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PHYSIOCHEMICAL CHARACTERIZATION AND UTILIZATION OF MELON (*Cucumis melo*) SEED OIL AS A FUNCTIONAL FOOD INGREDIENT

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The aim of current research was to evaluate physico-chemical characters, fatty acid profile and total phenolic contents of sweet melon seed oil obtained from two different extraction techniques and its suitability to be used as a functional ingredient in yoghurt. In the study two different oil extraction techniques (solvent extraction and cold press) were employed to obtain the oil from sweet melon (*Cucumis melo*) seeds. Both type of oils were characterized for different physico-chemical characters, fatty acid profile and total phenolic contents. The oil was later on used for preparation of yoghurt by replacing animal fat. Results obtained showed that the melon seeds contained substantial amount of oil yield (20-27.33%) with comparable physico-chemical characters, high polyunsaturated fatty acid profile (70-75%) and significant amount of total phenolic contents (2.8-3 GAE/mg). The product analysis also positively demonstrated the addition of melon seed oil in the yogurt but up to 25% replacement of animal fat. It was concluded from the results that the sweet melon seed gives significant quantity of edible oil with high nutritional profile. Moreover, it could be utilized by food industries as functional edible oil as well as for the production of nutraceutical food products.
Keywords: Sweet melon seed oil; fatty acid profile; functional food ingredient, yoghurt.

INTRODUCTION

Pakistan is an agricultural country and agricultural commodities serve as the backbone and locomotive machinery for the national economy. During the processing of these agricultural commodities (fruits and vegetables) by the food industries, a large quantity of agro-industrial waste is produced. Agro-industrial waste includes inedible portion of plant origin food (fruits and vegetables) like seed, peel, fibrous material, bran and stalk etc. (Ennouri *et al*., 2007). Fruit and vegetable waste especially seeds and peels are rich source of many biologically active components (phytochemicals) and other valuable nutrients like amino acids, fatty acids, vitamins and minerals. So the extraction of these valuable compounds from the fruit and vegetable waste, their characterization to evaluate their effective features and then their incorporation in the food products can be useful in the up gradation of better-quality of human diet and also helpful in the maintenance of human physiology (Jelassi *et al*., 2014).
Seeds of fruits and vegetables are good sources of unsaturated fatty acids. Most species of *Cucurbitaceae* are oilseeds and their kernels have tremendous food value (Badifu, 2001). Sweet melon (*Cucumis melo*) is one of the most important specie of this family and widely grown vegetable crop throughout the warm regions in the world. The seeds of sweet melon (*Cucumis melo*) consist of seed coat and seed kernel. According to the Mansouri *et al*. (2017) seeds of *Cucumis melo* consists of 27-35% seed coat and 65-72% seed kernel. Seed kernel rich in unsaturated fatty acids and consists of 40-50% fatty acids and 20-30% protein depending upon the cultivar of *Cucumis melo*. According to Petkova and Antova (2015) fatty acids in the *Cucumis melo* seed oil ranged from 41.6 to 44.5%. Although sweet melon (*Cucumis melo*) seeds are rich in oil but oils of these seeds are not characterized to examine its specific functional characteristics until now (Nergiz and Donmez, 2004). Because of healthy fatty acid ratio, it could become an auspicious oil source to fulfil various nutritional and functional goals through its food applications (Horax *et al*., 2011).
Sweet melon (*Cucumis melo*) seeds, belong to *Cucurbitaceae* family are rich in oil contents with healthy fatty acid profile. These seeds are also considered to be a good source of protein, fiber, minerals and bioactive compounds. But these valuable contents of melon seeds are not utilized by the food industries for the production of valuable functional food products (Mehra *et al*., 2015). Non-utilization of these seeds in proper way not only results in wastage of valuable components but it also causes pollution. So to reduce the land solid waste pollution, the utilization of such waste in a proper manner is becoming the global issue (Nergiz and Donmez, 2004).
Keeping in view the importance of sweet melon (*Cucumis melo*) seed oil (healthy oil) the current research work was planned for characterization of sweet melon (*Cucumis melo*)

seed oil and its suitability for food application (Yoghurt) as functional ingredient. The objectives of the research work were, extraction, physico-chemical characterization and application of melon seed oil (*Cucumis melo*) in yoghurt as functional ingredient.

MATERIALS AND METHODS

The research study was conducted at Food Microbiology Laboratory, Institute of Food Science and Nutrition, University of Sargodha, Sargodha, Pakistan and FST Laboratory, Muhammad Nawaz Shareef University of Agriculture, Multan, Pakistan. The present research was aimed on extraction of sweet melon seed oil, its physico-chemical characterization and food application. The detail of the research work is as under:

Procurement of material: All the chemicals used in this study for analysis were of analytical grade and purchased from local market of Lahore, Pakistan. The fruit of sweet melon was purchased from the local market of Sargodha. The seeds from fruit were removed, sun-dried, converted into powder and stored at room temperature in glass jars for further process.

***Nutritional composition of sweet melon seed kernel*:** The nutritional/proximate composition of sweet melon seed kernel was determined according to the methods described by AOAC (2000).

***Oil extraction and yield*:** Oil was extracted by two different techniques, by solvent extraction using n-Hexane as solvent (termed as SEO) and cold press (termed as CPO) method. The total yield of oils recovered by both of the methods was calculated by the following formula:

$$\text{Oil yield (\%)} = \frac{\text{Wt. of Oil (g)}}{\text{Wt. of Sweet Melon Seed Sample (g)}} \text{X100}$$

***Oil analysis*:** The oil (cold press and solvent extraction) was analyzed for physico-chemical and fatty acid profiling as given below.

***Physicochemical analysis*:** The oil was analyzed for physico-chemical parameters including free fatty acid, peroxide value and saponification value by following the official methods recommended by AOCS (2009).

***Total phenolic contents*:** The total phenol contents (TPC) of sweet melon seed oils were calculated by using Folin-Ciocalteu assay (Kahkonen, *et al*., 1999). Firstly a sample (oil) of 2 mL was injected into test tubes then 2 mL Folin-Ciocalteu's reagent (diluted 10 times with water) was added. This mixture was kept under dark condition for 5 min and then 1 mL sodium carbonate (7.5% w/v) was additionally added. After this the mixture was covered with parafilm and kept again in the dark for 60 minutes. Absorption at 765 nm was calculated with a spectrophotometer UV-vis (Jasco V-530) and matched or compared with a gallic acid calibration curve. The results were expressed as mg gallic acid/g dried sample. Each assay was carried out in triplicate. The crude oils (cold press and solvent extraction) were analyzed for physico-chemical, fatty acid analysis and total phenolic compounds.

Food Application:

***Functional yogurt manufacturing*:** The skim milk was reconstituted and standardized. Dairy fat and sweet melon seed oils (extracted from solvent and cold press extraction methods) were added/replaced in various ratios (100:0, 75:25, 50:50, 25:75, 0:100) according to the treatment plan (Table 1).

***Physico-chemical analysis*:** The yoghurt prepared was stored at 4-6°C for 09 days and analyzed at 0, 3, 6 and 9 days of storage for physico-chemical composition by following the standard methods recommended by AOAC (2000).

***Sensory evaluation*:** Quality of yoghurt enriched with melon seed oil was evaluated for sensory characteristics (appearance, aroma, taste, body and texture, mouth feel and overall acceptability) during storage on Hedonic Rating Scale by a panel of assessors from faculty members and post-graduate students to judge the quality of yoghurt substituted with sweet melon seed oil (IDF, 1987; Nelson and Trout, 1964; Bano *et al*., 2011).

***Statistical analysis*:** All the data obtained was statistically analyzed through factorial designs and least significant difference by using STATISTIX 8.1 software as recommended by Steel *et al*. (1997).

RESULTS AND DISCUSSION

***Nutritional composition of sweet melon seed powder*:** The proximate composition of sweet melon seed kernel powder elicited that it contained 7.7$\pm$0.033%, 24.5$\pm$0.033%, 27.33$\pm$0.05%, 7.1$\pm$0.033%, 24.67$\pm$0.09% and 8.33$\pm$0.07% of moisture, crude fat, crude fiber, crude protein and ash, respectively. These values showed high oil contents (27.33$\pm$0.05%) in the seed kernel which was an indicator for sweet melon seed to be a value able non-conventional oil source for the oil industry. The results further revealed that the sweet melon seeds contained high quantity of protein (24.5$\pm$0.033%) and fiber (24.67$\pm$0.09%) which ultimately defined its potential nutritional benefits.

Table 1. Treatment plan for the development of functional yoghurt.

Ingredients	T_0	T_1	T_2	T_3	T_4	T_5	T6	T7	T8
		Hexane extracted oil				Cold press extracted oil			
Sweet melon seed oil (%)	0	25	50	75	100	25	50	75	100
Cream (%)	100	75	50	25	0	75	50	25	0

Yield percentage of extracted oils**:** The total yields of oils obtained by solvent extraction and cold press extraction techniques were 27±0.02% and 20±0.06%, respectively (Fig. 1).

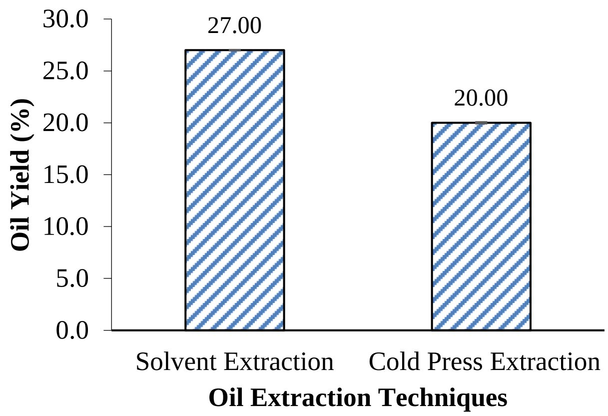

Figure 1. Melon seed oil yield extracted by different extraction techniques (%).

Oil Analysis:

Physico-chemical**:** The results obtained from the current study (Table 2) revealed that solvent extracted oil possessed moisture 0.02±0.01%, FFA 4.13±0.01%, peroxide value 1.65±0.02% and saponification value 129.88±0.05 mg KOH/g. Whereas the oil extracted by cold press technique possessed moisture 5.1±0.01%, FFA 2.13±0.02%, peroxide value 8.10±0.02 % and saponification value 131.95±0.06 mg KOH/g.

Total phenolic contents**:** The total phenolic contents were ranged from 2.824±0.09 to 3.00±0.11 mg EAG/g in oil extracted by solvent extraction and cold press technique.

Fatty acid profile**:** The results obtained from GC-MS analysis of the sweet melon seed oils (SEO and CPO) indicated high concentration of unsaturated fatty acids (91.25% in SEO and 90.33% in CPO) as compared to saturated fatty acids. The dominant fatty acid in the oil was found to be Linoleic acid with 75.61±0.06% and 70.12±0.07% in SEO and CPO, respectively. The other dominant fatty acid in the oil was found to be Oleic acid with mean contents of 15.40±0.04-17.34±0.05% in both type of oils (Table 2).

Table 2. Physico-chemical analysis of sweet melon seed oil (SMSO) through gas chromatography.

Parameters	Solvent extracted oil	Cold press extracted oil
Physico-Chemical Parameters		
Physical Appearance	Light Yellow	Yellow brown
Moisture (%)	0.02±0.01[a]	5.1±0.01[b]
FFA (%)	4.13±0.01 [a]	2.13±0.02 [b]
Peroxide value (%)	1.65±0.02 [b]	8.10±0.02 [a]
Rancidity	Nil	Nil
Saponification value (mg KOH/g)	129.88±0.05 [b]	131.95±0.06 [a]
Major functional contents		
Oleic acid	15.40±0.04 [b]	17.34±0.05[a]
Linoleic acid	75.61±0.06[a]	70.12±0.07 [b]
MUFA	15.40	17.34
PUFA	75.62	72.93
ΣUFA	91.25	90.33
UFA/SFA	10.150	9.258

Table 3. Effect of treatment and storage on acidity (as % lactic acid) of yoghurt.

Treatments	Storage period (Days)				Mean
	0	**3**	**6**	**9**	
T0	0.80±0.000 l	0.81±0.007 j-l	0.88±0.003 de	0.98±0.010 a	0.87±0.005 A
T1	0.81±0.007 j-l	0.83±0.007 g-j	0.85±0.003 e-h	1.00±0.003 a	0.87±0.005 A
T2	0.81±0.007 j-l	0.82±0.000 i-l	0.87±0.006 ef	0.99±0.009 a	0.87±0.005 A
T3	0.80±0.000 l	0.84±0.007 f-i	0.86±0.009 e-g	0.99±0.006 a	0.87±0.005 A
T4	0.82±0.017 i-l	0.81±0.007 j-l	0.88±0.010 de	0.97±0.022 ab	0.87±0.014 A
T5	0.81±0.007 j-l	0.82±0.015 i-l	0.86±0.007 e-g	0.98±0.006 a	0.87±0.008 A
T6	0.81±0.007 j-l	0.83±0.009 g-j	0.86±0.009 e-g	0.95±0.027 bc	0.86±0.013 A
T7	0.81±0.007 j-l	0.85±0.003 e-h	0.88±0.009 de	0.94±0.013 c	0.87±0.008 A
T8	0.82±0.009 i-l	0.82±0.015 i-l	0.90±0.006 d	0.98±0.015 a	0.88±0.013 A
Mean	0.81±0.004 D	0.82±0.005 C	0.87±0.004 B	0.98±0.006 A	

*Values with similar letter in a row or column indicate non-significant differences with each other

Product Development:

***Product physico-chemical*:**

***Acidity*:** The result regarding acidity of yoghurt indicated that there was no impact of different levels and types of melon seed oil on the acidity of the yoghurt. However, due to variation in oil concentrations the acidity was ranged from 0.86±0.013 to 0.88±0.013 % lactic acid as shown in Table 3. The influence of storage period revealed that the acidity of the yoghurt was gradually increased with storage period. The acidity of the yoghurt was highest acidity was increased from 0.81±0.004 to 0.98±0.006% (as lactic acid) during storage period of 9 days. The combine effect of treatments and storage period indicated that acidity of the yoghurt was ranged from 0.80±0.00% to 1.00±0.003% (as lactic acid) due to variation in concentration and type of oil during a storage period of 9 days.

***Total solids*:** The highest solids were observed in the yogurt prepared with 75% substitution of dairy fat with melon oil (SEO) followed by the yoghurt prepared by 25% replacement of melon oil (SEO) with mean total solids of 12.72±0.11% and 12.54±0.04%, respectively. Similarly, the maximum total solids were observed at zero day of storage followed by total solids at 3rd day of storage with mean values of 12.72±0.022% and 12.29±0.054%, respectively. Although, the interactive effect of treatments and storage period on total solids was non-significant however there was a gradual little decline in total solids of the product with the passage of time in all the treatments. The total solid contents were ranged from 10.98±0.03% to 13.34±0.07% due to variation in melon oil concentration and its type (extracted by different methods) during a storage period of 9 days (Table 4).

***Fat contents*:** The results for fat of yoghurt indicated non-significant effect of treatments, storage as well as treatments x storage. The mean fat contents were ranged from 3.49±0.005% to 3.50±0.01% and from 3.49±0.003% to 3.50±0.006% due to treatments and storage period, respectively. Similarly, due to combine effect of treatments and storage period, the mean fat contents were ranged from 3.48±0.005% to 3.51±0.009% due to variation in treatments and storage period as shown in Table 5.

Table 4. Effect of treatment and storage on total solids of yoghurt (%).

Treatments	Storage period (Days)				Mean
	0	3	6	9	
T0	12.35±0.02 a	11.88±0.06 a	11.41±0.06 a	11.15±0.03 a	11.70±0.04 F
T1	13.18±0.01 a	12.71±0.05 a	12.25±0.06 a	12.02±0.02 a	12.54±0.04 B
T2	12.53±0.04 a	12.08±0.08 a	11.57±0.08 a	11.32±0.05 a	11.87±0.06 E
T3	13.34±0.07 a	12.94±0.14 a	12.43±0.14 a	12.18±0.09 a	12.72±0.11 A
T4	13.00±0.03 a	12.59±0.07 a	12.05±0.10 a	11.79±0.06 a	12.36±0.06 C
T5	12.78±0.04 a	12.37±0.09 a	11.85±0.05 a	11.59±0.01 a	12.15±0.04 D
T6	12.12±0.04 a	11.68±0.10 a	11.23±0.08 a	10.94±0.05 a	11.49±0.07 G
T7	12.17±0.02 a	11.77±0.03 a	11.24±0.07 a	10.98±0.03 a	11.54±0.04 G
T8	13.00±0.08 a	12.57±0.04 a	12.11±0.07 a	11.80±0.08 a	12.37±0.06 C
Mean	12.72±0.022 A	12.29±0.054 B	11.79±0.054 C	11.53±0.028 D	

*Values with similar letter in a row or column indicate non-significant differences with each other.

Table 5. Effect of treatment and storage on fat content of yoghurt (%).

Treatments	Storage Period (Days)				Mean
	0	3	6	9	
T0	3.49±0.007 a	3.50±0.006 a	3.49±0.003 a	3.49±0.003 a	3.49±0.005 A
T1	3.50±0.015 a	3.50±0.009 a	3.50±0.006 a	3.49±0.009 a	3.50±0.010 A
T2	3.49±0.003 a	3.49±0.007 a	3.48±0.003 a	3.48±0.005 a	3.49±0.005 A
T3	3.50±0.006 a	3.50±0.006 a	3.50±0.009 a	3.50±0.000 a	3.50±0.005 A
T4	3.50±0.010 a	3.50±0.012 a	3.49±0.010 a	3.49±0.009 a	3.49±0.010 A
T5	3.50±0.015 a	3.51±0.009 a	3.49±0.008 a	3.49±0.003 a	3.50±0.009 A
T6	3.50±0.003 a	3.50±0.002 a	3.50±0.003 a	3.50±0.004 a	3.50±0.003 A
T7	3.50±0.003 a	3.50±0.003 a	3.50±0.004 a	3.50±0.006 a	3.50±0.004 A
T8	3.50±0.015 a	3.50±0.003 a	3.50±0.010 a	3.50±0.005 a	3.50±0.008 A
Mean	3.50±0.006 A	3.50±0.005 A	3.49±0.004 A	3.49±0.003 A	

*Values with similar letter in a row or column indicate non-significant differences with each other

***Sensory evaluation of yoghurt*:** The result regarding sensory/organoleptic properties of the yoghurt revealed that the food products like yoghurt could be a source of carrier of melon seed oil as functional ingredient. The results demonstrated that none of the treatment got score for different parameters in the range of dislikeness. However, the results for 25% substitution of animal fat with melon seed oil were better for different parameters and lowest scores were given to the yoghurt prepared by 100% substitution of animal fat by melon seed oil. Significantly the mean highest and second highest scores for appearance (6.71±0.12 and 5.83±0.27), body and texture (6.77±0.19 and 6.67±0.14), mouth feel (6.99±0.20 and 6.67±0.13) and over all acceptability (6.76±0.20 and 6.43±0.17) of yoghurt were given to the product prepared without replacement of oil (T_0) and 25% substitution of SEO (T_1). Similarly, significantly the mean highest and second highest scores for aroma (6.79±0.21 and 6.76±0.19) and taste (6.86±0.11 and 6.80±0.19) were given to the yoghurt prepared by 25% (T_1) replacement of animal fat with melon oil (SEO) and the yoghurt prepared without any addition of melon oil (T_0) as shown in Fig.2 to Fig.7.

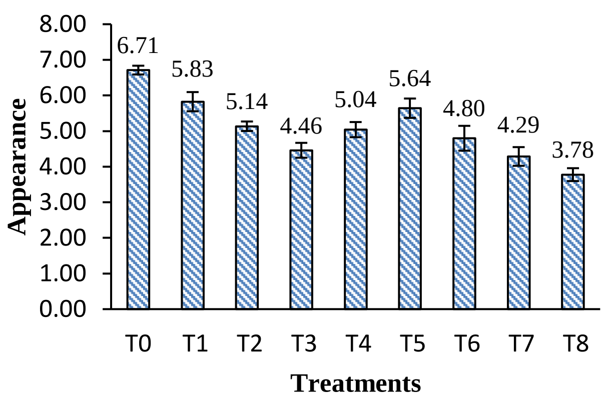

Figure 2. Effect of different levels of melon seed oil on appearance of the yoghurt.

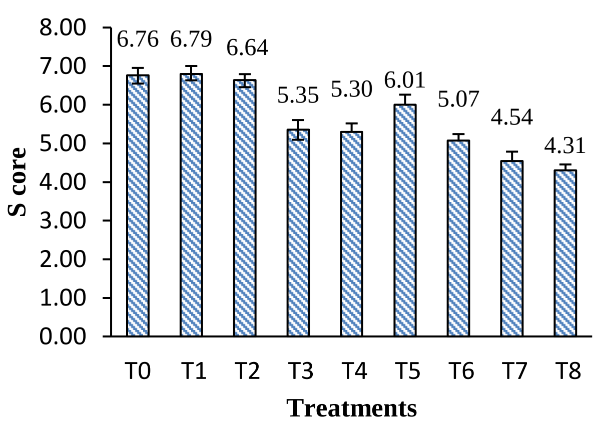

Figure 3. Effect of different levels of melon seed oil on aroma of the yoghurt.

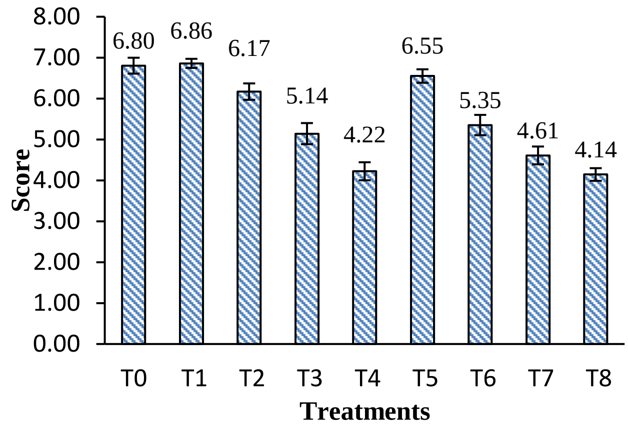

Figure 4. Effect of different levels of melon seed oil on taste of the yoghurt.

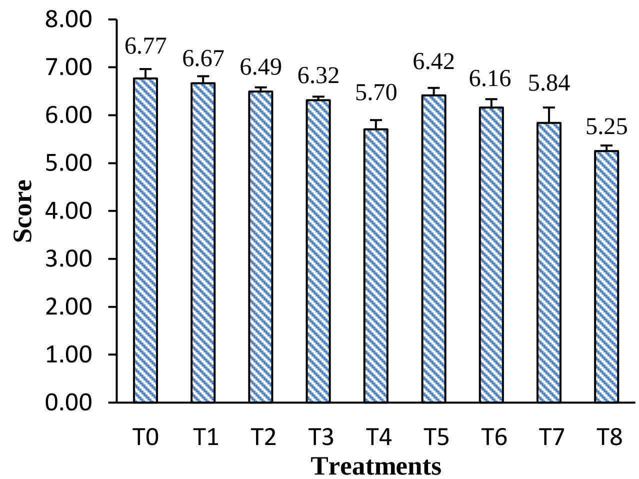

Figure 5. Effect of different levels of melon seed oil on body and texture of the yoghurt.

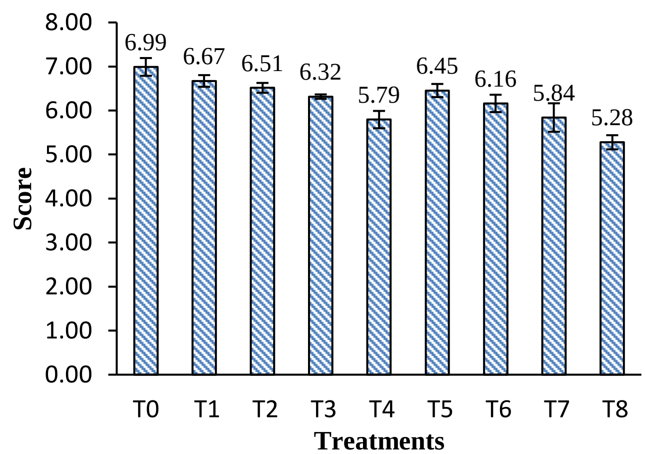

Figure 6. Effect of different levels of melon seed oil on mouth feel of the yoghurt.

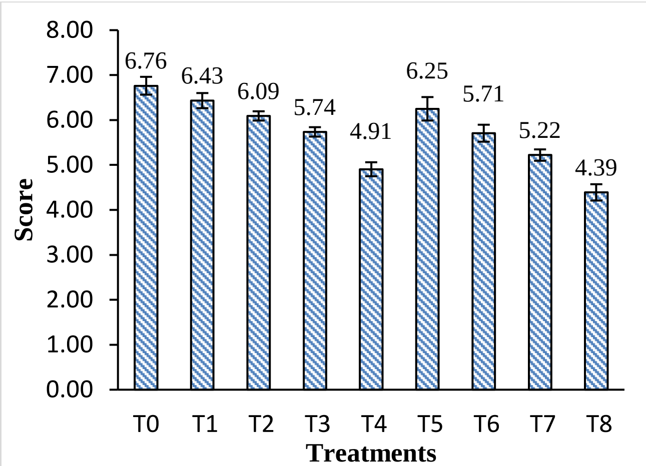

Figure 7. Effect of different levels of melon seed oil on overall acceptability of the yoghurt.

DISCUSSION

The current research results revealed that the melon seeds contains high amount of oil as well as protein, fiber and mineral contents. Similar results were also observed by Azhari *et al.* (2014), who reported 31.1% oil, 28.7% protein and 24.7% fiber in sweet melon seeds. The results were also similar to the findings of Mariod *et al*. (2009), who also observed oil recovery ranged from 22.33±0.18 to 27.10±0.26% while working on different cultivars of melon. Moreover, the current results revealed that the oil yield obtained from the sweet melon seeds (27±0.02% SEO, 20±0.06% CPO) was comparatively higher than cotton seed oil, corn oil and soybean oil with 15.05% (Adelola and Ndudi, 2012), 4-6% and 22.33% (Shende and Sidhu, 2014; Akani *et al*., 2005) oil yields, respectively. The high healthy oil yield of sweet melon seeds (27%) definitely make it a value able oil source to fulfil various nutritional and medicinal goals. The peroxide values (1.65±0.00% and 8.10±0.02%) elicited a good sign for quality of the oil as peroxide value more than 10% indicates deterioration and if this value cross the limit more than 20% then gave rancid taste to the oil (Adelaja, 2006). Similarly, the free fatty acid (FFA) contents of the extracted melon seed oil were found to be 2.13±0.02 to 4.13±0.01%. These values were higher than the FFA value of melon seed oil (1.51±0.06) reported by Azhari *et al*. (2014) in their investigation on physico-chemical properties and chemical composition of melon seed oil.

The observed saponification value of extracted oils from both techniques were lower than saponification values reported by some other researchers in oils extracted from different sources as reported by Warra *et al*. (2015), Akububugwo and Ugbogu (2007) and Ikhuoria and Maliki (2007) for canary melon seed oil (233.62±0.01 mgKOH/g), Elaeis guineensis seed oil (246.60 mg KOH/g) and African pear oil (143.76 mgKOH/g), respectively while evaluating the physico-chemical characteristics of above mentioned oils.

The concentrations of unsaturated fatty acids; UFA (80.54%) and saturated fatty acids; SFA (19.43%) in *C. melo* var. acidulus documented by Manohar and Murthy (2014) were lower than the current quantified values. However, they observed the same order of fatty acid concentrations (linoleic acid, followed by oleic acid and palmitic acid) as quantified by the current research on characterization of melon (*Cucumis melo*) seed oil obtained by n-hexane and cold press extraction. The conceding results were also observed by Azhari *et al*. (2014) while determining the fatty acid profile of seinat seed oil. They found 80.54% UFA concentration with linoleic acid (61.10±0.08%) as major detected UFA. Bouazzaoui *et al*. (2016) also found linoleic acid (60.1%) followed by the oleic acid (25.3%) as the major UFAs in *Cucumis melo* L. Inodorus seed oil. whereas, the polyunsaturated fatty acids; PUFA concentration observed in present study was higher than above mentioned seed oils and also from sunflower seed oil; 66.2% (Edem, 2002), pumpkin seed oil; 42.6% and Soybean seed oil; 53.2% (Nawirska-Olszanska *et al*., 2013). As far as saturated fatty acids constituents were concerned, melon (*Cucumis melo*) seeds oil obtained from both of the mentioned techniques (8.97-9.73%) were lower than SFA contents of palm oil (49.9%), soybean oil (15.1%), and pumpkin seed oil (20.3%) as reported by Nawirska-Olszanska *et al*. (2013). The SFA contents were also lower than the SFA contents of sunflower seed oil (11.3%) and *Cucumis melo* L. Inodorus seed oil (14.6%) as reported by Edem (2002) and Bouazzaoui *et al*. (2016), respectively.

The occurrence of high concentration of essential fatty acids such as linoleic acid and oleic acid in edible oil make it nutritionally valuable/functional. Oils rich in essential fatty acids are gaining market value and consumer acceptance due to its multifaceted functional/physiological health effects like improved immunity, prevention of atherosclerosis and cardio-vascular disorders (Oomah *et al*., 2000; Wang and Jones, 2004). Therefore, melon (*Cucumis melo*) seed oil obtained by hexane and cold press extraction techniques can be utilized as a functional edible oil with high concentration of essential fatty acids especially linoleic acid by the food industries.

Nowadays, functional food products has been gaining the market interest as well as consumer's preferences because of its positive impacts on human health. A functional food basically contains known bioactive compounds (functional ingredients) which advantageously influence one or more objective functions in the body along with its nutritious properties (Shafi *et al*., 2014). The functional foods exert their positive or beneficial impacts on human health because of the presence of bioactive food nutrients (Ozer and Kirmaci, 2010; Goyal *et al*., 2014). Although many of routine foods are naturally rich in biologically active components, the bio-accessibility of these compounds is a key aspect to be considered. Amongst bioactive food nutrients, polyunsaturated fatty acids (PUFA) play an important role in the physiology of human body as they serve as the basic structural components of biological cell membranes, hormones, brain, nervous system and ratina (Arterburn *et al*., 2007; Gogus and Smith, 2010). Moreover, PUFA also play an important role in the maintenance of blood pressure, prevention of cancer, availability of micronutrients (Hulbert *et al*., 2005; Lane *et al*., 2014). So PUFA are well recognized as essential part of the human diet (Vella *et al*., 2013; Ganesan *et al*., 2014). By focusing on the sources of healthy fatty acids (PUFA), it was discovered through recent researches that many fruits and vegetables could be rich, suitable, cost effective and available source of PUFA. Therefore, this valuable healthy oil can be effectively utilized by selecting appropriate food as a vehicle (Welch *et al*., 2010; Ganesan *et al*., 2014).

The physiochemical and sensory analysis of the product (yoghurt) in current study also gave significantly positive results for incorporation of melon seed oil as functional ingredient but up to some extent. Up to 25% incorporation of melon seed oil in the yoghurt was accepted by the consumers. By increasing concentration of melon oil above 25%, the typical taste and aroma of dairy product was masked. However, in non-dairy food products the higher concentrations of melon seed oil may be incorporated with no masking of typical taste and aroma of the product.

***Conclusion*:** On the basis of these results it was concluded that the presence of significant quantity of edible oil with high nutritional profile of sweet melon seed could be enough to boost its economical and nutritional use. Sweet melon seed oil would be a cheapest source of edible oil with advantage of its fatty acid constituents of both polyunsaturated fatty acids and mono unsaturated fatty acids as functional food ingredients to improve health conditions. So it could be utilized by food industries for various purposes like as edible oil, functional edible oil and for nutraceutical production.

The presence of high quantity of polyunsaturated fatty acids in the melon seed oil depicted its healthy and functional potentials. On the other side, physico-chemical assays of functional yoghurt developed by substitution of sweet melon seed oil extracted by Soxhlet extraction and cold press extraction methods concluded that a functional yoghurt with healthy nutritional status can be prepared by the substitution of dairy fat with sweet melon seed oil either extracted through Soxhlet extraction or cold press extraction technique. However, the lower concentration of sweet melon seed oil up to 25% was acceptable by the panelists. Whereas higher concentration of sweet melon seed oil impart its color, flavor and taste to the yoghurt. Hence, sensory evaluation results suggested to avoid complete substitution of dairy fat with sweet melon seed oil and focused on partial substitution for the development of functional yoghurt.

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