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Utilization of Egyptian golden berry fruit for producing sugar-preserved functional products

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Abstract

Golden berry, commonly known as "Harankash" in Egypt, is a non-traditional horticultural crop with a pleasing taste and significant nutritional value. This underutilized fruit is an excellent source of vitamins C, B complex, provitamin A (3000 IU of carotene per 100g), and minerals. Additionally, golden berry possesses medicinal properties and a relatively high energy value. Despite its potential, little attention has been paid to utilizing golden berry in the food industry in Egypt.This study aimed to develop and evaluate new, non-traditional golden berry products, such as compote and jam, which have not been processed before in Egypt. These novel products could extend the marketing season of golden berry throughout the year, catering to domestic consumers and providing opportunities for export to other countries.The study investigated various golden berry products, including fresh berry fruit (FBF), golden berry compote (GBC), traditional berry jam (TBJ), suggested golden berry jam (SBJ), and mixed berry jam (MBJ). These products were evaluated for antioxidant activity, phytochemical composition, microbial quality, and sensory attributes.The results showed that suggested golden berry jam (SBJ) had a 1.08-fold higher total phenolic content compared to fresh berry fruit, while traditional berry jam (TBJ) had the lowest content, with a 2.14-fold decrease. A similar trend was observed for total flavonoids content. However, the inverse pattern was noted for IC50, indicating that Egyptian golden berry products can be ranked in descending order of functionality as: SBJ, GBC, TBJ, MBJ, and FBF. Overall, SBJ emerged as the best new functional golden berry product.This study highlights the potential of golden berry as a functional food ingredient and the need for further research to optimize processing methods and expand its utilization in the Egyptian food industry. By developing novel products like compote and jam, the marketing potential and consumer appeal of this underexplored crop can be enhanced, both domestically and internationally.

Keywords: Type your keywords here, separated by semicolons ;

1. Introduction

A great interest was considered in recent years owing to fruit medicinal and antioxidant properties; (vit. C, phenolic compounds, minerals...etc.) that make them have nutraceutical benefits [1]. Over 360 million metric tons of commercially processed fruits were annually estimated. Throughout the last two decades, tropical fruit industries have been carried out which improve either production or competition for both domestic demand as well as export markets [2]. Goldenberry (Physalis peruviana L.) is a minor fruit that has been grown in the USA, India, Egypt, South Africa, Australia and New Zealand, but so far it has not become a major crop. Such a golden berry crop possesses succulent marbled spheres with a pleasing taste. Each fruit is protected by a papery husk like lantern and the fruit is tomato-like somewhat in appearance and flavor. It is easily stores in a sealed container, freezes well or is kept in a dry atmosphere for months (Fig. 1). Premium prices are paid by Europeans for dipping goldenberries in liquid chocolate or for using them to decorate tortes and cakes. This fruit is highly regarded in many of international markets, it is known by various names; i.e., “uchuva”, “aguaymanto”, “cape gooseberry” or “uvilla[3].

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Fig. 1: Golden berry (Physalis peruviana L.)

Such crop is an excellent source of vitamins C, and B complex, provitamin A (3000 IU of carotene /100g) and minerals. It is also having medicinal properties including, diuretics, antiasthmatic, anti-ulcer agents, antiseptics and strengthener for the optic nerve. It is also having a relatively high energy value about 88.72 Kcal, and also contains much fructose [4], so it may be recommended for diabetics. Such plant has steroid lactones with a broad benefit of medicinal properties; i.e. anti-tumours, anti-inflammatory cytotoxic, antibacterial, liver protective and lowering blood pressure which prevent brain stroke in addition to exhibiting a calming effect, antifeedants and repellents[5, 6]. The English names of this fruit inthe United Kingdom are golden berry, giant ground cherry, simply Physalis, Peruvian groundcherry, Inca berry, Pha and Aztec berry. Meanwhile, it names cape gooseberry and winter cherry in South Africa[7, 8]. It originates in South America then currently cultivated in Australia, New Zealand, Egypt, Europe and California state at the USA [2].

Goldenberry has a very pleasant sour-sweet, refreshing and pleasant aroma. It is also very durable and it can be stored for over three months at room temperature or for more than 5 months in refrigerated condition (2°C) without spoilage signs or wilting [9]. Such berries are characterized asa functional food owing to their high content of bioactive compounds. So, it is eaten fresh, cooked, snacks sweetened with sugar, processed product as jam, jelly as well juice. It is also added to salads, desserts, dishes and cakes [10]. In addition, it consumed after drying as a very nice raisin, and because of its high content of pectin is well suited for pies [9, 11]. The consumption of golden berries in processed form like jellies is an excellent way to increase their use because the jelly of golden berry could be a noble product accepted by all consumers that is nutritionally rich with high added value and can be used for preparing refined dishes either hot (grilled meats) or cold (ice cream and fruit salad). This jelly is extremely flavoured with fine cheeses, but on the other hand, the consumption of fresh golden berries is restricted due to its limited post-harvest life because it has a high activity of enzymes which promotes the speedy darkening after mechanical damage through transporting and storage [3,12].

Goldenberry juice improved blood glucose level, insulin level, and insulin resistance in type-2 diabetes mellitus in comparison to quercetin supplement in animal model [13]. Golden berry juice is considered as a functional food because it still contains the micronutrients or active substances from fresh fruits that provides physiological advantages [14]. the effect of goldenberry extract supplementation on fat accumulation, hepatic oxidative damage, hepatic fat deposition, inflammation, and hepatic scarring, as well as metabolic syndrome in obese rats [15].

In Egypt,such a crop is commonly named **"** Harankash **"**that eaten raw and it is a non-traditional horticultural crop that is still cultivated in limited areas compared with other crops. No attention has been paid to utilizing such fruit in food industries. So, this study aimed to suggest and evaluate the sensorial, physicochemical, and technological properties of new and non-traditional products (like compote and jam) that are not sold in the market in Egypt this crop. These non-traditional products consequently could extend the marketing season of golden berry all over the year for public consumers as well as for exporting these new processed products to other countries.

Materials and Methods

2.1 Materials

Fresh golden berry fruits were purchased from a local farm located in Qalyubia governorate, Egypt. The fruits were husked, washed and refrigerated at 5.0 ± 0.1ºc till laboratory analysis, as well as used for making non-traditional products.

Methods

2.2.1 Processing of sugar–preserved Egyptian golden berry products

The various golden berry products that suggested in this study were given in Table (1) with their used abbreviations and suggested marketing names.

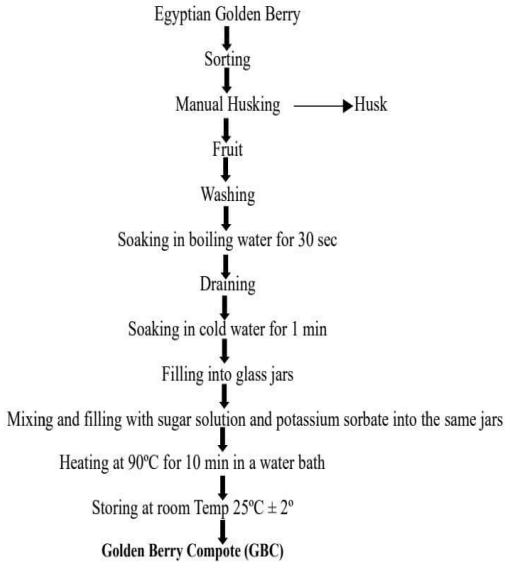
Table (1): Sugar–preserved suggested products and suggested marketing names

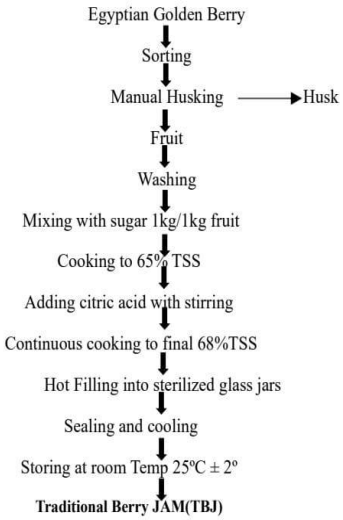
Product	Abbreviation	Suggested marketing name	References
Fresh berry fruit	**FBF**	Harankash	---
Golden berry compote	**GBC**	Berry compote	[5]
Traditional berry jam (1Kg sugar/kg fruit)	**TBJ**	Berry jam	[6]
Suggested golden berry jam (0.4 kg sugar /kg fruit)	**SBJ**	Golden jam	[28]
Mixed golden berry jam (0.4 kg sugar /kg fruit) +150 ml orange juice	**MBJ**	Mixy jam	[28], with some modification

**Fresh berry fruit (FBF), golden berry compote (GBC), traditional berry jam (TBJ), suggested golden berry jam (SBJ), mixed golden berry jam (MBJ).*

2.2.2 Preparation of suggested golden berry products:

The suggested golden berry products were prepared according to the following flow diagrams:





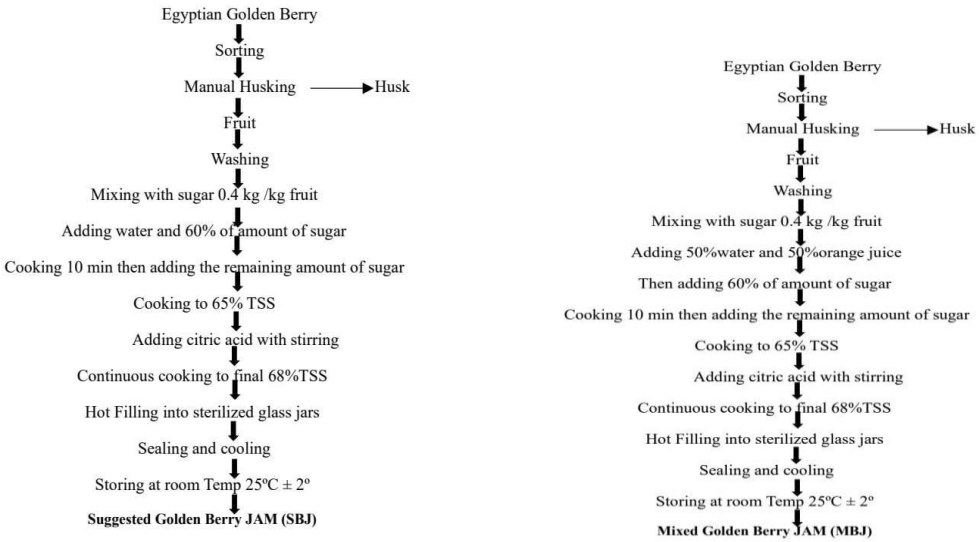


Diagram of Preparation of suggested golden berry products

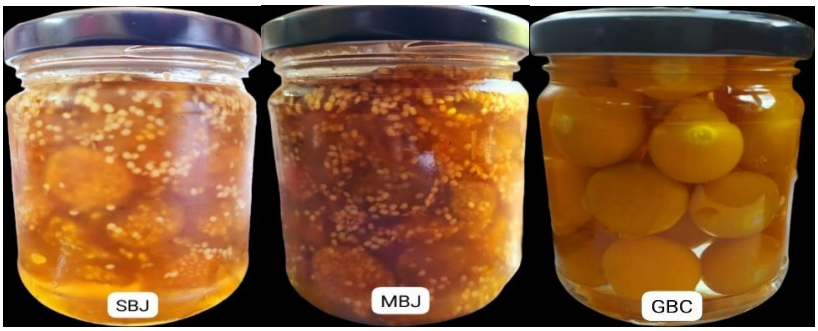


Fig.2. Egyptian Golden Berry Products.

2.2.3 Physical Properties

The shape, skin color and pulp color of Egyptian golden berry fruits were visually described. The number of fruits/ kg, average fruit weight (g/fruit) and average fruit volume (cm^3/fruit) were determined [16].The size of fruits was measured using vernier callipers (Kanon Instruments, Japan) with an accuracy of 0.1 mm. The density was calculated as the mass/volume of a fruit [17]. In addition, husks and yield after husking of Egyptian golden berry fruits were determined as gm/kg fruits using a top loading balance (model: D0001-HR120, AQD Company, Limited EC).

The pH value that measured using a glass electrode pH meter (Persica model pH 900, Switzerland) and total acidity was determined [18]**.** The total soluble solids (TSS) content at ambient temp(25-27ºc) expressed as Brix was determined using a digital refractometer (Hanna, HI 96811, Germany) as described [18]**.**

The proximate composition of processed products (moisture, ash,crude protein, ether extract and reducing sugar were determined [19]and[18]. Total carbohydrate was chemically calculated [20]. Bioactive components as well as antioxidant activities were determined [21].A microbiology examination was carried out [22,23].

2.2.4. Antioxidant properties of Egyptian golden berry products

The evaluated items described [24]**;** i.e. total phenolic content (TPC), total flavonoid content (TFC), total carotenoid content (TCC), and DPPH scavenging% (IC_{50}) were determined.

2.2.5. Microbial evaluation of Egyptian golden berry products

A) Procedure for Total Plate Count

All glassware was sterilized in an area (the media nutrient agar) prepared by weighing 7g and dissolved in 250ml of distilled water, it was then sterilized in the oven and was allowed to cool to 45º c, the serial dilution of the four samples were carried out by pipetting 1ml of each of sample to already measured 9ml diluted water into a test tube labelled $10^1 – 10^5$ and was covered with non-absorbent cotton wool to avoid contamination.1ml from 10^4 of each sample was aseptically transferred into a sterile Petri dish for each plate was covered immediately. 20ml of the cooled molten agar was poured into the Petri dish and rotated gently for thorough distribution of the inoculums throughout the medium and it was allowed to solidify, the plate was inverted and incubated at 30ºC for 48 hours [23].

B) Procedure for Yeast and Mould Count

Exactly 9ml of distilled water was pipette into 10 tubes and sterilized in an autoclave, then sterilized potato dextrose agar immediately before use. Pouring was done and Petri dishes swirled and allowed to solidify. The hardened agar was incubated at 37ºC for 3-5 days in an inverted form and a number of colonies were counted [22].

2.2.6. Sensory evaluation

The sensory evaluation attributed to color, taste, odor, texture, sweety and overall acceptability of four suggested Egyptian golden berry products [5].However, it is carried out by 10 staff members of the Food Science Department., Faculty of Agriculture., Ain Shams University.

2.2.7. Statistical analysis

Data were expressed as the mean values of three replicates and standard deviations were statistically analysed by performing an analysis of variance technique (ANOVA) using the Statistical Analysis System [25]. Differences among means were compared using Duncan's multiple range test [26] at the significant level of 95% ($P \leq 0.05$)

3. Results and Discussion

3.1. Physical properties of fresh Egyptian golden berry fruit

The fresh Egyptian golden berry fruit had sensory properties that could be summarized in Table (2). The shape of the golden berry fruit is small and round, classified as a berry.The skin color can vary from orange to yellow to yellow-greenish.The pulp color also ranges from orange to yellow to yellow-greenish, matching the skin color.The taste of the fresh golden berry fruit is described as light sweet and acidic. The appearance of the fruit is waxy and smooth.The entire fruit is used, including the pulp, seeds and skin, without the husk.In summary, the Egyptian golden berry is a small, round berry with a colourful skin and pulp ranging from orange to yellow to greenish-yellow. It has a unique light sweet and acidic taste, and a waxy, smooth appearance. The whole fruit, excluding the husk, is edible and utilized.It could be easily that such fruit was characterized by its sweet and acidic taste in addition to the possibility of using whole fruit including pulp,seeds and skin which gave a chance for producing many of the non-traditional sugar-preserved products that are largely consumed in Egypt; i.e. jam and compote [5, 6].

Table (2): Physical Properties of fresh Egyptian golden berry fruit

Item	Characteristic
Shape	Berry (small& round)
Skin color	Orange, yellow, yellow greenish
Pulp color	Orange, yellow, yellow greenish
Taste	Light sweet and acidic teste
Fruit appearance	Waxy and smooth
Parts used	Whole fruit without husk (pulp, seeds and skin)

Table 3 provides comprehensive insights into the characteristics of fresh Egyptian golden berry fruit, which is known for its appealing taste and nutritional benefits. Table 3 quantifies the fruit's physical characteristics, revealing an unhusked fruit weight of 213.66 kg, an average husked fruit weight of 4.68 grams, and an average diameter of 1.95 cm. The average volume of the husked fruit is 4.30 cm^3, with a density of 1.08 g/cm^3, indicating a relatively low density that suggests higher water content and juiciness. These physical attributes highlight the golden berry's market potential, ease of processing into products like jams and compotes, and overall consumer appeal, making it a promising candidate for both local consumption and export[5,27].

Table (3): Physical characteristics of fresh Egyptian golden berry fruit

Item	Results
Unhusked fruit	213.66±0.59 (kg)
Average of husked fruit weight	4.68±0.73 (g/fruit)
Average of husked fruit diameter	1.95±0.064 (cm)
Average of husked fruit volume	4.30±0.95 (cm^3/fruit)
Husked fruit density	1.08±0.82 (g/cm^3)

3.2. Proximate composition of suggested Egyptian golden berry products

Table 4 presents the proximate composition of various sugar-preserved products derived from Egyptian golden berry fruit, including fresh berry fruit (FBF), golden berry compote (GBC), traditional berry jam (TBJ), suggested golden berry jam (SBJ), and mixed golden berry jam (MBJ). The moisture content decreases significantly from FBF at 80.70% to SBJ at 52.90%, indicating that processing reduces water content, which is essential for shelf stability. Protein levels are relatively low across all products, with FBF containing the highest at 13.00 mg/g, while GBC has the lowest at 9.03 mg/g. Fat content varies, with SBJ showing the highest at 173.90 mg/g, suggesting that the formulation may include higher fat ingredients or a concentration effect during processing. Ash content, reflecting mineral content, is highest in TBJ at 4.10%, while GBC has the lowest at 1.89%. Fiber content ranges from 4.40% in TBJ to 9.20% in FBF, highlighting the potential health benefits of consuming whole fruits. Carbohydrate content is highest in SBJ at 819.10 mg/g, which is expected due to the sugar content used in jam production, while GBC has the lowest at 81.38 mg/g. Overall, the data indicate that while the sugar-preserved products retain some nutritional value, they also reflect the changes in composition that occur during processing, which can influence their functional food properties and market appeal[5].

Table (4):Proximate composition of suggested sugar–preservedEgyptian golden berry fruit products

Item / Product*	Moisture %	Protein (mg/g)	Fat (mg/g)	Ash %	Fiber %	Carbohydrate (mg/g)
FBF	80.70±0.632	13.00±0.765	146.7±0.632	3.50±0.632	9.20±0.765	343.50±0.760
GBC	63.31±0.095	9.03±0.17	60.10±0.34	1.89±0.021	7.77±0.147	81.38±0.070
TBJ	55.70±0.765	8.90±0.809	70.90±1.067	4.10±1.067	4.40±0.809	749.20±0.809
SBJ	52.90±0.921	10.30±0.70	173.90±0.766	4.50±0.766	4.60±0.700	819.10±0.70
MBJ	56.40±0.748	10.20±0.755	65.90±1.067	5.40±1.067	5.20±0.755	604.10±0.755

**Fresh berry fruit (FBF), golden berry compote (GBC), traditional berry jam (TBJ), suggested golden berry jam (SBJ), mixed golden berry jam (MBJ).*

3.3. Physicochemical properties of suggested Egyptian golden berry products

The pH values ranged from 3.4 in golden berry compote (GBC) to 4.2 in suggested golden berry jam (SBJ), indicating an acidic nature across all products (Fig. 3). The fresh berry fruit (FBF) has a pH of 3.8, while traditional berry jam (TBJ) and mixed berry jam (MBJ) have intermediate values of 3.9 and 4.1 respectively. The

acidic pH helps ensure microbial stability and the shelf life of the products. Total acidity is highest in FBF at 1.2%, decreasing to 0.9% in GBC, TBJ, SBJ and MBJ. The lower acidity in the jams and compote compared to the fresh fruit is likely due to the addition of sugar during processing, which can mask some of the natural acidity. Total soluble solids (TSS) are very low at 13.5 °Brix in FBF, increasing to 16.8 °Brix in GBC. However, the jams (TBJ, SBJ, MBJ) all have much higher TSS values around 68-69 °Brix, reflecting the large amounts of added sugar in these products. In summary, the golden berry products maintain an acidic pH, with the jams having the lowest acidity but highest soluble solids content due to sugar addition during processing. The fresh fruit and compote have higher natural acidity but lower soluble solids. These physicochemical properties impact the flavor, stability and overall quality of each product[6].

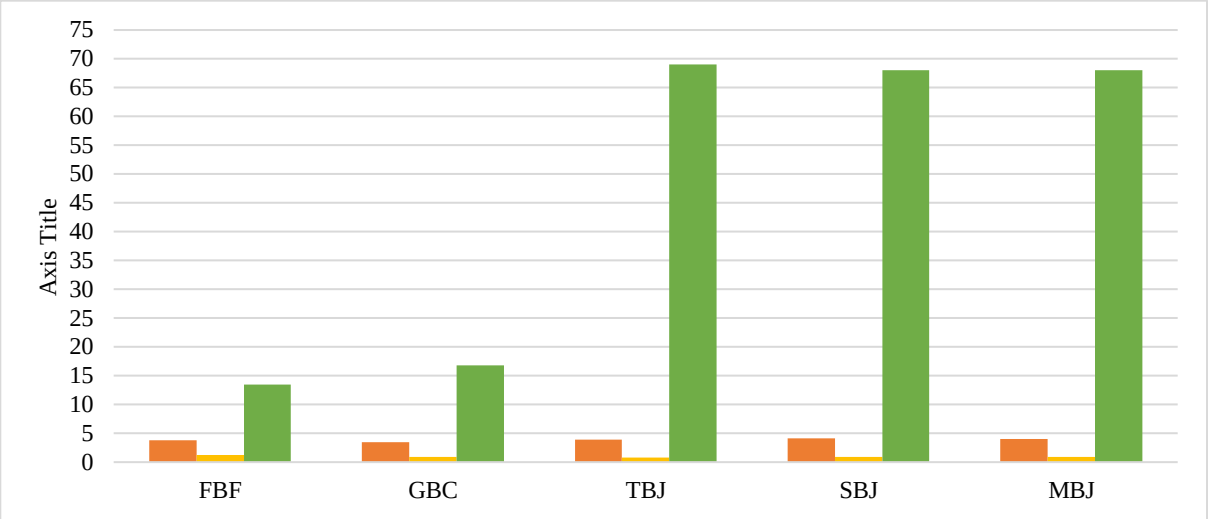


Fig. 3. Physicochemical Properties of Suggested Egyptian Golden Berry Fruit Products.

3.4. Total reducing sugars (TRS) content of suggested Egyptian golden berry fruit products

Figure 4 illustrates the total reducing sugars content (%) in various Egyptian golden berry products, revealing significant differences among them.

The fresh berry fruit (FBF) has the highest total reducing sugars at 43%, indicating its natural sweetness and potential for direct consumption. In contrast, the golden berry compote (GBC) shows a markedly lower level at 5%, likely due to the processing methods that may alter sugar composition. Traditional berry jam (TBJ) and suggested golden berry jam (SBJ) have similar total reducing sugars content at 25% and 26%, respectively, suggesting that the addition of sugar during jam production does not significantly increase the reducing sugar content compared to fresh fruit.

The mixed berry jam (MBJ) has the lowest total reducing sugars at only 1%, which may reflect a formulation that prioritizes other ingredients or a reduction in sugar content for health-conscious consumers. Overall, the data highlight the impact of processing on sugar content, with fresh fruit retaining the highest levels of natural sugars, while processed products exhibit a wide range of reducing sugar percentages, influencing their sweetness and potential applications in food products [6].

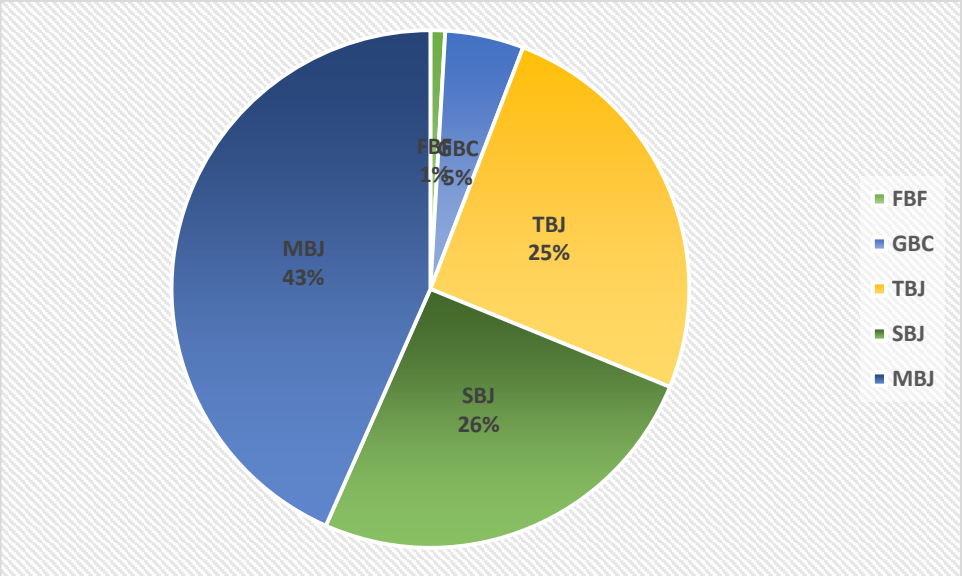


Fig.4. Total Reducing Sugars Content (mg/g) of Suggested Egyptian Goldenberry Fruit Products.

3.5. Antioxidant properties of Egyptian golden berry products

Table 5 provides a detailed overview of the bioactive compounds present in various fresh Egyptian golden berry products, including total phenolic content (TPC), total flavonoids content (TFC), total carotenoids content (TCC), and the DPPH scavenging activity measured by IC50 values.

The fresh berry fruit (FBF) exhibits the highest TPC at 85.90 mg GAE/mg, indicating a rich source of phenolic compounds that contribute to its antioxidant properties. In comparison, the golden berry compote (GBC) shows a reduced TPC of 71.11 mg GAE/mg, while traditional berry jam (TBJ) has a significantly lower TPC at 40.10 mg GAE/mg, suggesting that processing may diminish the phenolic content. Interestingly, the suggested golden berry jam (SBJ) has a higher TPC than GBC and TBJ at 92.80 mg GAE/mg, indicating that the formulation may enhance phenolic retention.

The mixed berry jam (MBJ) has a TPC of 71.70 mg GAE/mg, which is similar to GBC.Regarding total flavonoids content, FBF also leads with 31.30 mg/g, while GBC has a lower TFC of 19.11 mg/g. TBJ displays the lowest TFC at 15.80 mg/g, whereas SBJ has a moderate TFC of 19.20 mg/g, and MBJ has the lowest at 13.50 mg/g. This trend suggests that processing affects flavonoid retention similarly to phenolic compounds.For total carotenoids content,

TBJ has the highest value at 14.30 µg/mg, followed by SBJ at 21.90 µg/mg, indicating that carotenoids may be concentrated during the jam-making process. GBC and MBJ show lower carotenoid levels at 9.47 µg/mg and 26.50 µg/mg, respectively.The IC50 values, which reflect the antioxidant activity, show that FBF has the lowest IC50 at 10.38 µg/ml, indicating strong scavenging activity. In contrast, GBC has a much higher IC50 of 97.42 µg/ml, suggesting reduced antioxidant capacity after processing. TBJ and SBJ also exhibit higher IC50 values at 63.15 µg/ml and 103.66 µg/ml, respectively, while MBJ has a lower IC50 of 26.66 µg/ml, indicating it retains a relatively higher antioxidant activity compared to the other jam products [6, 28].Overall, the data from Table 5 highlight the impact of processing on the bioactive compounds in golden berry products, with fresh fruit retaining the highest levels of phenolics and flavonoids, while certain processed products, particularly SBJ, show potential for enhanced phenolic content. This information is crucial for understanding the health benefits and functional properties of these products.

Table (5): Bioactive compounds of fresh Egyptian golden berry products

Item / Product*	TPC (mg GAE/mg)	TFC (mg /g)	TCC (µg /mg)	IC_{50} µg /ml
FBF	85.90±0.4	31.30±0.4	12.1±0.032	10.38
GBC	71.11±0.095	19.11±0.095	9.47±0.147	97.42
TBJ	40.10±1.0	15.80±1.0	14.30±0.006	63.15
SBJ	92.80±0.9	19.20±0.9	21.90±0.067	103.66
MBJ	71.70±1.1	13.50±1.1	26.50±0.286	26.66

Fresh berry fruit (FBF), golden berry compote (GBC), traditional berry jam (TBJ), suggested golden berry jam (SBJ), mixed golden berry jam (MBJ); TPC (mg GAE/mg) = Total phenolic content; TFC (mg /g) = Total flavonoids conten; TCC (µg /mg) = Total carotenoids content; IC_{50} µg /ml - DPPH scavenging activity

3.6. Microbial evaluation

Table 6 presents the microbial evaluation of various Egyptian golden berry products, including golden berry compote (GBC), traditional berry jam (TBJ), suggested golden berry jam (SBJ), and mixed berry jam (MBJ), during a six-month storage period at 25°c. All products started with no detectable bacterial or yeast and molds counts at the time of packaging, indicating initial product quality and safety. Over the storage period, total bacterial counts gradually increased in all products, with GBC, TBJ, and MBJ reaching 20 CFU/g at 6 months, while SBJ showed a slightly higher count of 26 CFU/g. However, these levels remained relatively low and within acceptable limits. Notably, all products-maintained yeast and molds counts below detection levels (<10 CFU/g) throughout the storage duration, demonstrating the effectiveness of the preservation techniques used. This data suggests that these golden berry products can be stored for extended periods without significant microbial spoilage, although continued monitoring is essential to ensure product safety and quality over time. The gradual increase in bacterial counts, while still within acceptable limits, highlights the importance of proper storage conditions and the need for further research to optimize preservation methods and extend the shelf life of these functional food products [6].

Table (6): Microbial evaluation (CFU/gm) of Egyptian golden berry products during storage at 25 Cº for 6 months

Product*	Total bacterial content (CFU/g)			Yeast and molds (CFU/g)		
	0 time	3 months	6 months	0 time	3 months	6 months
GBC	ND**	10	20	ND**	<10	<10
TBJ	ND	8	20	ND	<10	<10
SBJ	ND	12	26	ND	<10	<10
MBJ	ND	10	20	ND	<10	<10

**Fresh berry fruit (FBF), golden berry compote (GBC), traditional berry jam (TBJ), suggested golden berry jam (SBJ), mixed golden berry jam (MBJ); **Not Detected*

3.7. Sensory evaluation

Table 7 presents the sensory evaluation results of various Egyptian golden berry products, including golden berry compote (GBC), traditional berry jam (TBJ), suggested golden berry jam (SBJ), and mixed berry jam (MBJ). The products were assessed on a 9-point hedonic scale for taste, color, odor, texture, sweetness, and overall acceptability, with 9 being "like extremely" and 1 being "dislike extremely."

The results show that GBC scored the highest in all sensory attributes, with taste, color, odor, texture, sweetness, and overall acceptability all receiving scores above 8.70. This indicates that GBC was highly accepted by the panellists.SBJ and MBJ also received high scores, with most attributes scoring above 8.30, suggesting that

they were also well-accepted. The only exception was sweetness in MBJ, which scored 8.00, slightly lower than the other attributes.TBJ had the lowest scores among the products, with taste scoring 7.20, sweetness scoring 7.00, and overall acceptability scoring 7.55. However, it still received scores above 7.00 for all attributes, indicating that it was moderately accepted by the panellists.In summary, GBC was the most preferred product, followed by SBJ and MBJ, which had similar high acceptance levels. TBJ had the lowest scores but was still moderately accepted. These results suggest that the golden berry products, especially GBC, SBJ, and MBJ, have good potential for commercialization due to their high sensory appeal [28].

Table (7): Sensory evaluation of Egyptian golden berry product

Product*	Taste	Color	Odor	Texture	Sweetness	Overall Acceptability
GBC	8.75a±0.54	8.90a±0.32	8.80a±0.42	8.70a±0.48	8.80a±0.42	8.80a±0.42
TBJ	7.20b±1.14	8.00b±0.67	7.90b±0.88	7.40b±0.84	7.00b±0.97	7.55b±0.96
SBJ	8.15a±0.82	8.40a±0.70	8.30a±0.67	8.40a±0.52	8.70a±0.48	8.50a±0.47
MBJ	8.30a±0.67	8.50a±0.71	8.40a±0.84	8.40a±0.84	8.00a±0.94	8.15a±0.75

**Fresh berry fruit (FBF), golden berry compote (GBC), traditional berry jam (TBJ), suggested golden berry jam (SBJ), mixed golden berry jam (MBJ).*

4. Conclusion

The study on Egyptian golden berry fruit highlights its potential as a source for sugar-preserved functional products, revealing that fresh golden berries possess appealing physical characteristics, including vibrant colors and a light sweet and acidic taste. The processing of products like compote and jams significantly reduces moisture content while retaining beneficial nutrients such as fiber, protein, and carbohydrates. Notably, the suggested golden berry jam (SBJ) exhibits the highest total phenolic content, indicating effective retention of bioactive compounds, which contribute to antioxidant properties. Microbial evaluations show that the products maintain acceptable safety levels during storage, with low yeast and mold counts. Sensory evaluations demonstrate high consumer acceptance, particularly for the compote and jams, suggesting strong market potential for these products. Overall, the findings underscore the versatility and health benefits of Egyptian golden berry fruit in food applications.

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