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Effect of Adding Grape Seed Powder on The Chemical Composition and Rheological Properties of Local Wheat Flour

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ABSTRACT

The study aimed to replace 3 and 4% of wheat flour with grape seed powder to improve the nutritional value of wheat flour and improve the rheological properties of wheat flour paste. The results of the chemical composition of wheat flour and grape seed powder showed that the moisture content in wheat was 11.5%, while its percentage in grape seed flour was 7.16%, ash 0.46% and 2.36%, protein 12.42% and 12.59%, fat 1.50 and 14.49%, fiber 1.43 and 42.98%, carbohydrates 72.69 and 20.42%, respectively. The Amylograph results showed that the gelatinization starting temperature of wheat flour dough replaced by grape seed flour for 3 and 4% reached 63.4 and 63.4 °C, respectively, with a significant difference from that of wheat flour dough. While the gel end temperature differed significantly for wheat flour dough that was replaced by 3and 4% of grape seed flour and reached 91 and 90.3°C, compared to wheat flour dough. The addition of grape seed powder showed a significant increase in the maximum viscosity to 1369 and 1433 °C compared with wheat flour dough. The addition of grape seed powder improved the farinograph qualities of wheat flour dough, for all 3 and 4% substitution ratios of grape seed powder, compared to wheat flour. Wheat flour replaced by 4% of grape seed powder, had a higher water absorption rate compared to wheat flour and reached 69.7%.

INTRODUCTION

Bread is a necessary material in human life because it contains essential nutrients, and provides the body with proteins, minerals and some vitamins. The elasticity and elasticity resistance due to the gliadin protein, and the cohesion and stiffness due to the presence of the protein glutenin, is what makes wheat flour important in bread making (Panina *et al.*, 2020) Wheat contains about 8-15% protein, proteins are composed of amino acids, and wheat is low in lysine, leucine and threonine (Padalino *et al.*, 2016).

Grape seed is used to improve the chemical and rheological properties of wheat flour and thus improve the quality of baked products and increase their acceptance by the consumer (Aghamirzaei *et al.*, 2018). Grape seeds are by-products that can be considered an excellent component of food products due to their chemical composition: oil, protein, fiber and sugars and are also a good source of some minerals such as calcium, phosphorous, potassium and iron (Bravi *et al.*, 2007).

The research aims to compare the chemical properties of wheat flour and grape seed powder and study the rheological properties of wheat flour paste, which was replaced with grape seed powder by 3 and 4%.

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MATERIALS AND METHODS

The Abu Ghraib soft wheat variety was obtained from the Agricultural Research Department / Nineveh for the agricultural season 2018-2019. The black grape seeds were obtained from the local markets of Nineveh Governorate. A humidification process was carried out for the wheat by adding amount of water required to deliver the percentage of moisture in the wheat to 14%, and ground with an extraction rate of 80%. The wheat and grape seed samples were ground using a Laboratory mill, then put them in sealed polyethylene bags at 4°C. Until the tests are done.

Chemical tests of wheat flour and grape seed flour:

Moisture Determination

The percentage of moisture in the samples was estimated using the method mentioned in AACC (2000), numbered A 15-44 at 130°C for an hour.

Protein Determination

The percentage of protein was estimated by the Micro-Kjeldahl method mentioned in AACC (2000), number 30-46, and the percentage of total nitrogen was multiplied by the factor of 5.7 to find the percentage of protein.

Fat Determination

The percentage of fat in the samples was estimated according to the method mentioned in AACC (2000) by using a soxhlet (intermittent method) and solvent hexane (boiling point 40-60) °C.

Ash Determination

The percentage of ash was estimated using the basic method ash mentioned in AACC (2000) number 1-8, at a temperature of 550°C for a period of 24 hours, using a muffle furnace.

Fiber Determination

The percentage of crude fibers in the samples was estimated based on what was mentioned in AACC (2000). Using acid and alkaline digestion and then incineration of the digestion product.

Carbohydrates Determination

It was determined according to the method of Nwosu *et al*. (2014) and in the following equation:

% carbohydrates = 100 _ (% moisture + % protein + % ash + % fat + % fiber)

Determination of metalic elements

Minerals were estimated for samples of wheat flour and grape seeds, using atomic absorption device, according to the method proposed by Adrian and Stevens (1977).

Amino acids determination

The amino acids present in wheat flour, and grape seed samples were diagnosed according to Jajic *et al*. (2013), at the Ministry of Science and Technology / Materials Research Department / Baghdad / Iraq by means of a Japanese-origin high-performance liquid chromatography (HPLC), device supplied by Shimadzu Corporation. Corporation 20A and using the mobile phase (A): -(methanol: tetrahydrofuran: 0.02 M of sodium acetate at PH 5.9) and the ratio of the previous substances was 77.5: 2.5: 20) %, respectively, the mobile phase (B): The same chemicals used in phase A except for the different proportions where (80: 2.5:17.5) The column used had dimensions of 250 x 4.6 mm Id and the separation material in the column (stationary phase) was (ODS1) Octadecyl Silane, which is chemically related to Silica Gel and has a diameter of 5 particles µm at room temperature, flow rate is 1 ml/min and the injection volume is 10 ml.

The sample to be examined was prepared by taking 5 grams of each sample, adding (100) milliliters of 60% acetonitrile + 40% methanol, the sample was shaken by vibrator, and the sample was placed for (15) minutes at a temperature of 50ºc in the ultrasonic device (Ultrasonic), then the sample was filtered by filter paper, after that the stencil was taken and passed over SEP to get rid of unwanted water and the required substance was reserved inside the SEP, the substance was removed from SEP by passing 5 ml of methanol, then 5 ml of acetonitrile, the above mixture was taken and placed in The flask of the rotary evaporator was left in the rotary evaporator until dry, then the remainder was collected in the flask by 1 ml of [50% acetonitrile: methanol] and finally injected into the HPLC device after treating it with the derivative simultaneously and then the results were obtained.

Rheological Test

Amylograph test

Test was performed according to the method mentioned in AACC (2000), number 12-22 using the brabender amylograph- E.

Farinograph test

The farinograph test was conducted as mentioned in AACC (2000), number 54-21, using brabender farinograph-AT

A- Flour water absorption: Water absorption is the amount of water, ml at a temperature of 30°C that the flour needs in order to reach the consistency of the mature dough, which is at the 500B.U.

B- The time to reach the consistency: Arrival time is the time (minutes) from adding water to the flour until the dough reaches the B.U.500 line.

C- Dough ripening time: Development time is the time (minutes) from adding water to the highest peak on the graph.

D- Stability: Stability is the time (minutes) from the curve's arrival at the resistance line 500B.U until its descent from this line.

E - Critical Kneading Factor: Mixing Tolerance Index is the difference in B.U. from the highest point in the curve to 10-20 minutes after the maturity zone.

F- Decline time: Decline time is the time (minutes) from adding water until the curve departs from the B.U.500 line, and it is equal to the arrival time + stability time.

STATISTICAL ANALYSIS

The data were statistically analyzed according to a fully randomized design (CRD) complete random design system and using as per Duncan Multiple Range 1900 test. (SAS) Statistical Analysis System Software for Statistical Analysis (2001), where the significant different coefficients were marked with different alphabetic characters, and at the level of probability ($P \leq 0.05$).

RESULTS AND DISCUSSION

The results in Table (1) for estimating the percentage of moisture in Abu Ghraib wheat flour showed that it was amounted to 11.5%, and this percentage was differed from what was found by Fadl *et al.* (2010), which amounted to 15.5%. The results in same table show that the percentage of grape seed flour is 7.16%, and this percentage was in agreement with what was found by Mironeasa *et al.* (2016), which amounted to 7.16, and slightly differs from what was mentioned by Aghamirzaei *et al*. (2018), which was 7.48%. The results of Table (1) showed that the percentage of ash in the studied wheat flour was 0.74%. The percentage of ash in grape seed powder was 2.36%, and this percentage is consistent with what was stated in Aghamirzaei *et al*. (2018), which amounted to 2.45%. The results in Table (1) showed that the protein amount of the studied wheat flour amounted to 12.42%, and this does not agree with what was stated by Fadl *et al.* (2010), who stated that the protein amount of wheat flour was 11%, where the results of the statistical analysis showed a significant difference at the level of ($P \leq 0.05$) between the percentage of protein in wheat flour and grape seed, which was 12.59%. The percentage of protein in grape seed flour was differed from what mentioned by Aghamirzaei *et al*. (2018), which amounted to 10.94%.

Table (1) chemical composition of wheat and grape seed flour

Samples	Moisture (%)	Ash (%)	Protein (%)	Fat (%)	Fiber (%)	Carbohydrates (%)
Wheat flour	a11.5	b0.74	b 12.42	b 1.50	b1.43	a72.69
Grape seed	b7.16	a2.36	a 12.59	a 14.49	a42.98	b20.43

The horizontally similar letters do not differ significantly at the probability ($P \leq 0.05$)

Table (1) show that the percentage of fat was 1.50% for the studied wheat flour, this result was almost consistent with what was mentioned by Fadl *et al.* (2010), that the percentage of fat in Abu Ghraib wheat flour was 1.54%. Salih (2013) found that the percentage of fat in wheat flour was 1.46%. Table (1) shows a significant difference ($P \leq 0.05$), that grape seed flour contains a percentage of fat reached to 14.49%, and this does not agree with what was stated by Ramez (2015) who said that the percentage of fat in red grape seed and white grape seed was 13.97% and 15.97% respectively. The results of Table (1) show that the percentage of fiber in the studied wheat flour amounted to 1.43%, and this result were similar to what was stated by saleh *et al*. (2013), which amounted to 1.47%, but Ramez (2015) indicate that the percentage of fiber in wheat flour was 2.98% for the Syrian variety Hourani. The same table showed a significant difference (P≤0.05), where the percentage of fiber in grape seeds was superior to wheat flour, which amounted to 42.98%. These results were close to what was found by Aghamirzaei *et al.* (2018), who indicate that the percentage of fiber in grape seeds amounted to 42.74%. Table (1) show that the carbohydrate content of wheat flour amounted to 72.69%, and this is consistent with what was mentioned by Anderson (2011), who indicated that the amount of carbohydrates in wheat may reach 75%. Fadl *et al*. (2010) found the percentage of carbohydrates in wheat flour amounted to 71.48%. The results in Table (1) showed a significant difference (P≤0.05), where the highest percentage of carbohydrates in grape seed meal was superior to wheat flour, which amounted to 20.42%, as for carbohydrates in grape seed flour, the results were different from what was observed by Aghamirzaei *et al.* (2018) which amounted to 19.28%.

Mineral Elements

Table (2) shows that the content of mineral elements for each of wheat flour and grape seed flour, where it was noted that the highest percentage of mineral elements in wheat flour for phosphorous, calcium and magnesium, which amounted to 324.5, 127.4 and 123.8 mg / 100 g, respectively, while The proportion of mineral iron in wheat flour was 2.5 mg / 100 g.

While it was found in grape seed flour that the highest percentage of mineral elements were calcium and potassium 440 and 500 mg/100 g respectively, and the lowest percentage of iron, magnesium and phosphorous (18.07, 130 and 183) mg/100 g.

Table (2) The mineral content of wheat and grape seed flours

Sample	iron	calcium	magnesium	Phosphorous	potassium
Wheat flour (mg/100g)	b2.5	b127.4	b123.8	a324.5	b100
Grape seed(mg/100g)	a18.07	a440	a130	b183	a500

The horizontally similar letters do not differ significantly at the probability (P≤0.05)

The percentage of phosphorous in wheat flour was superior to grape seed flour, which amounted to 324.5 and 183 mg/100 g, respectively, and the percentage of iron in grape seed flour was superior to wheat flour, which amounted to 18.08 mg/100 g. These results are consistent with what was mentioned by Sousa *et al.* (2014), who found when he estimating the mineral elements of grape seed flour that the amount of calcium, magnesium, sodium, potassium, iron, manganese, phosphorous, zinc and sulfur was 440, 130, 44, 1.40, 18.08, 180, 183, 89 and 980 mg/100 g, respectively.

These results agreed with Tangolar *et al.* (2009), who noted that the percentage of minerals in grape seeds for iron, calcium, potassium, magnesium and phosphorous was 17.30, 480, 500, 130 and 290 mg/100 g, respectively. And it does not agree with what was mentioned by Lachman *et al.* (2013), who found the percentage of calcium, iron, phosphorous, manganese, magnesium, sodium and zinc was 270, 4.54, 200, 1.45, 100, 42 and 1.1 mg / 100 g.

Amino Acids

Table (3) shows that the proportion of non-essential amino acids in wheat flour (hydroxyproline, arginine, asparagine, serine, proline, glycine, alanine and tyrosine) amounted to 4.18, 0.013,6.6, 6.88, 4.62, 3.11, 3.95 and 2.96 g / 100 g respectively, it was significantly superior (P≤0.05) higher than the essential amino acids in wheat flour (histidine, isoleucine, leucine, lysine, methionine, phenylalanine, threonine, valine and tryptophan) (2.65, 2.92, 3.47, 1.80, 2. 51, 5.28, 1.27, 5.70 and 1.69) g/100g, respectively, and this is consistent with the results of Abdel-Ghani,(2020), where the total non-essential amino acids were higher than the essential amino acids, which amounted to 32.7 and 28,076 g/100 g, respectively.

The results presented in Table No. (3) indicated that wheat grain contains a low percentage of essential amino acids, namely lysine, threonine and tryptophan, which were 1.80, 1.27 and 1.69 g/100g, respectively, and their high content in grape seed powder was 1.95. , 1.77and 4.65 g/100g, respectively

Table (3) the amino acid content of wheat and grape seed flours (gm/100g protein)

amino acids	**wheat flour(gm/100gm)**	**grape seeds (gm/100gm)**
Histidine	2.65	1.78
Isoleucine	2.92	2.90
Leucine	3.47	4.71
Lysine	1.80	1.95
Methionine	2.51	1.19
Phenylalanine	5.28	3.85
Threonine	1.27	1.77
Valine	5.70	3.64
Tryptophan	1.69	4.65
Total EAA	27.29	26.44
Arginine	4.18	7.26
Asparagine	6.6	7.18
Serine	6.88	3.34
Proline	4.62	2.83
Claicin	3.11	7.95
Alanin	3.95	3.20
Tyrosine	2.96	2.65
Hydroxyproline	0.013	0.36
Total NEAA	32.34	34.77

Table (3) shows that the total percentage of non-essential amino acids is higher than the percentage of essential acids in grape seeds, which amounted to 34.77 and 26.44 g/100 g, respectively, and the percentage of tryptophan, glycine and arginine in grape seed flour was 4.65, 7.95 and 7. 26 g/100g respectively, and the lowest percentage of amino acids in grape seed flour, which were hydroxyproline, histidine, serine and proline, amounted to 0.36, 1.78, 3.34 and 2.83 gm/100g, respectively, and this is consistent with what was mentioned by Baca-Bocanegra *et al.* (2021), who found that the ratio of glycine, asparagine and arginine was 7.96, 7.18 and 7.29 g/100 g, respectively.

Rheological Properties

Amylograph

The results of the amylograph test for wheat flour and the substituted grape seed flour are shown in Table (4) where the start of the gelling temperature of wheat flour is 62.9 °C.
The results of this test showed significant differences for wheat flour samples replaced with grape seeds by 3 and 4%, which reached to 63.4 and 63.4 °C, respectively.

Table (4) Amylograph test of wheat flour and wheat flour replaced with grape seeds

Sample		Gelation start temperature (°C)	end temperature of gelation (°C)	Maximum viscosity at the end of gelation (A.U)
Wheat flour		62.9b	88.9b	1277a
Grape seed	3%	63.4a	91a	1369c
	4%	63.4a	90.3a	1433b

The horizontally similar letters do not differ significantly at the probability (P≤0.05)

The results in Table (4) and Figure (1) showed that there were significant differences in the average values of maximum viscosity of the end of gelation temperature between wheat flour and it's substituted with grape seed powder. The maximum viscosity value of wheat flour was 1277 AU, it showed a significant increase in the maximum viscosity values of wheat flour samples replaced by 3 and 4% of grape seed powder, which amounted to 1369 and 1433 AU. This is consistent with

what was found by Tolve *et al*. (2021), who found that the addition of grape seed powder to wheat flour at the substitution ratios of 5 and 10% led to an increase in the maximum viscosity temperature compared to the wheat flour sample. This increase in viscosity is due to the formation of complex polymers resulting from the interactions between fibrils, amylose and amylopectin.
This significant increase in the maximum viscosity values of wheat flour samples replaced with grape seeds may be due to the high amount of fiber in grape seeds, which caused an increase in gelling of the sample.

Farinograph

The rheological properties of the dough's of wheat flour substituted with 3 and 4% of grape seed flour and their effect on most of the measurements were studied for the farinograph test. The rheological properties of the dough are important because they affect both the mechanical ability of the dough and the quality of the final product, as noted in Table (5) and the figures are as follows:

Water Absorption Ratio

It is noted from Table (5) and Figure (2) that there are significant differences ($P \leq 0.05$) in the absorption ratio of samples of flour to which grape seeds have been added. It was noted from the table that wheat flour added to it flour of grape seeds was superior. When replacing wheat flour with 4% grape seed powder, the water absorption rate increased to 69.7% compared to 61% for wheat flour sample, while the flour added to the at the replacement rate of 3% grape seeds flour showed the lowest water absorption rate of 60.3 compared to the standard sample, and this is in agreement with what was mentioned by Tolve *et al*. (2021), when he study the effect of adding grape seed flour on the rheological properties of the dough , and he found that the amount of water absorbed by the dough increased with the increase in the replacement ratios of 0, 5 and 10% of grape seeds, which amounted to 55.50%, 56.80% and 60.03%, respectively. This increase is related to a higher content of dietary fibers in the dough after adding grape seed flour, as noted by Mironeasa *et al*. (2013). That the dietary fiber is characterized by a high number of hydroxyl groups that allow greater interactions with water molecules through hydrogen bonds,

Arrival Time

Table (5) shows that there are significant differences ($P \leq 0.05$) between wheat flour and the replacement with grape seed powder proportions of 3, and 4%, the least time to reach the 500 B.U line for wheat flour dough was 1.20 minutes, pointed out by Madkour *et al.* (2018). There is a relationship, the higher the water absorption, the greater the arrival time.

It is noted from the same table that the arrival time decreased at the replacement ratios of 3 and 4% of grape seed flour compared to wheat flour to 1.12 and 1.14 minutes, respectively, and this is consistent with what was mentioned by Aghamirzaei *et al.* (2018) when they studying the effect of adding grape seed flour with replacement percentages of 5, 10, 15, 20 and 25%, where the arrival time of the dough is reduced, and the arrival time is an indicator of the ability to moisturize the flour particles and the presence of hydrophobic components in the grape seed flour such as fatty substances can be responsible for the arrival time.

Table (5) Characteristics measured by the farinograph device for wheat flour and wheat flour substituted with different percentages of grape seeds

Samples		water absorption %	Arrival time minute	ripening time Dough Development Time minute	dough stability minute	departure time minute	degree of deterioration F.U	Farinograph number
Wheat flour		b61	a1.20	a3.8	c3.7	c4.9	c138	b47
Seed grape	3%	c60.3	c1.12	a3.8	b3.8	b4.92	b140	a50
	4%	a69.7	b1.14	b3.9	a3.9	a5.04	a141	a50

The horizontally similar letters do not differ significantly at the probability ($P \leq 0.05$)

One of the factors affecting the arrival time is the amount of gluten formed in the dough. Its speed leads to a shortening of the time for the required dough to reach the desired consistency, and the lengthening of the reaching period of time indicates the weakness of the dough or its dissolution due to the weakness of the gluten network formed (Al-Helitan, 2010).

Dough Development Time

It is noted from Table (5) and Figure (2) that the maturation time of the wheat flour dough study is 3.8 minutes.Table (5) shows no significant differences (P≤0.05) between the ripening time of wheat flour and wheat flour substituted by 3% of grape seed flour, as the ripening time was fixed at 3.8 minutes, but the ripening time increased when the replacement rates were 4% of Grape seed flour, which was 3.9 minutes, and this is consistent with what was mentioned by Mironeasa *et al.* (2013). It was found that when replacing wheat flour with grape seed powder by 10%, the dough ripening time increased compared to the standard sample, which indicates the strength of the dough and the formation of the gluten network.

Dough Stability Time

The results of Table (5) and Figure (2) show that there are significant differences (P≤0.05) between the dough stability time for wheat flour and samples of wheat flour substituted with different percentages of grape seed flour, as well as significant differences (P≤0.05) between the replacement percentages of grape seed flour as the dough stability period for wheat flour reached 3.7 minutes, the dough stability period increased significantly for grape seed flour replacement rates of 3 and 4% reached 3.8 and 3.9 minutes, respectively, and this is consistent with what was stated by Aghammirzaei *et al*. (2018), when studying the effect of adding grape seed flour on the properties of wheat flour with the replacement ratios of 5, 10, 15, 20 and 25%, they found that highest stability was at the replacement level of 10%, and the higher the replacement rates, the less the stability of the dough, and it is due to the presence of fatty compounds in Grape seed flour, which interferes with the polymeric part of gluten, leads to the softening of the dough and improving the rheological properties of the dough. This may be down sampling is caused by the formation of a gluten network and dough stabilization in the rheological performances of the dough**.**

Departure Time

The results of Table (5) show that there is a significant difference at the (P≤0.05) between the times of leaving the dough with wheat flour and between samples of wheat flour substituted with grape seeds and with all replacement percentages. It is noted that the highest increase in the departure time for wheat flour replaced with grape seed flour at rates of 3 and 4% compared to wheat flour, it reached 4.9, 4.92 and 5.04 minutes, respectively.

Degree of Softening

Table (5) showed that the values of the degree of degradation of wheat flour dough which were 138 F.U Compared to grape seed powder paste at 3 and 4% replacement ratios, the degree of deterioration increased and reached 140 and 141 respectively.

Grape seed flour increases the degree of degradation, indicating weakening. This is due to the fact that the addition of grape seed flour reduces the strength of glutenin in wheat flour and thus weakens the cross-links between proteins leads to a weakening of the interactions between the chains that affect the formation and expansion of the gluten network (Sudha *et al.*, 2007), the ideal limits for the degree of degradation that make flour acceptable is 80.

Farinograph Number

Table (5) and Figure (2) show the indices of farinograph values for wheat flour dough amounted to 47. Significantly higher (P≤0.05) farinograph values for wheat flour dough substituted with 3 and 4% of grape seeds amounted to 50 and 50, respectively.

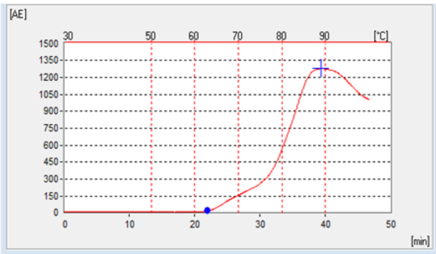
CONCLUSIONS

Adding grape seeds to flour by 3% and 4%, led to a change in the physical and chemical properties of wheat flour by increasing protein, ash and moisture and improving the chemical properties of bread with a high nutritional value and improved the rheological properties and gave a significant increase in water absorption, dough stability, deterioration degree, farinograph number, gelatinization start temperature, gelation temperature, and maximum viscosity.

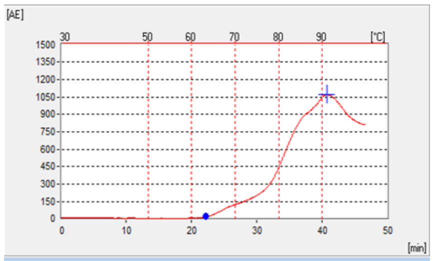
RECOMMENDATIONS

-Study the effect of adding grape seed powder - as a cheap by-product from the economic side, preparing bread mixtures with at two levels of addition 5% and 10 % .

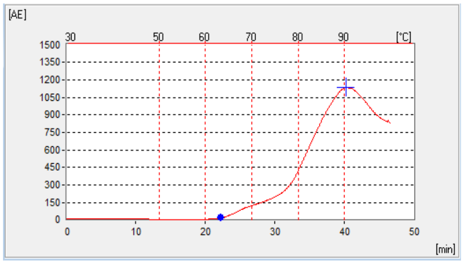
-Study the effect of adding flax seed extract, lupine and other vegetable seeds in specific proportions to flour. Its effect on the properties of dough and on the qualitative characteristics of bakery products manufactured from it and the extent of this quantitative effect on the nutritional value of these products.



Wheat flour 100%

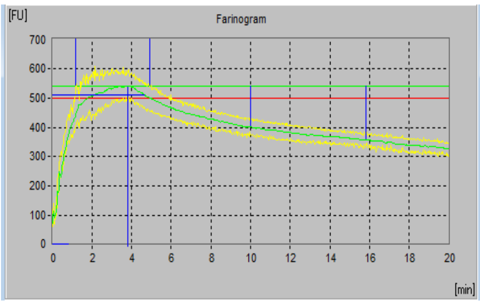


Wheat flour 97%+seed grape3%

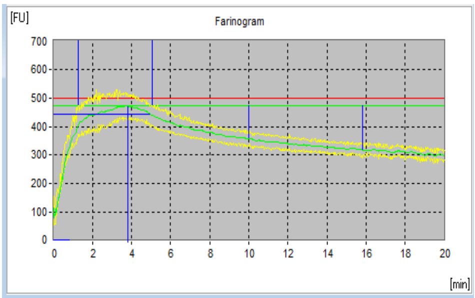


Wheat flour 96%+grape seed 4%

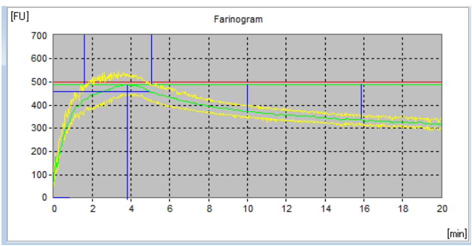
Figures (1) Amylograph charts for wheat flour and replacement ratios for grape seed flour



Wheat flour 100%



Wheat flour 97%+3%flour seed grape



Wheat flour 96%+4% flour seed grape

Figures (2): Farinograph charts for wheat flour and replacement ratios for grape seed flour

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تأثير إضافة مسحوق بذور العنب على التركيب الكيميائي والخصائص الريولوجية لطحين الحنطة المحلية

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الخلاصة

الكلمات المفتاحية:
طحين الحنطة، طحين بذور العنب، الصفاتالريولوجية ,أميلوكراف ,فارينوكراف ,عجينة,

هدفت الدراسة إلى استبدال 3 و 4٪ من طحين الحنطة المحلية بمسحوق بذور العنب لتحسين القيمة الغذائية لطحين الحنطة وتحسين الخواص الريولوجية لعجين دقيق طحين الحنطة. أظهرت نتائج التركيب الكيميائي لطحين الحنطة ومسحوق بذور العنب أن المحتوى الرطوبي في الحنطة بلغ 11.5٪، بينما كانت نسبته في مسحوق بذور العنب 7.16٪ والرماد 0.46٪ و 2.36٪ ، والبروتين 12.42٪ و 12.5٪ ، والدهن 1.50 و14.49٪ ، وألالياف 1.43و 42.98 ٪ ،والكربوهيدرات 72.69و 20.42٪ على التوالي, أظهرت نتائج الاميلوكراف أن درجة حرارة بداية التهلم لعجينة طحين الحنطة التي تم استبدالها بدقيق بذور العنب بنسبة 3 و 4٪ وصلت إلى 63.4 و 63.4م° على التوالي ، مع وجود فروقات معنوية عن درجة حرارة التهلم لعجينة طحين الحنطة. كما اختلفت درجة الحرارة نهاية التهلم معنويا لعجين طحين الحنطة الذي تم استبداله بنسبة 3 و 4٪ بمسحوق بذور العنب وبلغت 91 و 90.3 م° ، مقارنة مع عجين طحين الحنطة. أظهرت إضافة مسحوق بذور العنب زيادة معنوية في اللزوجة القصوى اذ وصلت الى 1369 و 1433 م° مقارنة بعجين طحين الحنطة.أدت إضافة مسحوق بذور العنب إلى تحسين الصفات الفارينوكراف، لجميع نسب الاستبدال 3 و 4 ٪ من مسحوق بذور العنب ، مقارنة مع طحين الحنطة واعطى استبدال نسبة 4٪ من مسحوق بذور العنب معدل امتصاص للماء أعلى من طحين الحنطة بلغ 69.7٪.