QUALITY PARAMETERS IN BLACK HONEY SAMPLES PROCESSED IN DIFFERENT REGIONS IN EGYPT

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Abstract

An experiment was performed to study quality parameters of Egyptian treacle concentrated sugar cane juice with out the removal of any sucrose of its valuable nutritional properties. Treacle is a popular food and as such is a very important part of the diet in Egypt and it is traditionally called black honey.

Samples were collected from main production regions (Farshout- Mallawi- Der Mawass and Bahgora), Cairo Market (10 samples). An Experimental Sample was prepared the Food Technology Center – Ministry of Foreign Trade and Industry.

The study included the determination of the chemical and physical quality parameters such as sucrose, reducing sugars, total sugars, ash, moisture, refractive index, titratable acidity, volatile acidity, pH, T.S.S., purity and color intensity index. Minerals in terms of (Ca, P, Mg, Zn, Pb, Cu and Fe) and microbiology analysis including bacteria and fungi were also considered.

The results showed that, the level of sucrose and reducing sugars were higher in the Cairo market samples (F, B) 47.79% and 22.7% than the experimental sample, while the total sugars and ash were higher in the experimental sample 68.5% and 1.6% than the all investigated samples.

The data showed that the moisture and titratable acidity in the experimental sample showed lowest value than the other samples (18.6% and 0.22%). On contrary, values of refractive index and volatile acidity in the Cairo market (J) were 1.3527 and 0.11% respectively.

The other analysis proved that the pH in the experimental sample indicated a lower level (4.34) but the color index proved to be of higher level (38116 unit) than the other investigated samples. On the other hand, the T.S.S. and purity recorded higher values in the Cairo market (F) 82.4% and 57.99% than the experimental sample.

Mineral analysis showed that the sample of Der Mawass was higher in Ca (336.2mg/100g), P (86.95mg/100g), Mg (98.55mg/100g) and Zn (0.579mg/100g), while Pb and Cu proved to be of lowest levels in the experimental sample than the other investigated samples (20ppm and 2.48ppm).

The results obtained clearly proved that the samples obtained from Bahgora, Cairo market (A, C, E, F, G, H, I, J) were completely free of bacteria contamination Fungi.

INTRODUCTION

Sugar is in fact a generic name referring to a host of carbohydrates, but it has become common to refer particularly for sucrose. Sucrose is produced in vast quantities throughout the world and it is the basic ingredient for classical sugar confectionery. Indeed, the whole confectionery industry has been built around the physicochemical properties of sucrose and their modification by other traditional sweeteners, Jackson (1995). He further added that confectionery is often given as a gift because of the pleasure it bestows and because of its ready portability makes

Beet molasses is rarely used in confectionery, due to its unpleasant flavor. The flavor of cane molasses is very strong and is often mellowed by adding higher-grade refinery syrups. When this is done, the products are usually called "treacle", Jackson (1995).

Properties of commercial sugars are suryeved from a confectioner's viewpoint since types of sugars affecting greately the properties of the produced confectionaries, James and Jackson (1995).

In Egypt, sugar cane syrup locally known as Assal Isswid (Black Honey) is produced by concentration of the juice extracted from sugar cane stalks without removal of any sucrose (not less than 70.00 Brix). The sugar cane cultivated area in 1994 was about 268.549 feddan in El-Minia, Sohag, Kena and Aswan governorates. The area for the production of cane syrup in 1994 were about 12.955 feddan (about 4.8% of the total), Abbas (2002).

Black honey is one of the important food items for the majority of the population in Egypt. It is usually produced in small mills, mainly in the private sector, located near the sugarcane cultivation areas. The production process is carried out as a traditional food industry controlled mainly by experience and practice of the treacle makers. Color, taste and density define the quality of the product. There are no specific tests or quality parameters used to identify and standardize the quality specifications of treacle, except its gross chemical composition, Amin *et al.*, (1999).

Treacle is a sweet, heavy viscous solution and its color varied from dark brown to light brown. It is considered as one of the main diet or at least possessed an important part of the diet on the table of the growers in the villages, particularly in Upper Egypt due to its high nutritional value and cheap price. Small producers in Farshout, Naga Hammadi, Dair-Mawas, Mallawi and Seriakoos produce the major proportion of treacle. In Upper Egypt there are about 347 mills which produce about 61.198 tons of cane syrup. In El-Minia governorate alone there are about 104 mills which produce about 52.000tons of cane syrup representing 84.97% of the total cane syrup production, Abbas (2002).

The amount of produced treacle ton/feddan, costs and profits varied according to many factors i.e. cane price, the treacle extraction ratio, processing costs and the demand on treacle in the markets. The definition of the best processing practices of treacle is very important to avoid the adverse effects on sugar industry and in the mean time to obtain a high quantity and quality of treacle, Abbas (2002).

The present study was carried out to identify the different important quality parameters of black honey processed at different regions. In such case, chemical, physical, minerals and microbiological analysis were considered. Comparison of the obtained results with experimental sample and the EOS (1993) was of great interest.

MATERIALS AND METHODS

Materials:

Experimental Sample was prepared in the Food Technology Center. Inst. A.R.C. The obtained sample was packed into glass refill bottle and stored at room temperature (25°C to 20 °C).

The Investigated samples of treacle (Black Honey) were divided into three groups:

*Four samples were purchased from different private processors in Farshout, Mallawi, Der Mawass and Bahgora regions from December (2003) at the time of production. The given samples were packed into plastic refill bottle and stored at room temperature (25°C to 20 °C).

*Ten samples were colleted from Cairo market (different super markets) from November to December (2003). The samples packed into glass refill bottle and stored at room temperature (25°C to 20 °C).

Methods:

** **Physicochemical Analysis.** pH, Ash, Moisture, Volatile Acidity and Titratable Acidity expressed as acetic acid and Refractive Index according to the method of the, AOAC (1995). Sucrose was calculated using the equation of, EOS (1993) [Sucrose%= (total sugars% - reducing sugars %) calculated to invert sugars × 0.95]. Reducing sugars and total sugars were determined by Lan-Eynon volumetric method as described by, EOS (1993).

Total Soluble Solids % was determined according to the method of the, AOAC (1995). Purity was given as the percentage of sucrose in the total soluble solids of the studied samples. Color index was evaluated by measuring the extinction of the samples using Spectrophotometer, and then the results were expressed in ICUMSA-unit (International commission for uniform methods of sugar analysis) according to, Reinefeld and Schneider (1983).

** **Minerals Analysis.** Microelement mg/100g (Ca, P, Mg and Zn) and trace element PPm (Pb, Cu and Fe) were determined using the Atomic Absorption available at the Central Laboratory, Fac. of Agric Ain Shams University. The method was given in details in the, AOAC (1995) method.

** **Microbial Analysis.** Bacteria, Fungi and Salmonella were determined according to the method of the, AOAC (1995) in the Central Laboratory, Fac. of Agric Ain Shams University.

** **Statistical analysis.** Regression and analysis of variance were used to compare mean values of the tested factors and the level of significance is accepted as being ($p \leq 0.05$). Test of regression analysis was also applied according to, Snedecor and Cochran (1971).

RESULTS AND DISCUSSION

Physicochemical Analysis. The major chemical constituents of the investigated black honey samples are given in Table (1). The level of sucrose within the tested black honey samples showed a general trend to be higher in the Cairo market (F) than the experimental sample. Values obtained were 47.79% and 45.41% and during treacle making a part of sucrose inverted by heating to mono-saccharide (glucose and fructose). The used sugar cane variety is essentially selected to contain assured high sucrose and low invert sugar. However, it should be assured that the portion of invert sugars is enough to prevent recrystallization of sucrose in black honey during handling and storage periods, Ferweez (1997).

The lowest value of reducing sugars was found at the Cairo market (E) 10.08% while the highest value was obtained at the Cairo market (B) 22.7%. Jackson (1995) showed that the reducing sugar % must represent about 30-35% of the total sugar in all products which contain high sugar content such as treacle, jams and syrups to prevent the undesirable recrystallization of sucrose and consequently the spoilage of these products.

The data also showed that total sugars were higher in the experimental sample 68.5% than all investigated samples and such trend is due to the different production process that was carried out as traditional food industry which was controlled mainly by experience and practice of the black honey makers. Buraczynska and Ceglarek (2003) proved that the organic fertilizer application of sugarbeet in most cases increased the content of sugar, soluble ash and treacle-producing element.

The experimental sample is characterized by a low value of pH (4.34). Abbas (2002) stated that the pH value of sugar cane increased with the maturity of plant

then decreased due to the degradation of sugars at the end of the season or as a result of unsuitable storage conditions of cane stalk or juice before processing.

Experiments proved that there is no difference between the ash content of the experimental sample and Cairo market (E) being 1.6% for the former and 1.62% for the latter one. A good black honey must contain not more than 3% ash on wet weight basis. This means that, all studied samples were within the permissible limits. These results agree also with those reported by E.O.S. (1993). Yeshajahu and Clifton (1994) proved that ash is the inorganic residue from the incineration of organic matter. The amount and composition of ash in a food product depend on the nature of the food ignited and on the method of ashing.

Data given in Table (2) proved that the value of moisture in the experimental sample being the lowest one corresponds to the other samples (18.6%). The moisture within the different production regions was higher in the Der Mawass (25.97%), while in the Cairo market (B,G) it was 19.09% and 19.05% respectively.

The other analysis given in the same table showed that the level of refractive index was respectively similar in the Farshout and Der Mawass of the main regions of samples production (1.4712 and 1.4710) while in the Cairo market (J) it was not more than (1.3527).

The available data of titratable acidity in the tested samples showed that the lowest values were in the experimental sample 0.22% and the Cairo market (F) 0.23%. Variations during the processing season might be led to the decomposition of acids during the ripening stage of sugar cane or/and the formation of new acids as a result of over ripening of sugar cane, Rozeff (1999).

The obtained results clearly proved that values of volatile acidity were similar in the experimental sample and Cairo market (F, J) being 0.11% .The five samples of the different processing regions Farshout, Cairo market (B,C,G,I) contain 0.13% of the volatile acidity. These results are completely with those reported by EOS (1993) which stated that the titratable and volatile acidity should not increased than 8% and 0.2% calculated on NaOH and % acetic acid respectively.

Table 1. Sugars, pH and Ash content of Black Honey samples under investigation.

Tested Samples	Values are given as g/ 100g samples (%)				
	Sucrose	Reducing Sugars	Total Sugars	pH	Ash
Experimental Sample	45.41	20.7	68.5	4.34	1.6
Main Regions of Samples Production					
Farshout	44.27	10.4	57	4.74	1.14
Mallawi	37.81	14.2	54	4.52	1.21
Der Mawass	41.7	12.4	56.3	4.68	1.07
Bahgora	42.30	11.74	56.27	4.69	1.05
Mean	41.52	12.19	55.89	4.735	1.12
P ≥ 0.05	0.075	0.269	0.108	0.044	0.171
Cairo Market					
C.M. A	43.6	12.1	58	4.83	1.08
C.M. B	29.5	22.7	53.8	4.40	1.48
C.M. C	38.70	11.51	52.25	4.36	1.09
C.M. D	43.76	10.28	56.34	4.69	1.13
C.M. E	46.27	10.08	58.79	4.82	1.62
C.M. F	47.79	13.5	63.8	4.62	1.04
C.M. G	46.65	15.1	64.2	4.35	1.08
C.M. H	43.44	10.21	55.94	4.65	1.12
C.M. I	39.59	11.77	53.44	4.44	1.02
C.M. J	40.05	11.11	53.27	4.44	1.08
Mean	41.935	12.836	56.983	4.56	1.174
P ≥ 0.05	7.212	0.0004	3.5236	4.5462	7.9075

C. M. = Cairo Market

The data in Table (2) showed that the samples of black honey collected from the Cairo market were significantly increased in all parameters (moisture, refractive index and acidity) than all of the other tested samples.

It was considered to compare black honey samples under investigation as seen in Table (3). The tested parameters were T.S.S., purity and color intensity index.

The available data proved that the average of T.S.S. indicated a lower value in the main regions of samples production than the experimental sample, 76.75% and 81.41%. However T.S.S. content of all samples that was above 70% within the limit set by the EOS (1993), but its not in agreement with those reported by Amin *et al.*, (1999) who concluded that total soluble solids % must be not less than 95%.

Mean value purity showed a minimum of 53.416% for the Cairo market samples, while the maximal values 54.14% were scored for the main regions of samples production. Ferweez (1997) showed that the sugar cane.

Table 2. Moisture, Acidity and Refractive Index content of Black Honey sample under investigation.

Tested Samples	Values are given as g/ 100g samples (%)			
	Moisture	Refractive Index	Acidity	
			Titratable	Volatile
Experimental Sample	18.6	1.4781	0.22	0.11
Main Regions of Samples Production				
Farshout	21.60	1.4712	0.43	0.13
Mallawi	21.78	1.4775	0.49	0.15
Der Mawass	25.97	1.4710	0.43	0.14
Bahgora	23.67	1.4295	0.40	0.12
Mean	23.26	1.462	0.438	0.135
P ≥ 0.05	0.025	0.059	0.004	0.027
Cairo Market				
C.M. A	24.39	1.4729	0.41	0.12
C.M. B	19.09	1.4824	0.42	0.13
C.M. C	24.1	1.3551	0.41	0.13
C.M. D	21.35	1.4542	0.43	0.12
C.M. E	20.93	1.5244	0.46	0.14
C.M. F	20.21	1.4626	0.23	0.11
C.M. G	19.05	1.4738	0.35	0.13
C.M. H	21.2	1.4439	0.42	0.10
C.M. I	24.65	1.3862	0.41	0.13
C.M. J	22.4	1.3527	0.25	0.11
Mean	21.737	1.44082	0.379	0.122
P ≥ 0.05	5.7978	9.4330	3.1969	1.0448

C.M. = Cairo Market Volatile Acidity = % acetic acid

Titratabla Acidity= g NaOH / 100g sample

contained more reducing sugar and lower sucrose content than G.T. 9/54 variety, used in the present investigation. The high juice purity of the G.T9/54 variety might be related to the recrystallisation of sucrose in the black honey, which also represents a problem during storage for a few months since it may cause deterioration (fermentation) of the sample.

The obtained data proved also that the parameter of color intensity index was higher in the experimental sample (38116 unit) than the other samples. The parameter of color index in the investigated samples was found to be between 36928 unit in the Cairo market (G) and in the Cairo market (E) being 20079 unit. Ferweez (2002) proved that the nitrogenous compounds, especially amino nitrogen has an effect on the browning reaction that takes place during black honey processing but, caramlization reaction is the main factors that affect the color of treacle to certain extent depending on the way and the time used in juice concentration.

The significantly level was found to be of lowest values in pH, T.S.S. and purity in the main regions of samples production.

Table 3. Total Soluble Solids, Purity and Color Intensity Index content of Treacle (Black Honey) samples under investigation

Tested Samples	Values are given as g/ 100g samples (%)		
	T.S.S.	Purity	Color Intensity Index (ICUMSA-Unit)
Experimental Sample	81.4	55.79	38116
Main Regions of Samples Production			
Farshout	78.4	56.47	25175
Mallawi	78.22	48.34	25804
Der Mawass	74.03	56.33	21408
Bahgora	76.33	55.42	28071
Mean	76.75	54.14	27714.8
P ≥ 0.05	0.069	0.062	0.002
Cairo Market			
C.M. A	75.61	57.66	27310
C.M. B	80.91	36.46	31017
C.M. C	75.9	50.98	22641
C.M. D	78.65	55.64	30174
C.M. E	79.07	58.52	20079
C.M. F	82.4	57.99	31347
C.M. G	80.95	57.63	36928
C.M. H	78.8	55.13	26047
C.M. I	75.35	52.54	30240
C.M. J	77.6	51.61	26419
Mean	78.524	53.416	28220.2
P ≥ 0.05	1.0947	4.8629	0.0003

C.M. = Cairo Market T.S.S. = Total Soluble Solids

Unit = International Commission for Uniform Methods of Sugar Analysis.

Minerals Analysis.

The concentration of micro -elements (Ca, P, Mg and Zn) of black honey collected from different Egyptian districts is given in Table (4).

The Cairo market (F) has a lowest value of Ca being 227.86mg/100g while that of the higher values (336.2mg/100g) was detected in Der Mawass sample. On the other hand, the corresponding ratio was completely converted in case of Cairo market and experimental sample was 0.884:1. Jackson (1995) showed that Ca is required for skeleton building, conduction of nerve impulses, muscle contraction, blood clotting. He further added that low intake may result in premature osteoporosis in old age.

These results indicate that, the average of P concentration was higher in the main regions of samples production than the experimental sample being (77.86mg/100g and 62.28mg/100g) respectively. So, the level of P was (86.95mg/100g) in the Der Mawass and the lowest value was found in the Cairo market (F) 58.93mg/100g. Variations in the analyzed microelements could be reasoned to the degree of maturity of the sugar cane which used in processing of the tested samples.

Table 4. Micro-elements content of Black Honey sample under investigation.

Tested Samples	Micro-elements (mg/ 100g sample)			
	Ca	P	Mg	Zn
Experimental Sample	240.80	62.28	70.58	0.415
Main Regions of Samples Production				
Farshout	279.6	72.32	81.96	0.482
Mallawi	281.9	72.92	82.65	0.486
Der Mawass	336.2	86.95	98.55	0.579
Bahgora	306.44	79.25	89.82	0.53
Average	301.04	77.86	88.25	0.519
Ratio*	0.799	0.799	0.799	0.799
Cairo Market				
C.M. A	315.8	81.66	92.55	0.544
C.M. B	247.1	63.92	72.44	0.426
C.M. C	312.01	80.69	90.35	0.53
C.M. D	275.31	72.58	80.03	0.47
C.M. E	271.57	73.08	79.42	0.47
C.M. F	227.86	58.93	66.79	0.393
C.M. G	246.63	63.78	72.29	0.425
C.M. H	274.46	70.98	80.45	0.47
C M. I	318.12	82.43	92.44	0.55
C.M. J	234.02	68.19	76.33	0.461
Average	272.288	71.624	80.309	0.4739
Ratio*	0.884	0.869	0.879	0.876

C.M. = Cairo Market

Ratio*= the average of the concentration of the responded element divided by the concentration of the experimental sample

With respect to the concentration Mg and Zn in the same tested black honey samples, results showed that higher value was found in the Der Mawass (98.55mg/100g and 0.579mg/100g) and lowest value in the Cairo market (F) (66.79mg/100g and 0.393mg/100g). However, the ratio of Mg and Zn was completely converted in case of main regions of samples production and experimental sample being (0.799:1). Mg is required for food energy transformation and bone formation. Mg is especially abundant in vegetables as it is an essential constituent of chlorophyll, Jackson (1995).

Trace elements in terms of Pb, Cu and Fe of black honey samples measured by atomic absorption are given in Table (5). Trace element is a term that refers to those elements that occur at very low levels of a few parts per million or less in a given system. The term trace substance is a more general one applied to both elements and chemical compounds, Stanleye (2002). It seems evident that the concentration of Pb and Cu showed lower values in experimental sample (20ppm and 2.48ppm) than the other samples, while the concentration of Fe was higher in the Farshout sample (39.8ppm).

Table 5. Levels of Trace elements of Black Honey samples under investigation.

Tested Samples	Trace-element ppm		
	Pb	CU	Fe
Experimental Sample	20	2.48	29
Main Regions of Samples Production			
Farshout	32.2	9	39.8
Mallawi	29.4	4.1	21.7
Der Mawass	25.2	18.2	27.3
Bahgora	39.4	11.6	23.6
Average	31.55	10.73	28.6
Ratio*	0.634	0.231	1.014
Cairo Market			
C.M. A	28	9	23.9
C.M. B	35	4.6	30.3
C.M. C	30.6	10.8	20.7
C.M. D	25.4	7.4	28.4
C.M. E	33.9	9.7	23.4
C.M. F	22	7.2	33.2
C.M. G	25.9	5.4	29.4
C.M. H	20.8	4.2	26.8
C.M. I	32.6	6.1	30.9
C.M. J	28.7	12.3	29.7
Average	28.29	7.67	27.67
Ratio*	0.707	0.323	1.048

C.M. = Cairo Market

Ratio*= the average of the concentration of the responded element divided by the concentration of the experimental sample

Data of the same table showed that the ratio of Pb and Cu were (0.634:1 and 0.231:1) between the main regions of samples production and experimental sample but the ratio of Fe between the Cairo market and experimental sample was (1.048:1). Rozeff (1999) mentioned that treacle had a considerable amount of phosphorous, magnesium, calcium and copper. It also had a high amount of iron and a low amount of zinc. However, treacle could be considered as a good and cheap source for minerals especially iron. It is of important to refer to the EOS (1993) which reported that the Pb should not increased than 1ppm and Cu should not increased than.

Microbial Analysis. Safety of food stuffs especially from the microbial view points is of great important to consumer health, Forsythe (2000). With this view, microbial analysis of the tested samples was considered as seen in Table (6).

Variations in the bacteria and fungi levels could be noticed in the samples, where as Bahgora sample and Cairo market (A, C, E, F, G, H, I, J) samples were completely free of bacteria and fungi. The value of total bacteria was 74X10, $40X10^2$ and $30X10^2$ cell/1g sample in the Farshout, Mallawi and Cairo market (D) samples but the value E.Coli. And T.C. Fungi was 58-cell/1g samples and 60-cell/1g samples in the Mallawi sample. Salmonella level was 9-cell/1g samples in the Farshout sample.

Table 6. Bacteria and Fungi counts of Black Honey samples under investigation.

Tested Samples	Cell / 1g sample				
	Bacteria				
	T.C. Bacteria	E.Coli.	Staph.	Salmonella	T.C.Fung.
Experimental Sample	-	-	-	-	-
Main Regions of Samples Production					
Farshout	74 $X10^2$	-	-	9	10
Mallawi	40 $X10^2$	58	-	-	60
Der Mawass	-	-	-	-	1
Bahgora	-	-	-	-	-
Cairo Market					
C.M. A	-	-	-	-	-
C.M. B	-	50	-	-	1
C.M. C	-	-	-	-	-
C.M. D	30 $X10^2$	-	-	-	10
C.M. E	-	-	-	-	-
C.M. F	-	-	-	-	-
C.M. G	-	-	-	-	-
C.M. H	-	-	-	-	-
C.M. I	-	-	-	-	-
C.M. J	-	-	-	-	-

C.M. = Cairo Market

The EOS (1993) reported that treacle samples must be completely free of bacteria and T.C. Fungi should contain more than 10-cell/1gm samples. Processing of black honey is carried out as a traditional food industry controlled mainly by the personal experience and practice of its makers and so, the level of micro organisms must be controlled by the implementation of GHP and GMP – during traditional placing processes.

CONCLUSION

The available data of the tested black honey demonstrate a significant variation between the experimental sample and the samples of main production regions in chemical, physical and microbial analysis. The obtained results clearly proved that the best quality of black honey was result from Cairo market. However, it is important to try to improve the processing condition of black honey by using good manufacturing practice GMP and the good handling practices GHP through all the processing claim.

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عناصر الجودة فى العسل الأسود المنتج فى مناطق مختلفة فى مصر

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١. *قسم الإقتصاد المنزلى- كلية التربية النوعية- جامعة عين شمس*
٢. *مركز تكنولوجيا الصناعات الغذائية*

اجرى هذا البحث لدراسة عناصر جودة العسل الأسود المصرى حيث ان صناعة العسل الأسود تعتمد على تركيز عصير القصب و العسل الأسود غذاء شعبى حيث انه جزء هام من الوجبه المصرية للطبقات المتوسطة الدخل.

اخذت عينات البحث من مناطق انتاج العسل الأسود الرئيسية (فرشوط، مالوى، ديرمواس وبهجورة)، السوبر ماركت (١٠ عينات) بالإضافه للعينه الرئيسية المجهزة بمعرفه مركز تكنولوجيا الصناعات الغذائية بوزارة الزراعة واستصلاح الأراضى.

تناول البحث قياس كل من الخواص الكيميائية والفزيائية منها تركيز السكروز، السكريات المختزلة، والسكريات الكلية، الرماد، الرطوبة، معامل الإنكسار، الحموضة والحموضة الطيارة، الـ PH، المواد الصلبة الكلية، درجة النقاوة ومعامل اللون. هذا وقد أخذ فى الإعتبار قياس نسبه العناصر المعدنية الأتية (Ca, P, Mg, Zn, Pb, Cu and Fe) والإختبارات الميكروبيولوجية للبكتريا والفطريات وذلك من خلال مقارنته هذه النتائج بنتائج العينة القياسية.

أظهرت النتائج ان تركيز السكروز والسكريات المختزلة كانت عالية فى عينة السوبر ماركت (F,B) (٤٧,٧٩%و ٢٢,٧%على التوالى) وذلك بالنسبه للعينة القياسية. بينما قيم السكريات الكلية والرماد كانت مرتفعة فى العينة القياسية حيث بلغت ٦٨,٥% و ١,٦% على التولى عند مقارنتها بالنسبه للعينات التى تحت الإختبار.

أظهرت المعلومات ايضاً ان قيم الرطوبة والحموضة الطيارة فى العينة القياسية كانت منخفضة بالنسبة للعينات الأخرى (١٨,٦%و ٠,٢٢%). ومن ناحية اخرى كانت قيمة معامل الإنكسار. والحموضة منخفضة فى عينه السوبر ماركت (J) ١,٣٥٢٧و ٠,١١%.

اشارت الإختبارات الأخرى فى البحث الى ان قيمة الـ Ph فى العينة القياسية كانت منخفضة (٤,٣٤) ولكن قيمة معامل اللون كانت مرتفعة (٣٨١١٦) بالنسبه للعينات التى تحت الإختبار. وفيما يتعلق بقيم المواد الصلبة الكلية ودرجة النقاوة كانت مرتفعة فى عينه السوبر ماركت (F) ٨٢,٤%و ٥٧,٩٩% بالنسبه للعينة القياسية.

أثبتت تحاليل العناصر المعدنية ان عينة الدير مواس كانت مرتفعة فى الـ Ca (٣٣٦,٢ ملجرام/١٠٠ جرام)، P (٨٦,٩٥ ملجرام/ ١٠٠جرام)، Mg (٩٨,٥٥ ملجرام/١٠٠جرام) وZn (٠,٥٧٩ ملجرام/١٠٠جرام). بينما قيم الـ Cu, Pb كانت منخفضة فى العينة القياسية بالنسبه للعينات الأخرى التى تحت الإختبار (٢٠ جزء فى المليون و٢,٤٨ جزء فى المليون).

هذا وثبت من نتائج البحث ان عينة بهجورة وعينات السوبر ماركت (A,C,E,F,G,H,I,J) خالية تماماً من البكتريا والفطريات.