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Total Carbohydrate, Total Protein, Minerals and Amino Acid contents in Fruits, Pulps and Seeds of Some Cultivars of Muskmelon and Watermelon Fruit Samples Collected from Al-Marj Region, Libya

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ABSTRACT

The aim of this study was to evaluate some chemical properties of Muskmelon and watermelon fruits, peels and seeds for their contents of some minerals, carbohydrates, proteins and amino acids from four locations around Al-Marj town (Al-Gabal Al-Akhder) namely Farzogha, Botraba, Sidi Arhoma and Al-Ewilia locations in Al-Marj plain. The results revealed that the fruits, peels and seeds from different locations contain Na, K, Fe and Cu percent higher than Ca, Ni and P contents. For the carbohydrate and protein contents, the obtained results revealed that there is no high difference between the highest values (12.22 ppm) for fruits from Al-Ewilia location (F4) and the lowest value (2.44 ppm) for seeds of Al-Ewilia location (S4) for all parts of the samples. For the protein content, all parts of fruits of muskmelon and watermelon exhibited higher values of protein contents than peels and seeds contents. Ten amino acid which they were had been detected in all parts of watermelon and muskmelon samples included: glycine, serine, isoleucine, Lucien, methionine, glutamine, asparagine, phenylalanine, tyrosine and cysteine.

Keywords: Carbohydrate; Protein; Amino acids; Watermelon; Muskmelon

INTRODUCTION

Watermelon (family Cucurbitaceae and species *Citrullus lanatus*) is a major fruit widely distributed in the tropics and sub tropic regions. It is one of the most important vegetable crops and has large, round, oval or oblong fruit shape, the skin is smooth, with dark green rind or sometimes pale green stripes that turn yellowish green when ripe. It can be used for breakfast as appetizer or snack and (*Citrulus lanatus*) is a popular thirst quencher during hot summer weather. Watermelon or scientifically known as *Citrullus lanatus* is among the favourite fruits for many people in the world. It is mainly composed of water, which is about 6% sugar and 92% water by weight. Watermelon belongs to Cucurbitaceae Family under Genus *Citrullus* Cucurbitaceae is a family that comprises of approximately 120 genera and over 900 species which is vastly distributed in tropical and subtropical regions of, Asia, Australia, Africa and America. They are collectively known as ground or cucurbits, which include watermelon, melon, cucumbers and pumpkins and so on. Watermelon (*Citrullus lanatus*) is the main world crop in the Cucurbitaceae family (~40%), followed by cucumber (*Cucumis sativus*) (~27%), melon (*Cucumis melo*) (~20%) and pumpkin (Cucurbita) (~13%), respectively.

Muskmelon (*Cucumis melo*) is an annual herbaceous plant belonging to the family of Cucurbitaceae (Cucurbit). Muskmelon (*Cucumis melo*) is an annual, drooping herbaceous plant that is distinguished by a short angular stem woody rootstock with bristly hairs large belonging to the family of Cucurbitaceae (Cucurbit), one of the most genetically diverse groups of food plants that are drought tolerant. It originated from Europe and Africa before spreading to other parts of the world. It is a bright yellow melon with a pale green to white inner flesh which is succulent and juicy. It is largely consumed as refreshing summer fruit, much appreciated by the consumers because of its refreshing capability, attractive color, delicate taste and high water content to quench the summer theist Study of fruit's nutritional profile reported the rich presence of water (92%), carbohydrates (7.5%), out of which (6.2 %) are sugars and (0.4 %) dietary fiber. The fruit is rich in carotenoid, vitamin C, citrulline, carotenoid, flavonoids and fat and cholesterol free [1].

Watermelon consumption results in generation of organic waste in the form of seeds and peels watermelon (*Citrullus lanatus*) is a globally cultivated fruit valued for its sweet flavor, high water content and low calorific value. However, while watermelon seeds are used in some regions of Asia for snacks and flour and watermelon peels are sometimes pickled or used as a cooked vegetable, both resources are more frequently discarded generating huge quantities of undervalued seed and peel wastes. Watermelon contains about 30% of rind, 68% of flesh or pulp and 2% of seeds. The rind is usually discarded, it may be applied to feeds or used as fertilizer; but it is also edible and may be used as a vegetable. The inner portions of the rind which is usually light green or white contains many hidden nutrients and is also edible; however, most times it is avoided due to its

unappealing flavor. It contains mainly citrulline which is a known stimulator of nitric oxide. Minerals are natural inorganic substances that possess definite chemical composition and atomic structure and nearly five percent of human body is composed of inorganic materials, the minerals. They are present in all body tissues and fluids and their presence is necessary for the maintenance of certain physicochemical processes which are essential to life. Minerals are chemical constituents used by the body in many ways. Although they yield no energy, they have important roles to play in many activities in the body [2]. Various physiological functions had been ascribed to these elements. For instance, Ca helps to regulate muscle contraction, transmit nerve impulse and bone formation. Magnesium has been established to be required by many enzymes, particularly the sugar and protein kinase families that catalyze ATP-dependant phosphoylation reaction. In addition, the fruits can act as very good sources of alternative nutrients to compliment the deficiency of these nutrients from other food sources, since they are known to be excellent sources of polysaccharides, sugars, vitamins, minerals and organic acids which provide their wonderful taste and excellent health properties; Also contain carbohydrates in the form of soluble sugars, cellulose and starch. Approximately 50%-80% of the total dry matters of fruits are carbohydrates, usually in the form of simple sugars (glucose, fructose and sucrose) that contribute to a sweet taste. Carbohydrates perform numerous roles in living things. Polysaccharides serve for the storage of energy and as structural components the 5-carbon monosaccharide Saccharides and their derivatives include many other important biomolecules that play key roles in the immune system, fertilization, preventing pathogenesis, blood clotting and development. Amino acids are the building blocks of peptides and proteins. They possess two functional groups, the carboxylic acid group gives the acidic character and the amino group provides the basic character. Proteins are composed of different amino acids and hence the nutritional quality of a protein determined by the content, proportion and availability of its amino acids. This study aims to evaluate the contents of total carbohydrate, total protein, amino acids and Minerals in Muskmelon and watermelon samples collected from some of Libya regions [3].

MATERIALS AND METHODS

Area of samples collection

Fresh watermelon and Muskmelon fruits samples were collected from four locations around Al-Marj city, northeastern Libya. The Al-Marj plain lie at the western side of Al-Gabal Al-khder, near the Mediterranean coast. Al-Marj is the commercial center for the surrounding plain, which has 16 inches (400 mm) of rain per year and produces cereals (barley and wheat), fruits and vegetables. Three muskmelon fruit samples were collected from Farzoogha, Botraba and Sidi Arhoma locations, while one watermelon fruit samples were collected from Al-Ewilia location [4].

Sample preparation

Fruits of different watermelon and muskmelon local varieties were collected from selected locations during the Month of April, 2022. The samples were brought to the department of plant biology herbarium unit for authentication. Each parts of different locations were categorized and give a symbol as shown in the Table 1 [5].

Table 1: Locations, part of fruits and symbol of each.

Location	Part of fruit	Symbol
Farzogha	Fruits of muskmelon	F1
	peels of muskmelon	P1
	Seeds of muskmelon	S1
Botraba	Fruits of muskmelon	F2
	Peels of muskmelon	P2
	Seeds of muskmelon	S2
Sidi Arhoma	Fruits of muskmelon	F3
	peels of muskmelon	P3
	Seeds of muskmelon	S3
Al-Ewilia	Fruits of watermelon	F4
	Peels of muskmelon	P4
	Seeds of watermelon	S4

The collected fruits were washed by distillated water and later rinsed several times with distilled water before subjecting them to analysis. Fresh samples of fruits were sliced with cleaned knife to separate the peels from the pulp. The seeds were carefully removed from the pulp. The peels were chopped into tiny cubes while the fruits was shredded Each sample was transferred into a tray lined with foil, labeled appropriately and preserved in laboratory fridge at 4°C before subjecting them to nutritional analysis [6].

Determination of metals and minerals: The metals off (Cu, Fe and Ni), were determined with an atomic absorption (Perkin Elmer 800) according to the method described by. Soluble sodium and potassium contents measured by a flame photometer (JENWAY flame photometer) according to the method described by at central lab of faculty of science, Omar Al Mukhtar university.

Determination of carbohydrate: It was carried out as follows: One gram of each powdered sample was defatted with petroleum ether, then extracted with hot 80% ethanol twice. The combined extracts were evaporated till dryness, the dried residues were dissolved in 10 ml of 10 % aqueous isopropanol in a volumetric flasks. One ml of sample containing the equivalent of 20-100 µg glucose was pipetted into thick walled test tubes of 16 mm-20 mm diameter. A reagent blank containing 1ml of water and a set of glucose standards (e.g., 25, 50 and 75 µg glucose, in a volume of 1 ml) were prepared at the same time. One ml of 5.0% (W/ V) phenol was added to all tubes and mixed then from a fast flowing it was added 5 ml of concentrated sulphuric acid, directing the stream of acid on the surface of the liquid and shaking the tube simultaneously, to effect fast and complete mixing. The tubes were allowed to stand 10 min shaken and placed in water bath 25°C to 30°C for to 20 min. before readings were taken. The colour was stable for several hours. The absorbance of characteristic yellow colour measured at 490 nm and followed Beer's law of standard calibration curve of glucose [7].

Estimation of total soluble protein: Crude protein was determined by converted total nitrogen to total protein (Total N × 6.25) and protein was expressed as mg protein/g.

Estimation of amino acids: A dry defatted sample of 0.1 g was hydrolyzed with 10 ml of 6 N HCl in sealed tubes for 24 hrs. at 110°C. After

hydrolysis, the excess HCL was removed by evaporation under vacuum with occasional addition of water. The residue was dissolved in sodium citrate buffer PH 2.2 and any insoluble matter is filtered off. The optically clear solution (30 µl) is chromatographic in an amino acid analyzer, at unit of analysis and scientific services, faculty of agriculture, Alexandria university.

RESULTS AND DISCUSSION

Table 2 showed the mineral contents (ppm) in seed extracts for all parts of watermelon and muskmelon samples. It was a clear that the seeds from different locations contain Na, K, Fe and Cu percent higher than Ca, Ni and P contents. The highest content was 54.76 ppm for Cu content in seeds from Botraba location (S2), while the lowest content was 2.95 ppm for P content in seeds from Botraba location (S2) too [8-10].

Table 2: Minerals contents (ppm) in seed extracts.

Sample	Na	K	Ca	Fe	Cu	Ni	p
S1	27.3	23.2	8.7	47.94	27.66	5.8	4.2
S2	26.82	28.7	9.6	21.38	54.76	5.324	2.95
S3	29.4	31.8	9.31	18.65	50.4	5.171	3.16
S4	26.5	27.44	8.72	17.4	38.18	5.736	3.8

Table 3 showed the minerals content (ppm) in peels extracts, it was a clear that the same trend for seed contents happened where the peels from different locations contain Na, K, Fe and Cu percent higher than Ca, Ni and P contents, Cu percent was higher than any minerals for all locations ranged between 51.04 ppm for peels from Botraba location (P2) to 47.98 ppm for peels from Sidi Arhoma location (P3) followed by K percent which ranged between 46.18 ppm in peels from Al-Ewilia location (P4) to 38.20 ppm in peels from Sidi Arhoma location (P3), while the lowest percent was 1.98 ppm for P content in peels from Botraba location (P4).

Table 3: Minerals contents (ppm) in pulp extracts.

Sample	Na	K	Ca	Fe	Cu	Ni	p
P1	19.25	41.15	7.14	24.2	50.24	5.96	2.15
P2	20.71	43.19	6.8	18.69	51.04	5.41	1.98
P3	22.3	38.2	6.45	18.09	47.98	7.36	2.3
P4	18.5	46.18	6.16	18.6	49.75	5.25	2.25

Table 4 showed the minerals content (ppm) in fruit extracts, it was a clear that the same trend for seed and peels contents happened in fruits contents where the K percent recorded the highest contents comparing with other minerals in all locations followed by Na contents, it was also note that the Ca, Fe and Cu percents in fruit were lower comparing to seeds and peels from different locations.

Table 4: Minerals contents (ppm) in fruit extracts.

Sample	Na	K	Ca	Fe	Cu	Ni	p
F1	19.2	55.14	10.3	10.61	4.27	1.684	1.57
F2	27.14	53.2	11.18	6.17	14.44	0.812	2.2
F3	25.7	60.15	13.15	6.25	7.98	9.93	1.7
F4	28.31	59.3	10.9	12.16	3.95	1.849	2.06

Olayinka. and Etejere, 2018 showed that the iron of these samples were relatively high with *Citrullus lanatus* pulp having the highest value of 0.242 ppm compared with *Cucumis sativus* pulp 0.074 ppm with the least value. Concentrations of magnesium, potassium, calcium and sodium were higher in *Citrullus lanatus* when compared to *Cucumis sativus*. The nutrient composition of the seeds of two cultivars of *Citrullis lanatus* ('Rhotmas' and 'Sugar Baby'), they found that Iron, copper, zinc, calcium and magnesium ranged from 191 to 211, 20.12 to 35.03, 68.97 to 92.57, 98.79 to 233 and 79.75 to 123.9 mg/kg, respectively. There are a large number of seeds in the center of the melon. The melon seeds (*Citrullus lanatus*) have high mineral contents (mg/100 g). The contents of zinc in the melon seed is 21.05 mg/100 g and that of magnesium is up to 20.46 mg/100 g. The analysis of minerals showed that more value is for iron which is 144.7 mg/100 g, zinc 21.05 mg per 100 g manganese 22.73 mg per 100 g, per 100 g. The concentration of calcium is least among of all which is 0.10 mg/100 g. The sodium to potassium ratio is 0.043 and the calcium to phosphorus ratio is 0.002 (Jacob, et al., 2015). The carbohydrate and protein contents (ppm for all parts of watermelon and muskmelon samples were shown in Table 5. For the carbohydrate content, the obtained results revealed that there is no high difference between the highest values (12.22 ppm) for fruits from Al-Ewilia location (F4) and the lowest value (2.44 ppm) for seeds of Al-Ewilia location (S4) for all parts of the samples. For the protein contents the obtained results revealed that protein contents were very low which ranged between the lowest concentrations (0.23 ppm) in seed of muskmelon from Farzogha location (S1) to the highest concentration (0.92 ppm) in fruits of watermelon from Al-Ewilia location (F4). It was worth noting that all parts of fruits muskmelon and watermelon exhibited higher values of protein contents than pulps and seeds contents. The composition of the flesh, seed and rind vary considerably. One hundred grams of watermelon flesh was analyzed and found to contain 92.6 g water,

0.5 g protein, 0.2 g fat, 6.4 g total carbohydrates, 0.3 g fiber, 0.3 g ash and a number of vitamins and minerals including 0.7 mg calcium, 590 International Unit (IU) vitamin A, 0.03 mg thiamine, 0.03 mg riboflavin, 0.2 mg niacin and 7 mg ascorbic acid [11].

Table 5: Total carbohydrate and total protein content (ppm) in the studied samples.

Sample	Code	Carbohydrates	Protein
	S1	5.22	0.23
	S2	6.94	0.54
	S3	6.26	0.39
seeds	S4	2.44	0.5
	P1	6.49	0.49
	P2	3.61	0.47
	P3	5.66	0.53
peels	P4	6.33	0.5
	F1	3.83	0.87
	F2	4.43	0.76
	F3	8.95	0.82
fruits	F4	12.22	0.92

The fruits can act as very good sources of alternative nutrients to compliment the deficiency of these nutrients from other food sources, since they are known to be excellent sources of polysaccharides, sugars, vitamins, minerals and organic acids which provide their wonderful taste and excellent health properties. Also contain carbohydrates in the form of soluble sugars, cellulose and starch. Approximately 50%-80% of the total dry matter of fruits is carbohydrates, usually in the form of simple sugars (glucose, fructose and sucrose) that contribute to a sweet taste. The crude protein content range of whole water melon seeds between13.5% and 16.4% which is contrary as finding of Purseglove (1968) that reached to a range of 25%-32% kernel of watermelon seeds contained about 40.5%, 24.55% and 39% crude protein for an Egyptian, Iranian and Chinese varieties, respectively. Carbohydrates are polar compounds which are readily converted into glucose as source of energy. Differences in percentages of protein, lipid, fibre, moisture, ash and carbohydrate contents in comparison to the present results could likely be attributed to varietal and regional/soil differences. The proximate chemical composition of the rind (exocarp) from the pulp (mesocarp) of the *Citrullus lanatus* cv Red (Watermelon) and *Cucumis sativus* cv Pipino, they found that the protein content were 0.53% and 0.34% for rind and pulp of *Citrullus lanatus*, while were 0.86% and 0.77% for rind and pulp of *Cucumis sativus* respectively. On the other side, the carbohydrates content which measured by difference were 5.22% and 4.23% for rind and pulp of *Citrullus lantus*, while were 1.85% and 1.28% for rind and pulp of *Cucumis sativus* respectively. The proximate composition of watermelon cultivars 'Rothmas' and 'sugar baby' and egusi melon (*C. colocynthis*) seeds, they found that carbohydrate (by difference) was 5.57%, 10.5% and 8.33% for and crude protein contents was 25.18%, 22.79% and 19.16% for watermelon cultivars 'Rothmas ' and 'sugar baby' and egusi melon (*C. colocynthis*) respectively.

The quality of plant foods depends not on only on the protein content but also on the proportion of essential amino acids. From the obtained data in Table 6, it could be noticed that the contents (ppm) of amino acids in seed, fruit and peel of watermelon and muskmelon samples revealed that ten amino acids which they were had been detected in all parts of watermelon and muskmelon samples included: Glycine (Gly), Serine (Ser), Isoleucine (Isoleu), Leucine (Leu), Methionine (Meth), Glutamine (Glu), Aspargine (Asp), Phenylalanine, (Ph ala), Tyrosine (Tyr) and Cysteine (Cys). Sixteen amino acids when they determined the amino acid profile of *Citrullis lanatus* (watermelon) and *Citrullus colocynthis* (egusi melon) seeds in Nigeria. On the other side, glutamine was the dominant non-essential amino acids in all watermelon and muskmelon parts. Moreover, most of the amino acid values are comparable with those of most protein values determined by many investigators [12].

Table 6: The contents of amino acids (ppm) in seeds, pulps and fruits of watermelon and muskmelon samples.

Code of samples	Amino acids (ppm)									
	Glu	Asp	Leu	Isoleu	Gly	Ser	Meth	Cyst	tyr	Ph ala
S1	0.732	0.54	0.084	0.029	0.28	0.067	0.028	0.019	0.26	0.4
S2	0.84	0.62	0.072	0.041	0.37	0.09	0.047	0.035	0.099	0.023
S3	0.55	0.442	0.082	0.031	0.28	0.06	0.038	0.029	0.105	0.04
S4	0.71	0.525	0.075	0.02	0.4	0.08	0.02	0.047	0.21	0.038
P1	0.58	0.22	0.045	0.071	0.09	0.08	0.06	0.02	0.045	0.19
P2	0.492	0.18	0.32	0.06	0.085	0.079	0.042	0.031	0.039	0.02
P3	0.64	0.179	0.041	0.035	0.079	0.06	0.05	0.029	0.025	0.017
P4	0.721	0.182	0.082	0.042	0.08	0.057	0.032	0.026	0.021	0.01
F1	0.82	0.312	0.084	0.025	0.143	0.091	0.085	0.066	0.072	0.043
F2	0.932	0.471	0.065	0.038	0.253	0.084	0.058	0.049	0.067	0.018
F3	0.72	0.541	0.059	0.044	0.36	0.094	0.04	0.5	0.067	0.018
S1	0.693	0.672	0.074	0.041	0.372	0.053	0.061	0.027	0.14	0.031

More than 300 amino acids have been found in nature, of which 20 are engaged in protein synthesis and are known as protein genic amino acids proteinogenic amino acids exist in two structures: In a free state in physiological liquids (e.g., plasma, urine) and food (e.g., wine, beverage) which

bound in peptides or proteins. This suggests variety happens as indicated by genotype and the geographical and environmental conditions in which watermelons are developed. The essential amino acids (histidine, leucine, lysine, methionine, phenylalanine, tryosine and valine ranged between 1.8%-3.6%, 5.5%-9.1%, 3.7%-6.7%, 0.4%-1.1%, 4.1%, 6.4%, 0.8%-7.2% and 5.5%-7.6% in the various parts which include watermelon plant, roots, stems, leaves, green crust, white crust, kernels and seeds of watermelon plan.

CONCLUSION

From the data which obtained in this study, one may be concluded that: Libyan watermelon and muskmelon parts (peels, seeds and fruits) showed that all parts have moderate to moderate contents of some minerals, carbohydrates, proteins and amino acids. The study conclude that these parts of watermelon and muskmelon have high nutritional value which can used in many food industries instead of expel these waste (peels and seeds) lead to environmental pollution.

REFERENCES

[1] Al-Khalifa AS. J Agric Food Chem. **1996**; 44(4): p. 964-946.
[2] Aremu MO, Olonisakin A, Otene IW, et al. Orient J Chem. **2005**; 21(3): p. 419.
[3] Artés-Hernández F, Robles PA, et al. Postharvest Biol Technol. **2010**; 55(2): p. 114-120.
[4] Kamel BS, Dawson H, Kakuda Y. J Am Oil Chem Soc. **1985**; 62(5): p. 881-883.
[5] Becker EW. Biotechnol Adv. **2007**; 25(2): p. 207-210.
[6] El-Adawy TA, Taha KM. J Agric Food Chem. **2001**; 49(3): p. 1253-1259.
[7] Erhirhie EO, Ekene NE. Int J Pharm Res. **2013**; 4(4): p. 1305-1312.
[8] Fales F. J Biol Chem. **1951**; 193(1): p. 113-124.
[9] Hasan HH, Habib IH, Gonaid MH, et al. J Nat Prod Plant Resour. **2011**; 1(1): p. 15-23.
[10] Jacob AG, Etong DI, Tijjani A. Br J Res. **2015**; 2(5): p. 142-151.
[11] Maoto MM, Beswa D, Jideani AI. Int J Food Prop. **2019**; 22(1): p. 355-370.
[12] Nahar N, Rahman S, Mosihuzzaman M. J Sci Food Agric. **1990**; 51(2): p. 185-192.