.30^{a}\pm0.33$	$7.16^{b}\pm0.29$	$6.50^{b}\pm0.50$

-a, b, c…. Values followed by the same letter in columns are not significantly different at LSD at $(p \leq 0.05)$.
- Each value was an average of three determinations ± standard deviation.

Fig. 6: Control and doum fruit powder toast bread.

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