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Physico-Chemical, Phytochemical, and Sensory Attributes of A New Functional Drinks Prepared From Carrot and Lassora Fruits

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Abstract

The goal of this study was to assess how frozen storage at -18°C for a year affected the quality attributes of drinks made from carrot and lassora fruits. Three types of drinks were prepared: carrot drink (CDr), lassora drink (LDr), and three carrrot-lassora drinks (CLDr), which contained mixed carrot drink and lassora drink with ratios of 3:1, 1:1, and 1:3 v/w, respectively. The drinks were pasteurised at 90ºC for five minutes and then frozen for a period of time of 12 months. At zero time of storage, approximate chemical compositions were determined. At 0, 6 and 12 months of storage, total solids, viscosity, pH, titratable acidity, colour, phytochemical composition, and sensory attributes were determined. Based on the sensory evaluation, the best combination was chosen, and its physico-chemical and sensory attributes were assessed. Carrot drink and lassora drink (CLDr 1:3) showed 18,32 cPs Viscosity, 0.201% titrable acidity, 25.60 % total sugar, 6.8 mg/100ml ascorbic acid, 10,99°Brix TSS, 4.43 pH, 290.40 mg/100g total phenolic,61.40% antioxidant activity and acceptable sensory qualities without any significant lose in the quality attributes at the end of 12 months' storage at -18°C freezing condition. In conclusion, the physico-chemical qualities of the resulting drinks were enhanced by combining the carrot and lassora drinks. Blending resulted in significant increases in total solids, viscosity, and lightness when compared to CDr; also, the flavour and acceptance of the CLDr were superior. Conversely, the CLDr outperformed the CDr and LDr in terms of sensory and colour retention following a 12-month period of freezing storage at -18 °C.

Keywords: *Cordia dichotoma*, *Dascus carota*, phytochemical, physico-chemical, sensory qualities.

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1. Introduction

Maintaining excellent health and ensuring that all of the body's organs operate at their best are made possible by eating a balanced diet. Additionally, it strengthens the immune system. Fruits, nuts, and vegetables are vital components of a human diet due to their many health advantages and the number of naturally occurring antioxidants they contain. According to [1], fruits are a great source of fibre, protein, carbs, and vitamins. Every fruit has a different nutritional value. Nevertheless, no fruit has all the vital nutrients that the body needs. To maximise the nutritional content of fruits, it is imperative to combine different fruits [2].

Given that fruits play a crucial role in maintaining bodily health, there is widespread worry about the insufficient consumption of fruits. In large part, this issue has been resolved by the rise of fruit juices as a raw fruit substitute because they offer convenience that raw fruits do not. When treated correctly, fruit juices don't fundamentally differ from the fruits they were taken from. They are composed of about the same quantity of nutrients and compounds found in raw fruit [3].

Strong antioxidant properties are found in several plants, such as *Cordia myxa* or *Cordia dichotoma*, which are referred to as Sebastian plum, soapberry, or mokhate in Egypt. The fruit consists of a pulpy part and one kernel seed. *Cordia dichotoma* was traditionally used to cure a variety of pathological disorders, such as anaemia, rheumatism, gastric pain, impotence, diarrhoea, mouth ulcers, bronchitis, asthma, and dental caries [4,5]. Fruits are hypolipidemic and anti-diabetic, and they also have hepatoprotective, wound-healing, anti-ulcer, and anthelmintic qualities [6,7]. Among the vital components of Cordia dichotoma fruit include polyphenols, flavonoids, alkaloids, and mucilage [8]. The main polyphenols found in the viscid layer aqueous extract include rutin, kaempferol, quercetin, rosmarinic acid, caffeic acid, and chlorogenic acid [9,10].

The root vegetable carrot (*Dascus carota* L) is grown in many parts of the world. It is a significant member of the family Apiaceae. It has nutrients that are vital to health, including as vitamins, minerals, polyacetylenes, carotenoids, and flavanoids. Due to its high amount of β-carotene, a precursor to vitamin A, it is most well-known [11]. Carrot juice's low acidity, which creates the perfect environment for the growth of several spore-forming and spoiling bacteria, makes preservation challenging [12].

Making juice blends will enhance the likelihood of obtaining a single product that combines the nutritional content of the individual fruit because some fruits lack nutrients found in others. These plants experience significant post-harvest losses as a result of subpar facilities for processing and preservation. They will be used more effectively and the issue of postharvest losses will be greatly reduced by processing them into juice. Low consumption of fresh fruits and vegetables is another issue [13]. With so many health advantages in one product, this work will provide a handy and nutritionally sound option for the consumer. Customers will find juice mixes appealing since they combine the flavour, colour, and taste of the separate ingredients to create a distinctive product [14].

This study aims to carry out the following: a) To discover an acceptable formulation of drink blend produced from Lassora and Carrot; b) To perform proximate analysis on the drink blends combined in four different ratios; c) To carry out physicochemical, phytochemical and sensory evaluation on the different drink blends during storage at freezing temperature.

2. Materials and Methods

2.1. Materials

We bought ripe carrot fruits (*Dascus carota* L.) in Zagazig, Egypt's Sharqia Governorate, from a nearby market. Fruits of the Lassora (*Cordia dichotoma*) were gathered at a private farm in Kafr-Saqre, Egypt's Sharqia Governorate. Indian cherries and pomegranates were harvested in the summer of 2011. The utmost purity of 99.95% sugar, produced by Nile Sugar Company, Km 54 Alexandria/Cairo Desert Road, was utilized.

2.2. Methods

2.2.1. Preparation of lassora and Carrot Juices

Lassora and Carrot fruits were carefully sorted and then cleaned with vinegar and drinkable water to remove any sand or other potentially dangerous contaminants. For carrots the outer skin was scraped off with a stainless steel knife and cutting the carrot into cubes, for lassora the pulps were manually separated by removing the stone and sticky pulp. Individually, water was added in a 1:1 w/v ratio to the lassora or carrot, and the resulted mixtures were homogenized with an electric blender. A sterile muslin cloth was used to sift the mash, and the clear juice was then heated for 5 min at 85°C, cooled, bottled in sterile containers, and kept in storage at -20°C until needed.

2.2.2. Formulation of Blended Carrot-Lassora drinks

Three different combinations of carrot-lassora drinks as well as lassora were made. To prepare the drinks, the formulations listed and coded in Table 1 were utilized, with 150g of sugar, 0.5g of citric acid, and 3g of maize starch added to each. The volumes were then filled with bottled water to a capacity of one litter. A household mixer was used to homogenize the mixture. The beverages were put into 200 ml clean glass bottles, pasteurized for five minutes at 90 °C, chilled, and kept for a year at -18 °C, or freezing point.

Table 1: Mixing ratios, codes and constitutes of carrot and lassora drinks

Drinks	Mixing ratio (%)	Code	Constitutes			
			Carrot juice (ml)	Lassora juice (ml)	Sugar (g)	Starch (g)
Carrot	100:0	CDr	200	0	150	3
Lassora	0:100	LDr	0	200	150	3
Carrot-Lassora blends	75:25	CLDr (3:1)	150	50	150	3
	50:50	CLDr (1:1)	100	100	150	3
	25:75	CLDr (1:3)	50	150	150	3

2.2.3. Physico-Chemical Analysis

Vitamin C content and approximate composition was calculated in accordance with [15]. A Unicum 969, England, atomic absorption spectrophotometer was used to determine the mineral composition. The beverage's pH was measured using a pH meter (LABMAN LMPH-12, India), adhering to the [16] protocol. The TSS of beverage samples was determined using a handheld refractometer (ATAGO-0258999, Japan). At room temperature, the viscosity was measured using a Brookfield viscometer (Model DV-I, USA). The sample colour was determined using the Hunter colour lab (Model CR-10, Konica Minolta sensors, INC, Japan). The methodology employed for measuring the L* (lightness), a* (redness), and b* (yellowness) was similar to that of [16].

2.2.4. Total phenolic content

According to [17], the total phenolic content was calculated using the Folin Ciocalteu reagent. The results were reported as gallic acid equivalents (GAE) per 100 g of sample.

2.2.5. Antioxidant properties

The DPPH% activity of the beverage formulations was used to measure their antioxidant activity. One millilitre of an ethanol solution containing 0.1 milligrammes of DPPH was mixed with three millilitres of each beverage composition. An ultraviolet–visible spectrophotometer (Hitachi, U2900) was used to measure the absorbance at 517 nm after the mixture had been vigorously shaken and allowed to stand in the dark for 30 minutes. The proportion of DPPH activity was calculated as follows:

DPPH (%) = absorbance of sample − absorbence of control / absorbance of control × 100.

2.2.5. Sensory Analysis

A group of ten experts from the Food Science Department at Zagazig University's Faculty of Agriculture were given coded samples to evaluate. The experts were asked to rate the drinks on colour, flavour, and overall acceptability using a nine-point hedonic scale, where one represents strong dislike and nine represents strong like.

2.3. Statistical analysis

To ascertain the statistical significance of treatments, the collected data were statistically examined using the analysis of variance technique (ANOVA). Duncan Multiple Range test was utilized to achieve mean separation.

3. Results and Discussion

3.1. Chemical, minerals and phytochemical composition of carrot and lassora fruits

The gross chemical composition of carrot (CF) and lassora fruits (LF) is reported in Table (1). The protein, fat, fiber, ash and carbohydrate contents of LF (1.99, 1.86, 2.88, 2.58 and 12.21%) were higher than those of CF (1.43, 0.36, 1.71, 0.81 and11.18%), respectively. CF was characterized by its higher moisture content (83.94%), while LF had a higher protein, fat, fiber, ash and carbohydrate contents than CF. The findings of LF were in close agreement with previously reported by [18], While, the findings of CF were in close agreement with previously reported by [19] .The results presented in Table (1) showed that the gross chemical composition of LF contained more nutrients compared to CF. Additionally, the LF is characterized as containing much higher levels of total phenolic (mg GAE/100 g), and antioxidant activity (AO) % than CF, i.e., 984.7mg/100 g, and 90.80% for LF compared to 690.50 mg/100 g and 88.20% for CF . Also, the LF is characterized as containing much higher levels of Vitamin C mg/100g than CF, i.e., 43.22 mg/100 g for LF compared to 15.65 mg/100 g for CF. The results of CF are in line with those reported by [20], which found that CF contains a high level of TPC and showed higher AO %. Also, the results of LF are in line with those reported by [21] who found that LF contains a high level of TPC and showed higher AO %.

The evaluation of the macro- and microelement composition of LF and CF is displayed in Table (2) as mg/100 g sample. LF was found to be a good source of Ca (59.35 mg/100 g), P (284.82 mg/100 g), Fe (7.52 mg/100 g), Na (164.78 mg/100 g) and Mg (3.87 mg/100 g) compared to CF. While CF had the highest content of K (32.14 mg/100 g), compared to LF. The obtained result about LF and CF mineral contents was similar to that obtained by [18,19], respectively. LF and CF can be recommended as sources of essential elements. Hence, the nutritive value and mineral content of both of them can play a considerable role in developing juice products.

Table 2: Chemical, minerals and phytochemical composition of carrot and lassora fruits

Components	Carrot fruit	Lassora fruit
Moisture (%)	83.94±1.2^a	77.97±1.6^b
Carbohydrate (%)	11.18±0.4^b	12.21±0.7^a
Protein (%)	1.43±0.16^b	1.99±0.12^a
Crude fiber (%)	1.71±0.22^b	2.88±0.34^a
Fat (%)	0.36±0.04^b	1.76±0.12^a
Ash (%)	0.81±0.02^b	2.58±0.14^a
Calcium (mg/100g)	23.34±0.88^b	59.35±1.42^a
Phosphorus (mg/100g)	5.65±0.9^b	284.82±5.2^a
Sodium (mg/100g)	103.57±2.6^b	164.87±3.3^a
Iron (mg/100g)	0.12±0.01^b	7.52±0.18^a
Potassium (mg/100g)	32.14±1.03^a	10.67±1.32^b
Magnesium (mg/100g)	2.43±0.3^b	3.87±0.2^a
Vitamin C mg/100g	15.65±0.52^b	43.22±0.66^a
Total polyphenols mg/100g	690.50±5.2^b	984.7±4.6^a
DPPH scavenging activity %	88.2±1.8^b	90.8±1.5^a

3.2. Proximate chemical composition of carrot and lassora drinks

In comparison to the carrot and lassora drinks, Table (3) displayed the gross chemical composition of carrot and lassora drinks samples. It was discovered that the carrot and lassora drinks samples' moisture contents varied from a low of 80.30 % in the LDr to a maximum of 81.62 % in the CDr. The range of 0.28 % to 0.34 % was discovered for the protein content. Carrot and lassora drinks samples ranged in ash percentage from 0.16 % to 0.49 %. However, the range of 0.07 % to 0.28 % was discovered for the fat content. While, Carrot and lassora drinks samples ranged in fiber percentage from 0.33 % to 0.57 %. Also, the range of 16.99% to 17.61 % was discovered for the Carbohydrate content. As the percentage of LDr increases in drink formula, the protein, ash, fat, fibre and Carbohydrate content of the carrot and lassora drinks treatments grew gradually in all samples. This observation may be connected to the high these component contents of the lassora fruit employed in the combinations at first [22,23].

As the percentage of LDr increases in drink formula, Ca , P , Fe , Na , and Mg content of the carrot and lassora drinks treatments grew gradually in all samples, this is due to the higher content of these mineral elements in lazuli fruits compared to carrots [24,23].

Table 3: Proximate chemical composition and minerals content of carrot and lassora drinks

Components	CDr	LDr	CLDr (3:1)	CLDr (1:1)	CLDr (1:3)
Moisture (%)	81.62±0.45^{a}	80.30±0.5^{b}	81.54±0.4^{a}	81.01±0.3^{a}	80.78±0.5^{ab}
Carbohydrate (%)	17.24±0.2^{ab}	17.61±0.3^{a}	16.99±0.2^{b}	17.35±0.4^{ab}	17.43±0.2^{a}
Protein (%)	0.28±0.12^{ab}	0.38±0.14^{a}	0.32±0.12^{a}	0.33±0.16^{a}	0.34±0.14^{a}
Crude fiber (%)	0.33±0.04^{c}	0.57±0.02^{a}	0.35±0.05^{c}	0.41±0.02^{b}	0.53±0.04^{ab}
Fat (%)	0.07±0.05^{d}	0.31±0.04^{a}	0.11±0.02^{c}	0.19±0.06^{b}	0.28±0.03^{ab}
Ash (%)	0.16±0.08^{e}	0.49±0.05^{a}	0.23±0.06^{d}	0.32±0.04^{c}	0.42±0.02^{b}
Calcium (mg/100g)	4.40±0.18^{d}	11.22±0.14^{a}	6.43±0.12^{c}	6.97±0.08^{c}	9.09±0.12^{b}
Phosphorus (mg/100g)	1.12±0.08^{e}	55.87±1.2^{a}	11.54±1.1^{d}	25.43±1.6^{c}	45.87±1.8^{b}
Sodium (mg/100g)	20.53±0.28^{d}	32.67±0.32^{a}	23.45±0.4^{c}	23.65±0.5^{c}	28.80±0.2^{b}
Iron (mg/100g)	0.02±0.001^{e}	1.48±0.02^{a}	0.99±0.01^{c}	0.71±0.02^{d}	1.21±0.02^{b}
Potassium (mg/100g)	6.12±0.55^{a}	2.08±0.22^{d}	4.58±0.30^{b}	4.87±0.42^{b}	3.23±0.28^{c}
Magnesium (mg/100g)	0.46±0.02^{d}	0.75±0.01^{a}	0.54±0.02^{c}	0.65±0.01^{b}	0.68±0.02^{b}

$^{a-e}$Mean values followed by the same superscript are not significantly different ($p<0.05$) .CDr =100% carrot drink, LDr =100% Lassora drink, CLDr (3:1) = 75.0 % carrot drink &25.0% Lassora drink, CLDr (1:1) =50% carrot drink &50% Lassora drink and CLDr (1:3) =25.0 % carrot drink &75.0 % Lassora drink.

3.3. Physico-Chemical Properties of carrot and lassora drinks

The total solids, viscosity, pH, titratable acidity, and total sugar of the carrot and lassora drinks are displayed in Table 4. The examined materials' total solids varied from 9.15 to 11.99 °Brix. There were the highest total solids in LDr and CLDr (1:3). All drink blends had an increase in total solids content as the storage time lengthened and continued to do so (12 months at –18 °C). Carrot and lassora drinks ranged in viscosity from 11.99 to 20.65 cPs; the highest viscosity was found in LDr and CLDr (1:3). Under the conditions utilised in this study, the viscosity of Indian cherry fruit pulp was too high to quantify. All drink mixes' viscosities decreased as the length of storage increased. Titratable acidity varied from 0.171 to 0.212%, whilst pH ranged from 3.98 to 4.88. In contrast to pH, the titratable acidity of all drink mixes declined with longer storage times. Carrot and lassora drink total sugar content ranged from 24.91 to 27.54 g/100 g. All drink mixes' total sugar content dropped as storage times increased. Overall, the values of total solids, viscosity, and acidity rose as the amount of lassora syrup in the drink mixture increased, whereas the values of pH and total sugars decreased. These findings are consistent with those published by [25,21].

Table4: Total solids, viscosity, pH, titratable acidity and Total sugar of carrot and lassora drinks during storage at freezing temperature for 12 Month

Properties	Treatments	Storage period (Month)			Mean
		Fresh	6	12	
Total solids (°Brix)	CDr	9.87	10.09	10.25	10.07[bc]
	LDr	11.65	11.88	11.95	11.82[a]
	CLDr (3:1)	9.15	9.29	9.51	9.31[c]
	CLDr (1:1)	10.32	10.49	11.45	10.75[ab]
	CLDr (1:3)	10.99	11.74	11.99	11.57[a]
Mean		10.39[b]	10.69[b]	11.03[ab]	
Viscosity (cPs)	CDr	12.43	12.18	11.99	12.2[e]
	LDr	20.65	20.49	20.40	20.51[a]
	CLDr (3:1)	14.74	14.68	15.64	15.02[d]
	CLDr (1:1)	16.54	16.48	16.43	16.48[c]
	CLDr (1:3)	18.32	18.20	18.12	18.21[b]
Mean		16.53[c]	16.40[c]	16.51[c]	
pH	CDr	4.88	4.83	3.98	4.56[b]
	LDr	4.23	4.26	4.28	4.25[d]
	CLDr (3:1)	4.68	4.73	4.79	4.73[a]
	CLDr (1:1)	4.50	4.58	4.62	4.56[b]
	CLDr (1:3)	4.43	4.47	4.48	4.46[b]
Mean		4.54[ab]	4.57[b]	4.43[c]	
Titratable acidity (%)	CDr	0.171	0.186	0.198	0.185[d]
	LDr	0.212	0.210	0.205	0.209[a]
	CLDr (3:1)	0.183	0.180	0.175	0.179[e]
	CLDr (1:1)	0.192	0.188	0.184	0.188[d]
	CLDr (1:3)	0.201	0.197	0.192	0.197[b]
Mean		0.192[c]	0.192[c]	0.191[c]	
Total sugar (g/100g)	CDr	27.54	27.46	26.90	27.30[a]
	LDr	25.45	25.21	24.91	25.19[e]
	CLDr (3:1)	26.53	26.46	26.25	26.41[b]
	CLDr (1:1)	26.36	26.22	25.99	26.19[bc]
	CLDr (1:3)	25.60	25.52	25.34	25.49[d]
Mean		26.30[b]	26.17[bc]	25.89[c]	

[a-e] Mean values followed by the same superscript are not significantly different ($p<0.05$) .CDr =100% carrot drink, LDr =100% Lassora drink, CLDr (3:1) = 75.0 % carrot drink &25.0% Lassora drink, CLDr (1:1) =50% carrot drink &50% Lassora drink and CLDr (1:3) =25.0 % carrot drink &75.0 % Lassora drink.

3.4. Colour attributes of carrot and lassora drinks

The colour characteristics of carrot and lassora drinks at -18 °C for 0, 6, and 12 months of storage are displayed in Table 5. Only modest changes in lightness (L), redness (a), and yellowness (b) were noted during the storage time. These alterations are most likely the result of various molecules precipitating from lassora or carrot juice, as well as variously coloured polymers made from the carrot juice and other substances, like proteins. All colour properties did, however, differ significantly at zero time of storage; with the CLDr (1:3) having the highest lightness (37.21), the LDr having the lowest redness (0.24), and the CLDr (1:3) was having the lowest yellowness (1.32). Even though the CLDr (1:3) lightness dropped to 36.18 after a year in storage, it nevertheless held the greatest lightness and redness values during that time. Compared to the results of [25], a clear difference was observed in the degree of lightness of the lassora and carrot drinks, as a result of treating the raw materials used in the current beverage industry with the boiling process, which improves the color of the fruits as a result of eliminating the enzymes and stopping their activity during manufacturing and storage [26,27].

Table 5: Colour attributes of carrot and lassora drinks during storage at freezing temperature for 12 Month

Properties	Treatments	Storage period (Month)			Mean
		Fresh	6	12	
L	CDr	31.93	31.08	30.57	31.19^{d}
	LDr	25.45	22.24	20.76	22.80^{e}
	CLDr (3:1)	33.34	32.81	32.46	32.87^{c}
	CLDr (1:1)	35.83	35.42	34.98	35.41^{b}
	CLDr (1:3)	37.21	36.87	36.18	36.75^{a}
Mean		32.75^{c}	31.68^{d}	30.99^{de}	
a	CDr	1.76	1.99	1.89	1.88^{a}
	LDr	0.24	0.47	0.66	0.46^{d}
	CLDr (3:1)	1.32	1.66	1.80	1.59^{ab}
	CLDr (1:1)	1.09	1.36	1.08	1.18^{b}
	CLDr (1:3)	0.76	0.87	0.99	0.87^{c}
Mean		1.03^{b}	1.27^{b}	1.28^{b}	
b	CDr	2.75	2.44	2.58	2.59^{a}
	LDr	1.43	1.89	2.08	1.80^{bc}
	CLDr (3:1)	2.12	2.43	2.33	2.29^{a}
	CLDr (1:1)	1.76	1.68	1.92	1.79^{b}
	CLDr (1:3)	1.32	1.55	1.68	1.52^{c}
Mean		1.88^{b}	2.0^{ab}	2.12^{ab}	

$^{a-e}$ Mean values followed by the same superscript are not significantly different ($p<0.05$) .CDr =100% carrot drink, LDr =100% Lassora drink, CLDr (3:1) = 75.0 % carrot drink &25.0% Lassora drink, CLDr (1:1) =50% carrot drink &50% Lassora drink and CLDr (1:3) =25.0 % carrot drink &75.0 % Lassora drink.

3.5. Total phenolic and radical scavenging activity of carrot and lassora drinks

According to [28], antioxidants are secondary components or metabolites that are found in plants like fruits and vegetables as well as in the body naturally. Because our endogenous antioxidants are unable to adequately protect against the persistent and inevitable threat posed by reactive oxygen species, it is thought that plant-based dietary antioxidants have a significant role in maintaining human health [29]. The means total phenolic of CDr, LDr, CLDr (3:1), CLDr (1:1) and CLDr (1:3) was 390.20, 201.50, 290.40, 240.50 and 218.30 zero time of storage (Table 6). The Total phenolic value of 100% lassora drink (LDr) was significantly higher than Carrot drink (CDr) at ($p<0.05$). The means antioxidant activity of CDr, LDr, CLDr (3:1), CLDr (1:1) and CLDr (1:3) was 52.70, 66.30, 55.20, 59.50 and 61.40 % at zero time of storage (Table 6). With increasing storage period, the values of total phenolic and antioxidant activity decreased for all treatments. 100% lassora drink (LDr) had considerably higher total phenolic and antioxidant activity values than carrot drink (CDr) at ($p<0.05$). This serves as the foundation for combining the two fruits and vegetables for complementary nutrient and functional purposes.

Most vitamins are not generated by the body, but they do have some unique responsibilities that are necessary for survival. Most juices either naturally contain vitamin C or have it added. The body needs vitamin C to create collagen, cartilage, muscle, and blood vessels. It also helps the body absorb iron. [30]. The means ascorbic acid content as evaluated was 3.12, 8.02, 4.55, 5.11 and 6.80 mg/100ml at zero time of storage for CDr, LDr, CLDr (3:1), CLDr (1:1) and CLDr (1:3) respectively. With 8.02 mg/100 ml of vitamin C, the 100% lassora drink (LDr) has a substantially higher vitamin C content than the unblended drink (CDr) at $p<0.05$. Laxora-carrot blend ingestion may offer a portion of the Vitamin C that the body requires for physiological processes.

3.6. Sensory attributes of carrot and lassora drinks

The sensory characteristics of CDr, LDr, CLDr (3:1), CLDr (1:1), and CLDr (1:3) at zero time of storage are displayed in Table 7. In general, judges overwhelmingly accepted all examined samples. For every attribute that was examined, there were no appreciable variations between the beverages. While the LDr was more acceptable for flavour (8.65), the CLDr (3:1) was more acceptable for aroma (8.63), and the CLDr (1:3) was more acceptable than other drinks for colour (8.60) and overall acceptability (8.69).

The sensory characteristics of CDr, LDr, CLDr (3:1), CLDr (1:1), and CLDr (1:3) at 6 and 12 months of storage at -18 °C are also displayed in Tables 7. A slight decrease in all tested sensory attributes was noted after 6 months of storage, but the judges still approved of all the drinks. The CLDr (1:3) had the highest colour score (8.50), taste (8.43), and overall acceptability (8.69) values.

There were minor changes seen after 12 months of storage at -18 °C as compared to the 6-month storage period. These modifications can be the result of alterations in the acid/brix ratio brought on by the development of acidity. All liquids, meanwhile, were accepted by the senses. The best colour (8.15), taste (8.09), aroma (8.11), and overall acceptability (8.37) values were reported by the CLDr (1:3).

In general, it can be said that improving CDr with LDr tends to enhance the physio-chemical characteristics of CLDr. When compared to CDr, the CLDr showed higher levels of protein, crude fibre, ash, vitamin C, calcium, phosphorus, and sodium. Blending was found to result in noticeable increases in viscosity, lightness (L), and total solids. Additionally, the CLDr demonstrated improved flavour, acceptability overall, and taste. However, based on sensory and colour attribute data, it was shown that the CLDr were more stable than the CDr and LDr throughout a 12-month freeze storage period at -18 °C.

Table 6: Phytochemical composition of carrot and lassora drinks during storage at freezing temperature for 12 Month

Properties	Treatments	Storage period (Month)			Mean
		Fresh	6	12	
TPC mg/ 100g	CDr	201.50	180.70	140.60	174.27^{e}
	LDr	390.20	360.80	320.40	357.14^{a}
	CLDr (3:1)	218.30	150.80	110.30	159.8^{e}
	CLDr (1:1)	240.50	190.90	140.70	190.7^{d}
	CLDr (1:3)	290.40	260.20	210.40	253.7^{b}
Mean		268.18^{b}	228.68^{c}	184.48^{d}	
Vit C mg/100ml	CDr	3.12	2.70	2.30	2.71^{g}
	LDr	8.02	7.40	6.80	7.40^{a}
	CLDr (3:1)	4.55	4.0	3.40	3.98^{f}
	CLDr (1:1)	5.11	4.60	4.10	4.60^{e}
	CLDr (1:3)	6.80	6.30	5.80	6.30^{b}
Mean		5.52^{c}	5.0^{d}	4.48^{e}	
AO%	CDr	52.70	48.90	43.80	48.47^{f}
	LDr	66.30	61.20	57.40	61.63^{a}
	CLDr (3:1)	55.20	49.70	44.20	49.7^{e}
	CLDr (1:1)	59.50	53.60	48.70	53.93^{d}
	CLDr (1:3)	61.40	56.40	51.70	56.5^{c}
Mean		59.02^{b}	53.96^{d}	49.16^{e}	

$^{a-e}$Mean values followed by the same superscript are not significantly different ($p<0.05$) .CDr =100% carrot drink, LDr =100% Lassora drink, CLDr (3:1) = 75.0 % carrot drink &25.0% Lassora drink, CLDr (1:1) =50% carrot drink &50% Lassora drink and CLDr (1:3) =25.0 % carrot drink &75.0 % Lassora drink.

Table 7: Sensory attributes of carrot and lassora drinks of carrot and lassora drinks during storage at freezing temperature for 12 Month

Properties	Treatments	Storage period (Month)			Mean
		Fresh	6	12	
Taste	CDr	8.26	7.86	7.13	7.75^{d}
	LDr	8.65	8.38	8.02	8.35^{a}
	CLDr (3:1)	8.34	8.00	7.53	7.96^{c}
	CLDr (1:1)	8.43	8.03	7.43	7.96^{c}
	CLDr (1:3)	8.52	8.43	8.09	8.37^{a}
Mean		8.44^{a}	8.14^{b}	7.64^{d}	
Aroma	CDr	8.75	8.08	7.45	8.09^{b}
	LDr	8.44	8.03	7.89	8.12^{b}
	CLDr (3:1)	8.63	7.83	7.24	7.90^{c}
	CLDr (1:1)	8.52	8.25	7.82	8.20^{ab}
	CLDr (1:3)	8.56	8.32	8.11	8.33^{ab}
Mean		8.58^{a}	8.10^{b}	7.70^{c}	
Color	CDr	8.06	7.46	7.00	7.51^{d}
	LDr	8.86	8.45	8.12	8.48^{a}
	CLDr (3:1)	8.33	7.99	7.19	7.84^{c}
	CLDr (1:1)	8.54	8.18	7.50	8.07^{b}
	CLDr (1:3)	8.60	8.50	8.15	8.42^{a}
Mean		8.48^{a}	8.12^{b}	7.59^{d}	
Overall acceptability	CDr	7.88	7.88	7.47	7.74^{b}
	LDr	8.44	8.44	8.31	8.40^{a}
	CLDr (3:1)	8.21	8.21	7.89	8.10^{ab}
	CLDr (1:1)	8.50	8.50	7.87	8.29^{ab}
	CLDr (1:3)	8.69	8.69	8.37	8.58^{a}
Mean		8.34^{a}	8.34^{a}	7.78^{b}	8.22^{ab}

$^{a-e}$Mean values followed by the same superscript are not significantly different ($p<0.05$) .CDr =100% carrot drink, LDr =100% Lassora drink, CLDr (3:1) = 75.0 % carrot drink &25.0% Lassora drink, CLDr (1:1) =50% carrot drink &50% Lassora drink and CLDr (1:3) =25.0 % carrot drink &75.0 % Lassora drink.

4. Conclusion

Lassora drink blended with carrot is a beverage that can be consumed by old and young people due to its high nutritional content. Sample CLDr (1:3) was the most acceptable samples from the sensory analysis, gross chemical, mineral, total phenolic and vitamin C content compared to other drinks prepared from mixing Lassora and carrot drink. This will make it possible to properly utilize these fruits, reduce post-harvest losses, cater to different health needs of the consumers and ensure food security. The product contains nutrient that can be obtained in the individual fruits, thus making it more nutritious than single fruit juices. Successful implementations of carrot juice with lassora juice will enhance the utilization of lassora fruits that is currently underutilized in Egypt.

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