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Chemical, Sensory and Microbiological Assessment of Some Local and Imported Jam in the Egyptian Market

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Abstract

In this study, a survey was carried out on some jam types in the Egyptian market, such as vitrac (strawberry, apricot and fig jam), El Rashidi El Mizan (strawberry, apricot and fig jam), Halwani Bros (apricot and fig jam) Hero (strawberry, apricot and fig jam) . Futher more, some imported jam in the Egyptian market, such as such as Menz Gasser (apricot and strawberry jam) from Italian, Hartleys apricot jam from England, Altunsa strawberry jam from Turky and Al Rakyzen quince jam from Iraqi. Chemical and physiochemical properties were analysis, the Altunsa strawberry jam from Turky was higher in moisture content 37.47%, while the least was Hartleys apricot jam from England 30.50%, also Altunsa strawberry jam from Turky was higher in total sugars 58.536% and the least was Menz Gasser apricot jam from Italian 54.24%. On the other hand,the local and imported generality jam samples acceptable in sensory evaluation of the overall acceptability ranged from 84.82 to 91.00%. All local and imported jams were not detected in heavy metals such as cadmium, mercury, arsenic, lead, tin and cobalt. The results showed that most of the pesticide residues were not detected for all local and imported jam samples. Also, local and imported jam samples were microbiological safety fortotal bacterial count, coliform group bacteria and total yeastsandmolds. The results showed that all local and imported jam samples were not detected for coliform group, that due to the high temperatue during manufacture of jam. Finally, these results its clear that local jam was better than imported jam and both of them jams meet with the Egyptian standards and the CODEX standards.

Key words: Jam; Chemical and physiochemical, sensory evaluation, microbiological safety, heavy metals, Pesticide residues, rheological properties.

Introduction

The quality of fruits and vegetables constitutes a dynamic composite of their physicochemical properties andconsumer perception. Attempts at defining quality often discriminate between intrinsic characteristics inherentto the nature of the products, dictated by genotypic, agroenvironmental and postharvest factors, and extrinsiccharacteristics influenced by socioeconomic and marketing factors which condition consumer perception of theproducts and formulate quality standards. The current regulatory context for fruit and vegetable quality comprises crop-specific class standards based on key visual and limited compositional criteria and lays primaryemphasis on visual attributes at the expense of flavour, nutritional and functional attributes related to phytonutrient content**(Kyriacou and Rouphael**, **2018)**.

According to the definition of the Food and Agriculture Organization of the United Nations (FAO), "Food security exists when all people, at all times, have physical and economic access to sufficient safe and nutritious food that meets their dietary needs". Food security not only implies the offer but also the availability of safe foods, taking innocuousness as the intrinsic attribute of a product to be considered suitable for human consumption. Safe food must be free of physicalhazards (bones, stones, metal fragments, or any foreign matter), chemical hazards (veterinary drugs, pesticides, toxins from microorganisms, cleaning and disinfection agents), and biological hazards (microorganism pathogens) for the consumer(**Pérez-Rodríguez *et al.*, 2018)**.

Grumezescu and Holban (2018)studied that**,** the main areas of quality control that are needed to produce uniformly high quality products are as follows: fruit preparation, accurate weighing and mixing of ingredients, hygienic preparation of fruits and fruit juices, correct acidity, moisture content and final total soluble solids content, that we study jam and honey for its safety and quality,.

Among all these preparation jam is one in which maximum pulp of fruit is used. Jams are one of the most popular food products because of their low cost, all year long availability and organoleptic properties. Hence, an attempt was made to develop value added fruit jams, (**Asha *et al.*, 2017).**

Shinwari and Rao (2018), showed thatfruits have mostly enough acidity and pectin content contributing to the texture development in jam. However, external pectin and acids are added in some cases to meet a minimum pectin requirement of 1% and pH 3.0, as gel network is formed by pectin with specific TSS and pH. However, the jam with lower TSS can be obtained by using different gelling agents like gums or pectin with lower degree of esterification (low methoxyl pectin, DE < 50%), and accordingly different categories of jam can be obtained like high-calorie jam (TSS > 50%), reduced-calorie jam (TSS < 45%), and low-calorie jam (TSS < 20% no added sugar). Further, the network between pectin and sugar is aided by the application of heat,**.**

Strawberries (*Frafaria x ananassa Duch*.) are mostcommonly used fruits for preparation of jam, jellies andspreads not only because of their aroma, attractive colorand flavor but also their nutritious effect on human health(**Curi *et al.* 2016**).

Sallam (2016) showed that, moisture content recorded 78.45, 77.24, 77.01 and 78.64% for Gerber, Hero, Riri and Nitropen jam , total solids were ranged from 21.36% in Nitropen sample to 22.99 in Riri sample.The fat content in all samples was less than 1%. Protein content of Gerber sample recorded the highest value 1.30% while other samples recorded 0.55, 0.87 and 0.93% for Hero, Riri and Nitropen respectively.All samples had more than 1.5% pectin. All samples had pH value more than 4.5, so all samples were non acid food.

Naeem *et al.* (2017)observed that, all of the jams possessed similar levels of moisture content (31.23–33.36%). For protein content, grape jams have the lowest, while apricot jams have the highest which is comparable to theprotein content of jackfruit (0.19 g/100 g) and pineapple jam(0.46 g/100 g). analyzed jams generally have very lowfat content with the apricot jam having no fat content whatever while the strawberry, blueberry and grape jams have similar fat contents (0.01 g/100 g to 0.03 g/100 g). It was reportedthat apricot, strawberry, blueberry and grape have very lowfat content (0.1–0.2 g/100 g). All the fruit jams have similar total sugar contents rangingfrom 52.43 g/100 g to 54.78 g/100 g. Grape jam hadthe lowest total sugar contents while blueberry jam had thehighest. Grape, apricot, strawberry and blueberry had considerably lower total sugar contents than jams (4.89–17 g/100 g).

The same autherobserved that, Ca content of the jams was comparable to the one reported for strawberry, blueberry and grape (6–16 mg/100 g). In terms of Fe content, grape and apricot jams tend to havesimilar levels. However, blueberry and strawberry jams tend tocontain higher Fe levels.Strawberry jam also tends to have the highest Mg contenteven though blueberry jam had the lowest.Strawberry jam had the lowest Na content followed bygrape jam (4.07 mg/100 g). On the other hand, apricot andblueberry jams have significantly higher but almost similarNa contents.

del Castillo *et al.* (2019) showed that, pesticides present in contaminated strawberries seems to be lost by evaporation during jam preparation.

The power law model (Equation 1) was employed to describe the flow behavior of the evaluated samples in relation to storage time and temperature and the addition of plasticizers. The regression coefficients (R^2) for all samples ranged between 0.912 and 0.999, indicating that the used modelproduced a satisfactory fit of the experimental data. the initial k value of raw currant paste was found to be 5.04±0.81 kPa·s^n(**Nikolidaki*et al.*, 2018).**

Abolila (2015) and González-Cuello *et al.* (2018) reported that, the all jam blends were found free from coliform group.

Sallam (2016) showed that, yeasts and moulds, coliform group, Salmonella *and Staphylococcus aureus* were found to be absent in all the formulas.

Sensory evaluation offers the opportunity to obtain a complete analysis of the various properties of food as perceived by human sense. Sensory evaluation is an important and best method for evaluating new products developed which provide quality measure and production control**(Sindumathi and Amutha, 2014)**.

The aims of the present work were the following:

1- Evaluate the quality survey of some commercial types of locally and imported jams by chemical composition , physicochemical properties, rheological properties , microbiological examination , and sensory evaluation.
2- Evaluate the safety survey of some commercial types of locally and imported jams byminerals content and pesticide residues.

Materials And Methods

Materials:

1- Commercial jam samples:

Commercial jam samples the most traded in the Egyptian market were purchased from the most important and largest markets in Egypt.

2- Imported jam samples:

Imported jam samples the most traded in the Egyptian market were purchased from the most important and largest markets in Egypt.

Methods:

Chemical and physicochemical analysis of jam

Moisture content, total ash, crude protein, T.S.S (total soluble solids), pH value, titratable acidity, crude fiber and ascorbic acid content were determined according to **A.O.A.C. (2016)**.

Determination of total and reducing sugars in jam:

Reducing sugars were estimated according to Lane and Eynon,svolumetric method given by **Ranganna (1986)**.

Pectic content: Pectin was determined by “Gravimetric method” (**Sadasivam and Manicham 1996**).

Determination of chlorophyll:

Chlorophyll a, b were calculated according to the **Nagata and Yamashita** (**1992**) equations:

Chlorophyll a (mg /100 ml of extract) = (0.999 x OD 663) - (0.0989 x OD 645)

Chlorophyll b (mg /100 ml of extract) = (-0.328 x OD 663) + (1.77 X OD 645)
Chlorophyll a, b were finally expressed as mg / 100 ml.

Determination of Total anthocyanins: Total anthocyanins were measured according to the method of **Skalaki and Sistrunk (1973)**.

Determination of minerals:

Minerals content were determined according to **A.O.A.C (2016)**using Perkin-Elmer, 2380, Atomic Absorption Spectroscopy (AAS) apparatus in central laboratory of Faculty of Agric., Moshtohor.

Determination of Heavy metals:

Heavy metalsin jam and honey were determined by using Perkin-Elmer, 2380, Atomic absorption spectrometry after wet digestion according to **A.O.A.C (2016)**.

Pesticide Residues (QuEChERS Method):

Method description: Quick and Easy Method (QuEChERS) for determination of pesticide residues in foods using GC–MS according to **European Committee for Standardization, (2008).**

Rheological measurements

The Brookfield small sample adapter was supplied with one spindle and sample chamber, flow jacket, mounting bracket, and all necessary hard ware.

The Power Law math model provide a numerically and graphically analyse the behavior of data sets.

Power law:

The power law equation is :

$$\tau = k\gamma^n$$

Where: τ= shear stress (N/m^2) γ= shear rate (sec^{-1})
k= consistency index ($mPa.s^n$) ^{n}= flow index (dimensionless)

The calculated parameters for this model are: flow index (n), consistency index (k) and confidence of fit (%)as mentioned by **Ibarz *et al.* (1996) and Sharoba (2004)**

Microbiological examination:

Sample preparation:

Ten grams of each sample (jam and honey) were mixed with 90 mls of sterile peptone solution (9 gms peptone / 1 L distilled water) in a blender, under sterile conditions, to give 1/10 dilution. Serial dilutions were prepared to be used for counting several types of bacteria and yeast and mold counts. Total plate bacterial count, coliform bacterial count, moulds and yeasts and osmophilic molds and yeastsaccording to American Public Health Association**A.P.H.A (1992)** and **Difco-Manual (1984)**.

Sensory evaluationof jam

Sensory evaluation was carried out by a properly well trained panel of 12 testers. They were selected if their individual scores in 10 different tests showed a reproducibility of 90%. The 12 member internal panel evaluated the different carrot, grapefruit, naring and pumpkin jams for color, taste, odor, consistency, mouth feel, Fruit distribution and over all acceptability. Mineral water was used by the panellists to rinse the mouth between samples, according to **Sallam *et al.*,(2016).**

Statistical analysis:

Moreover the statistical analysis was carried out using SPSS program (ver. 19) with multi-function utility regarding to the experimental design under significance level of 0.05 for the whole results and multiple comparisons were carried out applying LSD according to **Steel *et al.* (1997)**.

Results And Discussion

Physiochemical composition of some commercial types of local and imported jams:

Data presented in **Table (1)** showed that, the chemical composition of some commercial local jam samples. Results indicated that the moisture in all samples were within the range between 31.55 to 36.86%. Total solids content were within the range between 63.14% for El Rashidi El Mizan apricot to 68.45 % for Vitrac strawberry, total soluble solids ranged between 63.05% for El Rashidi El Mizan apricot to 68.26% for Vitrac strawberry,**Naeem, *et al.* (2017) and Wani *et al.* (2018)**.The ash content of commercial local jam samples were within the range between 0.11 to 0.355 % while the protein content were within the range between 1.34 to 1.89 %, pH values were ranged between 3.74to 4.16, While the total titratable acidity were ranged between 1.12 to 1.40 % , the total sugars content in commercial local jam samples were within the range between 54.64 to 56.43%. While, the reducing sugars content were within the range between 10.03 to 11.51%, Non-reducing sugars content in some commercial local market jam samples were within the range between 3.87 to 6.08% **(Khan *et al.*, 2012; Sallam 2016 and Wani *et al.*. 2018)**.

The total pectic substances content of commercial local jam samples were ranged between 1.52 to 1.72%.Ascorbic acid were within the range between 22.65 to 47.67 mg /100g sample.The pulp contents (v/v) % of some commercial were within the range between 54.48 to 87.04 (v/v) %. Among other local jam samples were within the range between 1.012 to 88.32 mg/L sample for carotenoids. While chlorophyll and anthocyanine, were within the range between 0.643 to 1.472 mg/L sample and 0.176 to 18.03 O.D. at 535for chlorophyll and anthocyanine, respectively **(Abdel-Hady *et al.*, 2014**).

Table 1. Physiochemical composition of some commercial types of local jams (g/100 g sample, on wet basis).

Components	Commercial local jam										
	Vitrac Strawberry	Vitrac Apricot	Vitrac Fig	El Rashidi El Mizan Strawberry	El Rashidi El Mizan Apricot	El Rashidi El Mizan Fig	Halwani Bros Apricot	Halwani Bros Fig	Hero Strawberry	Hero Apricot	Hero Fig
Moisture %	31.55	32.77	34.53	33.08	36.86	32.36	33.62	33.19	32.42	35.23	35.00
Total solids %	68.45	67.23	65.47	66.92	63.14	67.64	66.38	66.81	67.58	64.77	65.00
Total soluble solids %	68.26	66.65	64.59	66.53	63.05	67.55	66.09	65.78	66.9	64.28	63.93
Ash %	0.23	0.24	0.345	0.24	0.12	0.355	0.34	0.345	0.11	0.46	0.11
Fat %	0.41	0.46	0.47	0.42	0.41	0.40	0.41	0.43	0.38	0.40	0.36
Protein %	1.89	1.68	1.73	1.82	1.83	1.80	1.68	1.74	1.67	1.45	1.34
pH values	3.98	3.96	4.03	3.91	4.03	4.05	4.09	4.16	3.74	3.99	4.05
Titratable acidity %	1.40	1.20	1.20	1.30	1.18	1.24	1.23	1.12	1.15	1.17	1.18
Total sugars %	54.64	55.36	56.38	56.22	56.35	55.38	56.54	55.65	56.11	55.87	56.43
Reducing sugars %	10.03	10.33	11.16	10.57	10.63	11.51	10.46	11.32	11.43	10.65	10.87
Non reducing sugars %	44.61	45.03	45.22	45.65	45.72	43.87	46.08	44.33	44.68	45.22	45.56
Total pectic substances %	1.54	1.63	1.55	1.57	1.52	1.72	1.59	1.60	1.57	1.54	1.71
Fiber %	0.19	0.58	0.88	0.39	0.09	0.09	0.29	1.03	0.68	0.49	1.07
Carotenoids (mg/l)	3.589	86.171	1.281	2.987	78.99	1.043	80.43	1.012	3.754	88.32	1.301
Chlorophyll (mg/l)	1.472	0,721	1.201	1.532	0.753	1.298	0.750	1.254	1.032	0.643	0.930
Anthocyanine (O.D. at 535)	17.13	0.304	7.118	15.43	0.201	5.34	0.176	4.76	18.03	0.401	7.321
Ascorbic acid (mg/100g)	38.23	47.67	23.45	22.65	24.76	29.76	31.66	23.43	22.65	34.76	29.76
Pulp content (v/v)	73.99	54.54	54.48	75.47	72.43	64.00	87.04	60.48	73.77	76.19	70.00

Table 2. Physiochemical compositionof some commercial types of importedjams (g/100 g sample, on wet basis).

Components	Imported jams				
	Menz Gasser Apricot	Menz Gasser Strawberry	Hartleys Apricot	Altunsa Strawberry	Al Rakyzen Quince
Moisture %	34.23	32.786	30.5	37.47	34.43
Total solids %	65.77	67.214	69.5	62.53	65.57
Total soluble solids %	64.9	67.024	69.11	62.09	65.15
Ash %	0.66	0.47	0.45	0.09	0.32
Fat %	0.38	0.37	0.50	0.42	0.44
Protein %	1.34	1.65	1.44	1.54	1.54
pH values	4.15	2.93	2.09	3.21	3.65
Titratable acidity %	1.14	1.32	1.43	1.18	1.22
Total sugars %	58.107	54.24	56.473	58.536	54.274
Reducing sugars %	13.561	12.946	14.12	13.815	11.13
Non reducing sugars %	44.546	41.294	42.353	44.721	43.144
Total pectic substances %	1.58	1.59	1.60	1.931	8.046
Fiber %	0.87	0.19	0.39	0.44	0.42
Carotenoids (mg/l)	66.171	4.389	68.42	2.543	3.673
Chlorophyll (mg/l)	0.521	1.872	0.786	1.743	0.798
Anthocyanine (O.D. at 535)	0.204	18.07	0.587	17.53	4.87
Ascorbic acid (mg/100g)	22.54	21.76	28.76	25.65	27.76
Pulp content(v/v)	70.03	89.38	76.76	73.43	74.54

Chemical composition of imported jam samples are concerning the moisture content were within the range between 30.50 to 37.47%, while the total solid contents of imported jam samples were within the range between 62.53% for Altunsa strawberry to 69.50 % for Hartleys apricot**(Ferreira *et al.*, 2004 ; Sallam 2016 and Naeem *et al*, 2017).**Total soluble solids of imported jam samples were within the range between 62.09% for Altunsa strawberry to 69.11% for Hartleys apricot, further more ash content of imported jam samples were within the range between 0.09 to 0.66 %, protein content of imported was within the range between 1.34 to 1.65 %, pH values of imported jam were range between 2.09to 4.15,while the total titratable acidity content were ranged between 1.14 to 1.43 % .

Total sugars content in imported jam samples were within the range between 54.24 to 58.536%. While, the reducing sugars content were within the range between 11.13 to 14.12%, non-reducing sugars content were within the range between 41.294 to 44.721%,the total pectic substances content were ranged between 1.046 to 8.046%, ascorbic acid content were within the range between 21.76 to 28.76 mg /100g sample. The pulp contents (v/v) % of imported jam samples were within the range between 70.03 to 89.38 (v/v).Among other imported jam samples were within the range between 2.543 to 68.42 mg/L sample for carotenoids. While chlorophyll and anthocyanine were within the range between 0.521 to 1.872 mg/L sample for chlorophyll. And anthocyanine, range between 0.204 to 18.07 O.D. at 535 sample.The results of chemical composition and physical properties for ingredients used for the preparation of jam formulas were in agreement with those obtained by**Ferreira *et al.* (2004) ;Levaj*et al.* (2010); Khan *et al.* (2012); Sallam, (2016) ; Naeem, *et al.* (2017) and Wani *et al.* (2018)**.

Minerals content of some commercial types of local and imported jams:

Data presented in **Table (3)** showed that,the calcium content of all local and imported jam ranged between 7.33 to 39.00 mg/100g. For, sodium, it is clear that (Altunsa Strawberry) had the highest value while (El Rashidi El Mizan Fig) had the lowest value. The obtained data revealed that the highest potassium content are found in all local and imported jam and this may be due to the high percent of fruits puree, the highest content of (Hero Apricot), however the lowest content was found in (Vitrac Strawberry). The trace elements magnesium content was ranged from 1.53 to 7.72 mg/100 g for Menz Gasser Apricot and Halwani Bros Fig, respectively.The results of minerals contentfor the prepared jam formulas are in agreement with those obtained by **Bahlol *et al*.(2007); Özkan *et al.* (2009), Souad *et al*.(2012).**

Table 3. Minerals content of some commercial types of local and importedjams (mg/100g on wet weight basis).

Local and imported jams	Minerals (mg/100g.)				
	Ca	K	Mg	Na	P
Vitrac Strawberry	9.00	42.00	1.62	54.99	4.48
Vitrac Apricot	10.33	94.12	7.45	52.51	5.2
Vitrac Fig	19.00	88.45	2.33	57.80	9.43
El Rashidi El Mizan Strawberry	31.00	59.75	0.00	60.58	15.51
El Rashidi El Mizan Apricot	27.33	78.43	0.00	58.69	13.45
El Rashidi El Mizan Fig	39.00	57.33	0.00	56.39	19.43
Halwani Bros Apricot	36.66	91.32	4.53	56.92	18.3
Halwani Bros Fig	14.66	85.97	7.72	52.87	7.31
Hero Strawberry	13.33	50.66	3.13	54.36	6.69
Hero Apricot	31.33	124.04	4.54	52.39	15.71
Hero Fig	10.33	83.65	2.32	52.38	5.17
Menz Gasser Apricot	11.33	97.04	1.53	52.22	5.64
Menz Gasser Strawberry	9.00	67.43	0.00	52.21	4.46
Hartleys Apricot	18.00	58.43	0.00	52.17	9.04
Altunsa Strawberry	7.33	73.44	0.00	60.69	3.54
Al Rakyzen Quince	8.00	55.34	0.00	60.87	4.32

Pesticide residues of some commercial types of local and importedjams:

Data presented in **Table (4)** showed that,the pesticide residuescontent of jam such as, Lambda-cyhalothrin, Omethoate, Dimethoate, Carbendazim, Fludioxonil, Propargite and Cyprodinilpesticide were not deteacted in all commercial types of local and importedjams, while Cypermethrin pesticide was ranged from 0.01 to 0.04 ppm exept for Hero jam (J9, J10 and J11) were not deteacted . On other hand, Chlorpyrifos pesticide was ranged from 0.01 to 0.05 ppm. Iprodione pesticide was rangedfrom 0.01 to 0.03 ppm exept for Hero jam (J9, J10 and J11) were not deteacted. Pyrimethanil pesticide was rangedfrom 0.04 to 0.09;Ortho-phenyl pheno pesticide was rangedfrom l 0.10 to 0.13;

Thiabendazole pesticide was rangedfrom 0.04 to 0.13 and Imazalil pesticide was rangedfrom 0.08 to 0.18 ppm, respectively**(Keikotlhaile *et al* ., 2010**and **Hendawi *et al.*, 2013) .**

Rheological properties of some commercial types of local and imported jams:

Data presented in **Table (5)** showed that,the consistency coefficient **k** values decrease was from 18608 to 13038 mPa.s^n when the temperature was increase from 5 °C to 95°C for Vitrac strawberry, The consistency coefficient **k** values decrease was from 15563 to 9568 mPa.s^n when the temperature was increased from 5 °C to 95°C for Elrashidi El mizan strawberry, whiel Hero strawberry **k** values decrease from 20013 to 14631 mPa.s^n when the temperature was increased . The consistency coefficient **k** values decrease from 18700 to 13433 mPa.s^n when the temperature was increase from 5 °C to 95°C for Menz Gasser apricot, The consistency coefficient **k** values decrease was from 20044 to 12241 mPa.s^n when the temperature was increase from 5 °C to 95°C for Hartleys apricot, while Menz Gasser strawberry **k** values decrease was from 15173 to 10357 mPa.s^n when the temperature was increase, on the other hand **k** values decrease from 17391 to 13317 mPa.s^n when the temperature was increase for Altunsa strawberry at higher temperatures, due to rupture, the food structure becomes weak resulting in the lowering of yield stress **(El-Mansy*et al.*, 2005;Maceiras *et al.*, 2007 and Sharoba and Ramadan, 2011**).

Microbiological examination of some commercial types of local and importedjams:

Data presented in **Table (6)** showed that,revealed that the total viable bacterial count was 5 and 1.42x10^2 CFU/g for Elrashidi el mizan strawberry and Menz gasser apricot, respectively. On the other hand all Vitrac jam and all Hero jam sample were not detected in total viable bacterial count. On the contrary, the all imported jam ware higher for total viable bacterial count than the local jam**.** Yeasts and molds count was 9 and 75 CFU/g for Halwani bros fig and Menz gasser apricot, respectively. On the other hand, the all Vitrac jam and all Hero jam sample were not detected in Yeasts and molds. Osmophilic spore formers Yeasts and molds count were 2 and 41 CFU/g for Vitrac strawberry and Menz Gasser apricot, respectively.The microbiological results are in agreement with those obtained by**Ferreira *etal*. (2004) and Sallam (2016).**

Heavy metals of some commercial types of local and importedjams:

Data presented in **Table (7)** showed that,cadmium, mercury, arsenic, lead, and tin were not detacted in all commercial types of local and imported jams.On the other hand, zinc ranged from 0.2 to 1.8 ppm while, copper ranged from 0.2 to 1.4 ppm except forVitrac fig , El Rashidi El mizan fig and Hero fig were not detected. Cobalt was not detected in all jam samples except for strawberry and quince jams **(Verma *et al.*, 2016** and **Asema and Parveen, 2018)** .

Sensory evaluationof some commercial types of local and importedjams:

Data presented in **Table (8)** showed that, There were non significant difference ($p\leq0.05$) in appearance scores between all samples local and imported jams. On the other hand, taste score there were significant difference ($p\leq0.05$) between all jams samples. The highest taste score (18.71) was observed for Al rakyzen quince jam. While the lowest taste score (15.83) was observed for Hero apricot jam. Significant differences ($p\leq0.05$) were recorded in odor scores between all samples of jams. Odor score of all jam samples was significantly increase ($p\leq0.05$) from 7.50 for El Rashidi El mizan apricot jam to 9.38 for Vitrac strawberry jam. Also, mouth feel scores were non significant difference ($p\leq0.05$) between all jams samples but significant differences ($p\leq0.05$) were observed between all jams samples and Vitrac fig jam was (7.70) that may be to preference of panelists. Significant differences ($p>0.05$) were recorded in fruit distribution scores between all jam samples, while there were no significant differences ($p>0.05$) in overall acceptability scores between all jams samples except for Hero apricot jam was 82.78. These results are in agreement with those obtained by **(Abolila, 2015; Sallam, 2016; Naeem *et al.*, 2017** and **Abid *et.al*., 2018).**

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Table 4. Pesticide residues of some commercial types of local and importedjams:

Pesticide residues	Local and imported jams															
	J1	**J2**	**J3**	**J4**	**J5**	**J6**	**J7**	**J8**	**J9**	**J10**	**J11**	**J12**	**J13**	**J14**	**J15**	**J16**
Cypermethrin	0.02	0.02	0.01	0.03	0.04	0.03	0.03	0.04	ND	ND	ND	0.03	0.04	0.03	0.03	0.04
Lambda-cyhalothrin	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chlorpyrifos	0.01	0.01	0.01	0.04	0.03	0.05	0.03	0.03	0.01	0.01	0.01	0.03	0.03	0.04	0.05	0.04
Omethoate	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dimethoate	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbendazim	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Iprodione	0.01	0.01	0.01	0.03	0.02	0.03	0.03	0.02	ND	ND	ND	0.03	0.02	0.03	0.02	0.03
Fludioxonil	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Propargite	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cyprodinil	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Pyrimethanil	0.04	0.04	0.04	0.06	0.07	0.06	0.08	0.06	0.04	0.04	0.04	0.07	0.08	0.08	0.07	0.09
Ortho-phenyl phenol	0.1	0.1	0.1	0.12	0.11	0.13	0.12	0.12	0.1	0.1	0.1	0.13	0.14	0.13	0.12	0.13
Thiabendazole	0.07	0.08	0.07	0.11	0.12	0.13	0.12	0.13	0.05	0.04	0.05	0.12	0.11	0.13	0.12	0.13
Imazalil	**0.12**	**0.12**	**0.11**	**0.12**	**0.13**	**0.14**	**0.13**	**0.15**	**0.08**	**0.09**	**0.10**	**0.2**	**0.18**	**0.17**	**0.15**	**0.18**

J1(Vitrac Strawberry 450gm), J2(Vitrac Apricot 450gm), J3(Vitrac Fig 450gm), J4(El Rashidi El Mizan Strawberry 340 gm), J5 (El Rashidi El Mizan Apricot 340 gm) , J6 (El Rashidi El Mizan Fig 340 gm), J7 (Halwani Bros Apricot 750 gm), J8 (Halwani Bros Fig 380 gm), J9(Hero Strawberry 340 gm), J10(Hero Apricot 340 gm), J11(Hero Fig 340 gm), J12(Menz Gasser Apricot 340 gm), J13(Menz Gasser Strawberry 340 gm), J14(Hartleys Apricot 340 gm), J15(Altunsa Strawberry 380 gm) and J16(Al Rakyzen Quince 360 gm).

Table 5. Rheological properties of some commercial types of local and importedjams:

Local and imported jams	Temp. (°C)	Power law		
		K	n	R^2
Vitrac strawberry	5	18608	0.694	0.971
	25	14768	0.607	0.917
	90	13038	0.527	0.928
Vitrac apricot	5	20285	0.897	0.986
	25	17870	0.772	0.962
	90	16536	0.636	0.969
Vitrac fig	5	27108	0.742	0.999
	25	22075	0.669	0.952
	90	17761	0.574	0.958
Elrashidi El mizan strawberry	5	15563	0.804	0.957
	25	14116	0.526	0.965
	90	9568	0.488	0.993
El rashidi El mizan apricot	5	17801	0.661	0.979
	25	13660	0.610	0.998
	90	11212	0.472	0.952
El rashidi El mizan fig	5	17541	0.711	0.986
	25	13788	0.638	0.962
	90	10931	0.431	0.969
Halwani Bros apricot	5	18351	0.729	0.997
	25	17516	0.619	0.951
	90	16099	0.589	0.948
Halwani bros fig	5	15405	0.753	0.957
	25	14848	0.706	0.965
	90	13619	0.626	0.993
Hero strawberry	5	20013	0.722	0.979
	25	16106	0.621	0.998
	90	14631	0.559	0.952
Hero apricot	5	21910	0.857	0.986
	25	18290	0.823	0.962
	90	16219	0.698	0.969
Hero Fig	5	26665	0.721	0.997
	25	17506	0.643	0.958
	90	15671	0.539	0.988
Menz gasser apricot	5	18700	0.608	0.978
	25	15293	0.517	0.967
	90	13466	0.437	0.962
Menz gasser strawberry	5	15173	0.570	0.965
	25	12735	0.554	0.960
	90	10357	0.399	0.985
Hartleys apricot	5	20044	0.647	0.970
	25	17574	0.601	0.953
	90	12241	0.381	0.957
Altunsa strawberry	5	17391	0.543	0.987
	25	15963	0.514	0.996
	90	13317	0.364	0.980
Al rakyzen quince	5	16582	0.611	0.967
	25	15030	0.480	0.962
	90	14925	0.437	0.965

Where:

(k): Consistency index (mPa.s^n) **(n):** Flow index (dimensionless).

(R^2): Correlation coefficients**.**

Table 6. Microbiological quality of some commercial types of local and imported jams (CFU/g).

local and imported jams	Microbiological examination			
	TVBC*	Y&M**	OsmophilicYeast and molds	Coliform group
Vitrac strawberry	ND	ND	2×10	ND
Vitrac apricot	ND	ND	5×10	ND
Vitrac fig	ND	ND	4×10	ND
El Rashidi El mizan strawberry	5×10	12×10	5×10	ND
El Rashidi El mizan apricot	7×10	14×10	7×10	ND
El Rashidi El mizan fig	8×10	16×10	9×10	ND
Halwani Bros apricot	6×10	10×10	6×10	ND
Halwani Bros fig	5×10	9×10	7×10	ND
Hero strawberry	ND	ND	2×10	ND
Hero apricot	ND	ND	3×10	ND
Hero fig	ND	ND	3×10	ND
Menz Gasser apricot	1.42×10^2	75×10	41×10	ND
Menz Gasser strawberry	1.17×10^2	62×10	35×10	ND
Hartleys apricot	1.28×10^2	68×10	38×10	ND
Altunsa strawberry	1.32×10^2	71×10	40×10	ND
Al Rakyzen quince	1.14×10^2	59×10	37×10	ND

* (TVBC) Total viable bacterial count
** Yeasts and MoldsND: Not detected.

Table 7. Heavy metals of some commercial types of local and importedjams (mg/Kg):

local and imported jams	Heavy metals							
	Cadmium	mercury	Arsenic	Lead	Copper	Cobalt	Zinc	Tin
Vitrac strawberry	ND	ND	ND	ND	0.8	0.2	1.6	ND
Vitrac apricot	ND	ND	ND	ND	0.2	ND	0.4	ND
Vitrac fig	ND	ND	ND	ND	ND	ND	0.6	ND
El Rashidi El mizan strawberry	ND	ND	ND	ND	0.10	0.1	1.2	ND
El Rashidi El mizan apricot	ND	ND	ND	ND	0.6	ND	0.5	ND
El Rashidi El mizan fig	ND	ND	ND	ND	ND	ND	0.3	ND
Halwani Bros apricot	ND	ND	ND	ND	0.4	ND	1.8	ND
Halwani Bros fig	ND	ND	ND	ND	ND	ND	0.9	ND
Hero strawberry	ND	ND	ND	ND	0.6	0.2	1.5	ND
Hero apricot	ND	ND	ND	ND	0.4	ND	0.2	ND
Hero fig	ND	ND	ND	ND	ND	ND	0.7	ND
Menz Gasser apricot	ND	ND	ND	ND	0.2	ND	0.7	ND
Menz Gasser strawberry	ND	ND	ND	ND	0.8	0.1	1.3	ND
Hartleys apricot	ND	ND	ND	ND	0.6	ND	0.9	ND
Altunsa strawberry	ND	ND	ND	ND	0.8	0.2	1.5	ND
Al Rakyzen quince	ND	ND	ND	ND	1.4	0.3	1.6	ND

ND: Not detected.

Table 8. Sensory evaluation of some commercial types of local and imported jams (mean ±SE):

local and imported jams	**Properties**							
	Appearance (10)	**Consistency (20)**	**Color (20)**	**Taste (20)**	**Odor (10)**	**Mouth feel (10)**	**Fruit distribution (10)**	**Overall acceptability (100)**
Vitrac strawberry	8.79±0.23^{ab}	18.56±0.26^{a}	18.44±0.29^{ab}	17.82±0.40^{abc}	9.38±0.16^{ab}	8.44±0.26^{ab}	8.06±0.30^{bcd}	90.38±1.14^{a}
Vitrac apricot	8.36±0.30^{ab}	17.61±0.42^{a}	18.10±0.47^{ab}	16.42±0.61^{bcd}	8.48±0.30^{bcde}	8.23±0.39^{ab}	7.53±0.42^{d}	84.84±2.30^{ab}
Vitrac fig	7.77±0.32^{b}	17.23±0.39^{a}	17.83±0.33^{ab}	17.33±0.36^{abc}	8.50±0.33^{bcde}	7.70±0.29^{b}	7.83±0.32^{cd}	84.82±1.58^{ab}
El Rashidi El mizan strawberry	8.92±0.25^{a}	18.61±0.25^{a}	18.65±0.31^{ab}	18.13±0.48^{ab}	8.71±0.32^{abcd}	8.87±0.27^{a}	8.61±0.23^{abc}	90.58±1.69^{a}
El Rashidi El mizan apricot	8.74±0.20^{ab}	17.77±0.41^{a}	17.60±0.49^{ab}	15.30±0.77^{d}	7.50±0.33^{e}	8.10±0.49^{ab}	8.33±0.30^{abcd}	85.33±2.06^{ab}
El Rashidi El mizan fig	8.58±0.28^{ab}	18.13±0.41^{a}	17.94±0.40^{ab}	16.84±0.60^{abcd}	8.29±0.34^{cde}	8.45±0.28^{ab}	8.77±0.24^{abc}	85.34±1.87^{ab}
Halwani Bros apricot	8.71±0.32^{ab}	17.26±0.49^{a}	17.90±0.40^{ab}	18.00±0.33^{ab}	8.87±0.26^{abcd}	8.39±0.29^{ab}	8.77±0.28^{abc}	88.00±1.41^{ab}
Halwani Bros fig	8.24±0.43^{ab}	18.06±0.45^{a}	18.00±0.34^{ab}	17.48±0.46^{abc}	9.03±0.20^{abcd}	9.00±0.23^{a}	9.29±0.21^{a}	91.00±1.40^{a}
Hero strawberry	8.85±0.23^{ab}	18.24±0.44^{a}	19.00±0.23^{a}	17.39±0.53^{abc}	9.21±0.25^{abc}	8.73±0.25^{ab}	9.00±0.19^{ab}	89.44±1.47^{a}
Hero apricot	8.83±0.24^{ab}	17.34±0.42^{a}	17.34±0.42^{b}	15.83±0.54^{cd}	8.00±0.33^{de}	8.17±0.31^{ab}	8.34±0.30^{abcd}	82.78±1.75^{b}
Hero fig	8.80±0.23^{ab}	17.78±0.48^{a}	17.41±0.32^{ab}	18.41±0.32^{ab}	9.13±0.20^{abc}	8.94±0.24^{a}	8.56±0.29^{abc}	88.86±1.37^{a}
Menz Gasser apricot	8.92±0.29^{a}	18.00±0.43^{a}	18.00±0.28^{ab}	16.55±0.62^{bcd}	8.40±0.29^{bcde}	8.48±0.25^{ab}	8.90±0.22^{ab}	88.07±1.49^{ab}
Menz Gasser strawberry	9.28±0.22^{a}	18.00±0.47^{a}	17.63±0.47^{ab}	17.47±0.59^{abc}	9.34±0.23^{abc}	9.22±0.19^{a}	9.38±0.15^{a}	89.22±1.80^{a}
Hartleys apricot	8.96±0.43^{a}	18.37±0.23^{a}	18.23±0.42^{ab}	17.68±0.43^{abc}	8.97±0.26^{abcd}	8.82±0.24^{ab}	9.07±0.24^{ab}	90.13±1.38^{a}
Altunsa strawberry	9.00±0.31^{a}	18.14±0.34^{a}	18.29±0.29^{ab}	18.00±0.31^{ab}	9.57±0.20^{a}	9.14±0.14^{a}	8.43±0.30^{abcd}	90.21±1.10^{a}
Al Rakyzen quince	9.00±0.31^{a}	17.71±0.18^{a}	17.57±0.37^{ab}	18.71±0.47^{a}	8.43±0.20^{bcde}	9.00±0.38^{a}	8.86±0.46^{abc}	89.07±0.88^{a}

a, b & c: There is no significant difference (P>0.05) between any two means, within the same column have the same superscript letter.

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التقييم الكيميائى والحسى والأمان الميكروبيولوجى لبعض أنواع المربى المحلية والمستوردة فى السوق المصرى

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تم في هذه الدراسة إجراء دراسة مسحية لبعض أنواع المربى المنتشرة فى السوق المصرى محلية الصنع وهى مربى فيتراك (فراولة ، مشمش و تين) ومربى الرشيدى الميزان (فراولة ، مشمش و تين) و مربى حلوانى إخوان (مشمش وتين) ومربى هيرو (فراولة ، مشمش و تين) وبعض العينات المستوردة والتى تباع بالسوق المصرى وهى مربى فراولة ومشمش مينز إيطالى ومربى مشمش هرتيليز إنجليزية ومربى فراولة التونسا التركية ومربى الكمثرى الراكيزين عراقية.تم إجراء التحليلات الكيميائية والخواص الطبيعية وكانت مربى فراولة التونسا التركية أعلى فى المحتوى الرطوبى ٣٧.٤٧٪ بينما كانت أقلهم مربى مشمش هرتيليز إنجليزية ٣٠.٥٠٪ بينما مربى فراولة التونسا التركية أعلاها فى السكريات الكلية ٥٨.٥٣٦٪ وأقلهم مربى مشمش مينز إيطالى ٥٤.٢٤٪. وتم إجراء التقييم الحسى لعينات المربى المحلية والمستوردة من حيث(المظهر، اللون ،الطعم ،الرائحة ،الشعور بالفم ، توزيع الفاكهة والقابلية العامة) ووجد أن عينات المربى المحلية والمستوردة كانت جميعها مقبولة حسيا حيث تروا‌حت قيم القابلية العامة لهذه المربات بين ٨٤,٨٢ إلى ٩١,٠٠ لكل من مربى تين فيتراك و مربى تينحلوانى إخوان ، كما تم تقدير الأمان الغذائى لعينات المربى محل الدراسة حيث كانت جميع المربات المحلية والمستوردة خالية من كا من المعادن الثقيلة مثل الكادميوم ،الزئبق ،الزرنيخ ،الرصاص ،القصديرو الكوبالت ومتبقى المبيدات ،وأظهرت النتائج المتحصل عليها أن السلوك الريولوجى لعينات المربى المحلية والمستورد كانت تسلك السلوك الغير النيوتينى من نوعية البلاستيكى الكاذبوكذلك تم تقييم عينات المربى المحلية والمستورد من حيث الجودة الميكروبيولوجية حيث بتقدير العدد الكلى للبكتيريا ، بكتيريا القولون وعدد الخمائر والفطريات وأظهرت النتائج خلو جميع المربات من بكتيريا القولون مما يثبت أن المعاملة الحرارية التى تم إجراءها أثناء تصنيع المربى كانت مناسبة. وقد إتضح من النتائج المتحصل عليها ان المربى المحلية كانت افضل من المربى المستوردة وكلاهما يتطابق مع المواصفات القياسية المصرية ومواصفة الكودكس .

الكلمات المساعدة : المربى ، التركيب الكيماوى، الجودة الميكروبيوجية، متبقى المبيدات ، المعادن الثقيلة ، الخواص الريولوجية ، التقييم الحسى .