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EFFECT OF PARTIAL SUBSTITUTION OF SUPPLEMENTARY SKIM MILK POWDER WITH DEFATTED APRICOT KERNEL POWDER ON THE QUALITY OF ICE CREAM AND YOGHURT

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ABSTRACT

Defatted apricot kernel powder (DAKP) was added as a supplementary protein source while making ice cream and yoghurt in different ratios ranging from ١٠-٥٠٪ for ice cream and ١٠-٤٠٪ for yoghurt to replace a part of added skim milk powder (SMP). Values of ice cream pH, specific gravity and weight per gallon increased by increasing amount of DAKP. Irrespective of the replacement level, higher protein stability was noticed. Supplementing with DAKP led to reduce the overrun of the resulting ice cream. However, the use of DAKP deteriorated the flavor more than body and texture and appearance of the resulting ice cream. Substitution of supplementary SMP by DAKP in ice cream could be recommended up to ٣٠٪.

When supplementary SMP was replaced by DAKP in yoghurt manufacture, the average titratable acidity, total solids, total nitrogen, tyrosine, tryptophan and non-protein nitrogen contents of yoghurt were increased by increasing DAKP. Conversely, pH and acetaldehyde values decreased with increasing of DAKP. Also, addition of DAKP led to a decrease in the counts of lactic acid bacteria and psychrotrophic bacteria in the resultant yoghurt when either fresh or after cold storage for ٧ days. Substitution of supplementary SMP with DAKP in the manufacture of yoghurt could be recommended up to ٢٠٪.

Keywords: Ice cream, Yoghurt, Apricot kernel, Skim milk powder

INTRODUCTION

The consumption of food enriched with protein from plant sources has been increased among vegetarian and health conscious people (Wu *et al.* ٢٠٠١). However, efforts need to ensure that enrichment should not cause any important alteration in the sensory and functional attributes of final product (Topgul, ١٩٩٦). In addition, enriched product should be economically affordable, nutritive and satisfactory in terms of consumers' expectations (Ugarcic Hardi *et al.* ٢٠٠٣).

The kernels of apricot which considered as a waste in the canning and fruit industries, have been utilized in Germany and USA for the manufacture of fixed oil. On the other hand, the defatted apricot kernel powder (DAKP) containing ٥٢٪ crude protein, which can be used in supplementing some food industries with vegetative protein (Rizk *et al.* ٢٠٠٩ and Volotavskaya *et al.* ١٩٨٠).

Defatted apricot kernel powder mainly contains high levels of potassium and magnesium and amino acids: methionine, phenyl alanine valine, therionine, arginine, aspartic acid and glutamic acid (Azouz *et al.* ٢٠٠٩ and Kamel & Kakuda, ١٩٩٢).

Many investigations had been undertaken to study the possibilities of manufacturing some new edible recipes containing vegetable protein which could be added in significant amounts to many food recipes as an excellent low cost protein (Hammad *et al.* ١٩٨٥; Megdoub *et al.* ١٩٩٢ a & b and Paik *et al.* ١٩٨٥).

The objective of this research was to study partial substitution of supplementary skim milk powder (SMP) with defatted apricot kernel powder (DAKP) while making ice cream and yoghurt for lowering cost and improving their qualities.

MATERIALS AND METHODS

Apricot seeds (*Prunus ameniaca* L.) were collected during ٢٠٠٩ season from Food Processing Unites of Food Technology Research Institute, Agriculture Research Center, Giza, Egypt.

Pure culture of *Streptococcus thermophiles* and *Lactobacillus bulgaricus* were obtained from Cairo – MIRCEN, Fac. of Agric., Ain Shams University. These cultures were propagated weekly in sterilized buffalo skim milk at ٤٢°C and held under refrigeration at ٤°C after coagulation.

Fresh raw buffalo milk was obtained from Dairy Industry Unit, Animal Production Research Institute, Ministry of Agriculture, Giza, Egypt.

Skim milk powder was from USA, its composition was protein ٣٤٪, lactose ٥١٪, fat ١,٢٪, mineral ٨,٢٪ and moisture ٤٪.

The apricot seeds were washed with water, and sun dried for ٣ weeks, then manually crushed. The kernels were collected and boiled for ٣٠ min. in ٠,١٪ sodium bicarbonate, then soaked in distilled water for ٤٨ hrs. to remove bitterness (detoxification) and strip off the brown skin. The peeled kernels were dried in a forced draught air oven at ٥٠ºC. Then, the apricot kernels were ground and sieved to pass through a ٧٠ mesh sieve to get apricot kernels powder. Then, defatted apricot kernel meal was prepared using hexan (٨٠٪).

Control yoghurt treatment was made from fat standardized buffalo milk (٣٪ fat) with adding ١,٥٪ skim milk powder (SMP) in order to improve the yoghurt consistency. The supplementary SMP was substituted in four yoghurt treatments with DAKP at levels of ١٠, ٢٠, ٣٠ and ٤٠٪, respectively.

Moisture, protein, fat, crude fiber, ash hydrocyanic acids (HCN) in the defatted apricot kernel were assessed or checked according to the methods of A.O.A.C. (٢٠٠٠).

Essential amino acids composition of defatted apricot kernel meal was analyzed using Amino Acid Analyzer, Beckman ٧٣٠٠, according to the method of Lopez *et al.* (١٩٩١).

All yoghurt treatments were examined, when fresh and after ٢, ٤ and ٧ days of cold storage for their contents of total solids, titratable acidity, pH values, total nitrogen and non-protein nitrogen (Ling, ١٩٦٣) tyrosine and tryptophan (Vakaleris and Price, ١٩٥٩) acetaldehyde (Lees & Jogo, ١٩٦٩).

Total viable count of psychrotrophic bacteria count and coliform count were determined in yoghurt treatments according to (APHA, ١٩٩٤) Lactic acid bacteria count (Elliker *et al.* ١٩٩٥), staphilococci count (Baird-Parker, ١٩٦٢) and yeast mold count according to (APHA, ١٩٩٤).

The used ingredients of an ice cream mix were: fresh cream ٣٠% fat, skim milk powder, sugar, DAKP, stabilizer & emulsifier. Control ice cream mix was prepared (Arbuckle, ١٩٧٧), to contain ٨٪ fat, ١٢٪ MSNF, ١٦٪ sucrose and ٠,٥٪ stabilizer and emulsifier mixture.

Another five ice cream mixes were prepared by substitution of SMP with DAKP at levels of ١٠, ٢٠, ٣٠, ٤٠ and ٥٠٪. All mixes were homogenized at ٧١ºC using a laboratory manual homogenizer at ١٠٠ pound/inch٢, and pasteurized at ٧١ºC/٣٠ min. as suggested by Sommer (١٩٥١). All mixes were cooled to ٥ºC and aged at the same temperature for ١٨-٢٤ hrs. prior to freezing. After aging, samples of each mixture were withdrawn for chemical and physical analysis. Then ١٠ ml of edible red color solution (١٪ w/v) and suitable amount of edible strawberry essence were added. Mixes were frozen (-١٨ºC) in an ice cream freezing machine which was automatically controlled to stop whipping at unified consistency. The resulting ice cream was hardened in freezer at -١٨ºC according to Rothwell, (١٩٧٦).

All ice cream treatments were examined for titrable acidity and pH values according to Arbuckle (١٩٧٧), specific gravity (Winton and Winton,K. ١٩٥٨), weight per gallon (Burke, ١٩٤٧) and protein stability (Kramer and Twigg ١٩٧٣). The resulting ice cream was examined for overrun (Sommer, ١٩٥١).

Sensory evaluation of ice cream and yoghurt manufactured with different ratios of DAKP were evaluated by ten trained panelists from the staff members of Dairy Research Department, Food Technology Research Institute, Agricultural Research Center, Giza, Egypt.

Data were statistically analyzed to facilitate comparing the least significant differences (LSD) between means of different values according to (Snedecor and Cochran ١٩٧٣).

RESULTS AND DISCUSSION

Chemical composition of apricot kernel and defatted apricot kernel powder are illustrated in Table (١). It could be observed that the apricot kernel contained ٥,٥٪, ٢٧,٨٣٪, ٥٠,٣٠٪, ٢,٢٠٪ and ٣,١٦٪ moisture, protein, crude lipid, ash and crude fiber, respectively. On the other hand, the chemical constituents of defatted apricot kernel powder were ٦,١٢, ٥٥,٧٦, ٠,٧٢, ٥,٣٢ and ٧,٩٢ for moisture, protein, crude lipid, ash and crude fiber respectively. These results are similar with those obtained by Rizk *et al.* (٢٠٠٩); Azouz *et al.* (٢٠٠٩); Galal (١٩٩٢) and Lazos (١٩٩١).

Table ١: Chemical composition of dried apricot kernel and defatted apricot kernel powder.

Constituents	Dried Apricot kernel	Defatted apricot kernel powder
Moisture (%)	٥,٥	٦,١٢
Crude oil (%)	٥٠,٣٠	٠,٢٧
Protein (%)	٢٧,٨٣	٥٥,٧٦
Ash (%)	٢.٢٠	٥,٣٢
Crude fiber (%)	٣,١٦	٧,٩٢
Total carbohydrate* (%)	١٦,٥١	٣٠,٢٨

- **Calculated by difference.**

Regarding the amino acids composition of DAKP, Table (٢). reveales the presence of ١٦ amino acids . The major amino acid were glutamic (٢٠,٧٥), aspartic (١٢.٨٢), glycine (٦,٩٥) g/ ١٠٠ g protein. On the other hand, serine, valine, isoleucine, tyrosine, arginine, lysine, histidine, leucine and therionine were ٥,٣٨, ٤,٧٣, ٤,٥٠, ٥,٩٣, ٤,٧٣, ١,٨٣, ٢,٥٣, ٣,٢٦ and ٠,٨٢ g/ ١٠٠ g protein, respectively. These results are in agreement with Azouz *et al.* (٢٠٠٩) and El-Samkary *et al.* (١٩٩٥).

Table ٢. Amino acids profile of DAKP.

Amino acid	g/ ١٠٠ g protein
Aspartic	١٢,٨٢
Therionine	٠,٨٢
Serine	٥,٣٨
Glutamic	٢٠,٧٥
Glycine	١١,٨٦
Alanine	٧,٥٢
Valine	٤,٧٣
Methionine	١.١٨
Cystine	١,٢٧
Isoleucine	٤,٥٠
Leucine	٣,٢٦
Tyrosine	٥,٩٣
Phenylalanine	٦,٩٥
Histidine	٢,٥٣
Lysine	١,٨٣
Arginine	٤,٧٣

DAKP= Defatted apricot kernel powder.

Physicochemical properties of ice cream mixes being manufactured with different ratios of DAKP are illustrated in Table (٣).

Titrable acidity (%)of ice cream mixes slightly decreased with the addition of DAKP. This decrease could be attributed to some differences in the nature of apricot protein, as compared with milk proteins. The increase of DAKP ratio led to the decrease of titratable acidity. Changes in pH values of ice cream mixes of all treatments were opposite to those found for titratable acidity. These results are in agreement with Hammad *et al.* (١٩٨٥) and Magdoub *et al.* (١٩٩٢).

The specific gravity values of ice cream **mixes increased** by increasing the replacement of DAKP. This could be attributed to the nature of DAKP protein.

Table ٣: Physicochemical properties of ice cream mixes and product containing different levels of DAKP.

Physicochemical properties of ice cream (mix & product)	Replacement of SMP will DAKP (%)					
	٠	١٠	٢٠	٣٠	٤٠	٥٠
Titratable acidity (%)	٠,٢٣	٠,٢١	٠,٢٠	٠,١٩	٠,١٩	٠,١٨
pH values	٦,٥٥	٦,٩٠	٦,٩٤	٦,٩٨	٧,٠٠	٧,٠٠
Specific gravity	١,٠٧٤٠	١,٠٧٧٩	١,٠٨٠٠	١,٠٨٧٠	١,٠٩٠٤	١,٠٩٤٨
Weight per gallon (kg)	٤,٠٦	٤,٠٨	٤,٠٩	٤,١١	٤,١٣	٤,١٥
Protein stability (ml ٩٥٪ ethanol)	٨,٠	٩,٠	٩,٠	٩,٠	٩,٠	٩,٠
Overum % (Product)	٧٢,٥	٦٨,٣	٦٧,٧	٦١,٣	٥٩,٣	٥٧,١

SMP= Skim milk powder.
DAKP= Defatted apricot kernel powder.

The weights per gallon of different ice cream mixes were found to be closely related to their specific gravity (Table ٣). It is obvious that the weight per gallon of ice cream mixes increased proportionally as the level of DAKP was increased. Such result mostly related to the increase being occurred in the protein content of ice cream mixes containing the defatted apricot kernel powder. However, slightly higher protein stability irrespective of the replacement level was recorded. These trends in ice cream mix results are in agreement with those of Magdoub (١٩٩٢a); El-Deeb and Salem (١٩٨٤) and Hammad *et al.* (١٩٨٥).

Overrun of the resulting ice cream decreased as a result of using DAKP as a replacer for SMP (Table ٣). This decrease could be attributed to the low whipping ability of mixes containing DAKP. These data coincide with Magdoub *et al.* (١٩٩٢a) and Hammad *et al.* (١٩٨٥) who used defatted soy flour as replacer for MSNF in ice cream mixes.

The sensory evaluation of ice cream manufactured with different levels of DAKP are presented in Table (٤). The results indicate that the control sample and sample containing ١٠٪ DAKP gained the highest score being ٩٢ points of investigated attributes, followed by adding ٢٠, ٣٠, ٤٠, and ٥٠٪, DAKP respectively.

The foregoing results indicate that DAKP can be successfully used to substitute SMP in ice cream mix at a concentration up to ٣٠٪.

The effect of DAKP on some chemical properties of yoghurt during storage periods is illustrated in Table (٥). During cold storage for ٧ days, it was observed that the total solids content of yoghurt gradually increased as the DAKP increased. These results are in accordance with those given by Khader *et al.* (١٩٨٣). Such results could be an indication for some increase in the protein content instead of lactose, which is mostly fermented in the resulting yoghurt.

The acidity of yoghurt gradually decreased by increasing the level of DAKP. These results could mean that the DAKP has greater amphoteric capability than the milk protein, in addition to the decrease in the available lactose for lactic fermentation. Changes in pH values of all yoghurt treatments were opposite to those found for titratable acidity. These results are in agreements with those of Khader *et al.* (١٩٨٣).

Table ٤: Sensory evaluation* of ice cream manufactured with DAKP. (average of ٣ replicates)

Replacement SMP with DAKP (%)	Flavour (٥٠) points	Body & Texture (٤٠) points	Appearance (١٠) points	Total (١٠٠) points
٠	٤٧ᵃ	٣٩ᵃ	٩,٠ᵃ	٩٥ᵃ
١٠	٤٥ᵃ	٣٨ᵃ	٩,٠ᵃ	٩٢ᵃ
٢٠	٤٣ᵃ	٣٥ᵃ	٨,٦ᵇ	٨٦,٦ᵇ
٣٠	٤٠ᵇ	٣٤ᵇ	٨,٣ᵇ	٨٢,٣ᵇᶜ
٤٠	٣٨ᵇ	٣٢ᵇ	٨,٠ᵇᶜ	٧٨,٠ᶜ
٥٠	٣٥ᵇᶜ	٣٢ᵇ	٨,٠ᵇᶜ	٧٨,٠ᶜ

SMP= Skim milk powder, DAKP = Defatted apricot kernel powder.
***Values with different letters in the same column are significant different at p<٠,٠٥.**

The tyrosine contents gradually increased with the increase of added DAKP (Table ٥). This increase seems to be related to the increase recorded in the total protein of yoghurt containing the DAKP. However, the increase in tyrosine content of all treatments during the storage period could be attributed to partial protein degradation, that might be caused by microorganisms. These findings are in agreement with those obtained by both Magdoub *et al.* (١٩٩٢b) and El-Shibiny *et al.* (١٩٧٩) who reported that cold storage of yoghurt for ٧ resulted in an increase in soluble tyrosine content. Also, tryptophan content increased as the DAKP was increased in fresh yoghurt (Table ٦), but during cold storage, lower tryplophan content was noticed in yoghurt treatments. These results agree with those reported by El-Shibiny *et al.* (١٩٧٩), who found that the soluble tryptophan content of yoghurt was gradually decreased during cold storage for ٧ days.

Replacing SMP with ١٠٪ to ٥٠٪ of DAKP slightly increases the non-protein nitrogen (NPN) of yoghurt, when fresh and throughout the cold storage (Table ٥). This slight increase in NPN % of yoghurt during cold storage might be due to a limited hydrolysis of proteins.

Increasing the level of DAKP in yoghurt resulted a decrease in acetaldehyde content during cold storage periods (Table ٥). This decrease is presumably due to the ability of numerous lactic acid producing microorganisms to utilize acetaldehyde (Bills and Day, ١٩٦٦). Also, such a decrease could be attributed to volatility of acetaldehyde.

Table ٥: Effect of partial replacing of SMP by DAKP on chemical properties of yoghurt during cold storage.

Replacement level of SMP with DAKP %	Storage period (days)	Total solids (%)	Acidity (%)	pH values	Total nitrogen (%)	Tyrosine mg/ ١٠٠ g	Tryptophan mg/١٠٠ g	Non protein nitrogen %	Acetaldehyde µ mole/١٠٠ g
٠,٠	Fresh	١٣,٤	٠,٧٦	٤,٥٥	٠,٥٥	٣١,٥	٤١,٦	٠,٠٥١	١٨٤
	٢	١٣,٦	١,٠٩	٤,٢٠	٠,٥٧	٣٦,٤	٣٩,٨	٠,٠٥٣	١٤٠
	٤	١٣,٩	١,٢٠	٣,٩٤	٠,٥٨	٤٤,٠	٣٠,٦	٠,٠٥٦	١١٥
	٧	١٤,٠٤	١,٣٥	٣,٨٧	٠,٦٠	٤٩,٠	٢٦,٨	٠,٠٥٧	٨٦
١٠	Fresh	١٣,٥	٠,٧٥	٤,٦٢	٠,٦١	٤٤,٠	٥٩,٦	٠,٠٥٢	١٣٠
	٢	١٣,٧	٠,٩٨	٤,٣٥	٠,٦٢	٥١,٠	٥٥,٨	٠,٠٥٥	١١٠
	٤	١٣,٨	١,٠٠	٤,١٦	٠,٦٤	٦٨,٥	٥٠,٥٠	٠,٠٥٨	٦٧
	٧	١٤,٠	١,٢٣	٤,٠٠	٠,٦٥	٧٣,٥	٤٥,٧٠	٠,٠٦٠	٥٠
٢٠	Fresh	١٣,٧٥	٠,٧٤	٤,٦٨	٠,٦٧	٦٠,٠	٧٤,٥٠	٠,٠٥٧	١٠٠
	٢	١٣,٨٠	٠,٩٥	٤,٣٦	٠,٦٨	٦٥,٥	٧١,٨٠	٠,٠٥٩	٨٠
	٤	١٤,٠٠	١,٠٠	٤.١٢	٠,٦٩	٨٣,٥	٦٢,٣	٠,٠٦١	٥٣
	٧	١٤,٢٠	١,٢٤	٣,٩٠	٠,٧٠	٨٦,٨	٥٧,٥٤	٠,٠٦٢	٤٠
٣٠	Fresh	١٤,٠٠	٠,٧٢	٤,٧٠	٠,٧٣	٦٦,٣	٨٠,٣	٠,٠٦٢	٩٠
	٢	١٤,٠٤	٠,٩٦	٤,٤٥	٠,٧٤	٧٢,٤	٧٧,٥	٠,٠٦٢	٦٨
	٤	١٤,١٥	٠,٩٩	٤,١٩	٠,٧٥	٨٧,٣	٦٧,٤	٠,٠٦٤	٣٢
	٧	١٤,٢٨	١,١٦	٤,٠٢	٠,٧٦	١٠٠,٢٠	٦١,٣٠	٠,٠٦٦	٣٢
٤٠	Fresh	١٤,٠٥	٠,٧٠	٤,٧٣	٠,٧٦	٧٥,٦	٨٤,٦٣	٠,٦٥	٨٠
	٢	١٤,١٦	٠,٨٣	٤,٣١	٠,٧٧	٨٥,٤	٨٠,٥	٠,٦٥	٦٥
	٤	١٤,٢١	٠,٩٢	٤,١١	٠,٧٨	٩٥,٢	٧٥,٤	٠,٦٧	٣٥
	٧	١٤,٣٢	٠,٩٩	٤,٠٦	٠,٨٠	١٠٦,٤	٦٤,٢	٠,٦٨	٢٧

SMP= Skim milk powder.
DAKP = Defatted apricot kernel powder.

The effect of added different ratios of DAKP on some microbial counts in yoghurt during cold storage for ٧ days is illustrated in Table (٦). Lower total viable counts , and lactic acid bacteria were detected in yoghurt with added DAKR than that found in control yoghurt treatment. This was true whether the yoghurt was fresh or during storage and irrespective to DAKP level. This could be attributed to the fact that milk sugar is more suitable for microbial growth than the carbohydrate present in DAKP. However, the effect of DAKP on yoghurt starter is in accordance with the effect of soy protein in yoghurt beverage (Paik *et al.* ١٩٨٥).

Results in Table (٦) indicate that the psychrotrophic bacterial counts were lower in yoghurt treatments containing the DAKP than the control. On the other hand, coliforms, staphylococci, yeast and molds counts could not be detected in all treatments, either when fresh or during cold storage for ٧ days.

Sensory evaluation of yoghurt made with different levels of DAKP during cold storage for ٧ days is presented in Table (٧). It could be noticed that increasing DAKP more than ٢٠٪ tended to impair the sensory properties of the resultant yoghurt. Also, it could be noticed that cold storage greatly affected the sensory properties of yoghurt containing DAKP. However this effect was more pronounced when the replacement excessed ٢٠٪.

Table ٦: The effect of partial replacing of SMP by DAKP on some microbial counts in yoghurt during cold storage.

Replacement level of SMP with DAKP (%)	Storage period (days)	Total viable count	Lactic acid bacterial count	Psychrotrophic bacterial count
		C. F. U. $\times$١٠^{٧}/ ml		C. F. U. $\times$١٠^{١}/ ml
٠,٠	Fresh	٥,٦	٥,٨	٤,٦
٠,٠	٢	٧,٧	٩,٦	٧,٧
٠,٠	٤	٨,٢	١١,٨٠	١٠,٦
٠,٠	٧	٧,٩	١٠,٠	١٤,٨
١٠	Fresh	٤,٩	٣,٤	٣,٢
١٠	٢	٦,٣	٥,٨٠	٦,٠
١٠	٤	٦,٩	٩,٤٠	١٠,٠
١٠	٧	٦,٥	٨,٣٠	١٣,١
٢٠	Fresh	٤,٢	٣,٢	٢,٤
٢٠	٢	٥,٠	٤,١	٤,٨
٢٠	٤	٧,٠	٥,٩	٨,٣
٢٠	٧	٦,٨	٤,٩	١٠,٩
٣٠	Fresh	٤,١	٢,٨	٢,٢
٣٠	٢	٤,٩	٣,٧	٤,١
٣٠	٤	٦,٨	٥,٦	٧,٦
٣٠	٧	٦,٦	٤,٥	٩,٥
٤٠	Fresh	٤,٠	٢,١	٢,١
٤٠	٢	٤,٦	٣,٢	٣,٨
٤٠	٤	٦,٣	٤,٣	٦,٤
٤٠	٧	٦,٥	٣,٦	٨,١

SMP= Skim milk powder.
DAKP = Defatted apricot kernel powder.

Table ٧: Sensory evaluation of yoghurt made by replacing supplementary SMP with different ratios of DAKP during cold storage for ٧ days.

Replacement level of SMP with DAKP (%)	Storage period (days)	General appearance ١٠	Body and texture ٤٠	Flavour ٥٠	Total score ١٠٠
٠,٠	Fresh	٩[a]	٣٧[a]	٤٥[a]	٩١[a]
١٠		٩[a]	٣٧[a]	٤٤[a]	٩٠[a]
٢٠		٨[b]	٣٦[a]	٤٣[a]	٨٧[b]
٣٠		٧[c]	٣٢[b]	٣٧[b]	٧٦[c]
٤٠		٦[d]	٢٨[e]	٣٢[c]	٦٦[d]
٠,٠	٢	٩[a]	٣٦[a]	٤٦[a]	٩١[a]
١٠		٩[a]	٣٥[a]	٤٤[a]	٨٨[b]
٢٠		٨[b]	٣٠[b]	٤٢[b]	٨٥[b]
٣٠		٦[d]	٢٧[c]	٣٤[b]	٧٠[c]
٤٠		٥[e]	٣٦[a]	٣٠[c]	٦٢[d]
٠,٠	٤	٩[a]	٣٦[a]	٤٢[ab]	٨٧[b]
١٠		٨[b]	٣٤[b]	٤٠[b]	٨٢[b]
٢٠		٨[b]	٣٣[b]	٣٩[b]	٨٠[bc]
٣٠		٦[d]	٢٨[c]	٣٢[c]	٦٦[d]
٤٠		٥[e]	٢٦[c]	٢٥[d]	٥٦[e]
٠,٠	٧	٩[a]	٣٥[a]	٤١[ab]	٨٥[b]
١٠		٨[b]	٣٣[b]	٤٠[b]	٨١[b]
٢٠		٨[b]	٣٣[b]	٤٠[b]	٨١[b]
٣٠		٦[d]	٢٥[c]	٢٩[d]	٦٠[d]
٤٠		٥[ء]	٢٣[d]	٢٣[e]	٥١[e]

*** Values with different letters in the same column are significant different at p<٠,٠٥.**
SMP= Skim milk powder, DAKP= Defatted apricot kernel powder.

According to the present results, it could be concluded that acceptable palatable yoghurt could be made from a mixture of buffaloes' milk (٣٪ fat) with replacing ١٠ to ٢٠٪ of supplementary SMP with DAKP. Such yoghurt treatments ascertain the objectives of lowering manufacturing cost and improving the yoghurt quality.

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تأثير الإستبدال الجزئي لمسحوق اللبن الفرز الإضافي بمسحوق نوى المشمش المنزوع الدهن على جودة الأيس كريم والزبادي

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استهدف البحث دراسة تأثير الإستبدال الجزئي لمسحوق اللبن الفرز الإضافي (لزيادة الجوامد اللبنية اللادهنية) في صناعة كل من الآيس كريم والزبادي بمسحوق نوى المشمش منزوع الدهن، وذلك لتقليل التكاليف مع محاولة تحسين جودة هذه المنتجات، حيث أن نوى المشمش هو ناتج ثانوي من تصنيع ثمار المشمش (عصير أو مربى) وأن المسحوق منزوع الدهن لنوى المشمش يحتوي على حوالي ٥٢% بروتين خام و٨% ألياف غذائية وما يقرب ٣٠% مواد كربوهيدراتية مما يجعله مادة خام جيدة لدعم كثير من المنتجات الغذائية بالبروتين بتكاليف مناسبة.

ولقد تم إضافة مسحوق نوى المشمش المنزوع الدهن إلى مخلوط الأيس كريم بنسب مختلفة تتراوح ما بين ١٠-٥٠% من كمية مسحوق اللبن الفرز الإضافي، ولقد أظهرت النتائج أنه بزيادة نسبة الإضافة زادت متوسطات كل من الأس الهيدروجيني والوزن النوعي ووزن الجالون للمخلوط. كما لوحظ بصرف النظر عن نسب الاستبدال المضافة زيادة ثبات بروتين المخاليط الناتجة. وأدت إضافة مسحوق نوى المشمش المنزوع الدهن إلى خفض الريع للأيس كريم الناتج، وكان له تأثيراً على النكهة بدرجة أكبر عن تأثيره على القوام والتركيب البنائي والمظهر. ويمكن التوصية بأن مسحوق نوى المشمش المنزوع الدهن يمكن استخدامه كبديل لمسحوق اللبن الفرز الإضافي في صناعة الأيس كريم حتى نسبة إستبدال تصل إلى ٣٠%، للحصول على ناتج بجودة مناسبة بتكاليف منخفضة.

وفي صناعة الزبادي تم تجربة استبدال مسحوق اللبن الفرز الإضافي بمسحوق نوى المشمش منزوع الدهن بنسب تتراوح بين ١٠-٤٠% وأدى ذلك إلى زيادة قيم الـ pH و الجوامد الكلية والمحتوى من االنيتروجين الكلي والنيتروجين غير البروتيني وأحماض التيروزين والتربتوفان في الزبادي وذلك بزيادة نسبة الإستبدال بمسحوق نوى المشمش، بينما انخفضت نسبة الحموضة والمحتوى من الأسيتالدهيد بزيادة نسبة الاستبدال.

كما لوحظ أن زيادة إضافة مسحوق نوى المشمش منزوع الدهن بدلاً من مسحوق اللبن الفرز في صناعة الزبادي أدت إلى خفض عدد بكتريا حمض اللاكتيك وعدد البكتريا المحبة للبرودة في الناتج سواء الطازج أو أثناء التخزين بالثلاجة لمدة سبعة أيام. ومن هذه النتائج ونتائج التقييم الحسي يمكن التوصية بأنه يمكن استبدال مسحوق اللبن الفرز الإضافي في صناعة الزبادي بمسحوق نوى المشمش منزوع الدهن بنسبة ١٠ أو ٢٠% للحصول على ناتج بجودة مناسبة وبتكاليف منخفضة.

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