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Physicochemical evaluation and Antioxidant Capacity of Cow milk yogurts Containing Different Levels of *Panax ginseng* Extract

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Abstract

The present study aimed to evaluate the physicochemical parameters of cow milk yogurt containing Panex ginseng extract at different levels (0, 5, 10, and 15%). Effect of storage period on water holding capacity, acidity, texture analysis, pH, inhibition, totally sold and sensory parameters. The physicochemical and texture characteristic of yogurt prepared from cow milk was performed. The titratable acidity and pH, inhibition indices were evaluated during 21 days of refrigerated storage. the pH of yogurt was decreased on the first day of storage from (4.895) to (4.695), while the inhibition percentage increased with increasing of P. ginseng extract to cow milk were (48.5±5.1) to (62.1±4.6%). Although higher acidification was observed in the first day of storage due to P. ginseng extract addition, While moisture (%) and springing as texture increased and viscosity decreased during storage after 21 days. Changes in pH of yogurt samples during storage period were not remarkable at 14 days of storage, Therefore, the addition of P. ginseng extract to cow milk yogurt could be a good option to improve the functionality of this food matrix for dairy companies wishing to enter the functional food market.

Introduction

Yogurt is a trending fermented milk product in a society of the world, especially in Europe and the Middle East, due to the many benefits of consuming yogurt, the benefits are improving lactose absorption in lactose intolerant patient and heal diarrhea (1). there has been better consumption and popularity of yogurt especially among women, children and diet-conscious consumers (2).

Yogurt product has various market segments namely fruits flavored, low calorie yogurt, whipped yogurt, mild yogurt, hard and soft yogurt, yogurt drink, yogurt with probiotic culture, long-life yogurt, yogurt for breakfast and yogurt for toddlers Various types of yogurt are set yogurt, stirred yogurt, sweet drinking yogurt, fruit yogurt, yogurt cheese, frozen yogurt and dried yogurt (3).

Yogurt characteristics are containing 12% total solids. The main factors to yogurt produced are milk total solids, milk composition, homogeny, and the types of starter bacteria, pasteurization, fermentation process, and temperature during incubation (4).

From all yogurt categories, 74% is yogurt combined with fruit (fruit yogurt). Added fruit flavor, pure fruit of fruit extract can improve taste, color and texture flexibility of yogurt to consumers. The fiber in the fruit adds more benefit when consuming fruit yogurt namely preventing colon disease. Some fruits even contain antioxidants (5).

Many consumers have increased interest in functional foods for healthy and various attempts may be made in dairy products, Fruit yogurts give a more health benefit. Fruit additions in yogurt improve the taste and nutrition value of yogurt. Fruit yogurt also plays a significant role in the rate of yogurt selling and consumption(1). After the addition of dragon fruit, mango, apple, and banana with different composition is assumed to affect the final yogurt product. A total solid of dragon fruit is 12.50% (6), mango is 16% apple is 17.08% and banana is 17.51% (7). Adding fruit or plant extracted with different total solids in yogurt is

expected to affect the characteristics and total solids of the fruit yogurt. The development of new products with fragrance and flavor will increase sales and consumer satisfaction. It can be used in order to prepare materials such as soy yogurt, vegetables, sweet potatoes, pumpkin to enhance the flavor and quality of feed used (8).

Ginseng is one of the most widespread and widely available of all herbal supplements. A common name for (ginseng). Ginseng has more than ten species of slow-growing perennial plants with fleshy roots, in the Panax genus, in the family Araliaceae (9).

Panex ginseng an ancient and eminent medicinal herb in the Orient has been used as a valuable tonic and for the treatment of various diseases including hepatic disorders. Ginseng saponins, normally recognized as ginsenosides, are principal constituents and have believed to be responsible for multiple ginseng health benefits. Large amounts of red ginseng products are produced and consumed in Korea. However, yogurt enhanced with red ginseng has not been developed yet. In addition, no scientific studies have been conducted on red ginseng supplemented yogurt in Korea (10).

Therefore, the aim of this study was to evaluate the physicochemical parameters of cow milk yogurt (functional yogurt) added to Panex ginseng extract through a study of characteristics and produce a dairy product.

Materials and Methods

Yogurt preparation and physiochemical analysis:

Cow milk was collected from animals in Siamaro village at the Garmian governorate (Kalar city) during the period between august – November.

Yogurt culture starter: Lyophilized mixed starter culture containing the bacteria (Streptococcussalivarius Sub sp.thermophilus and Lactobacillus delbrueckii Sub sp.bulgaricus) supplied by France Rhodia Food Company. The starter culture preparation was carried out using the method described by Shori and Baba(11)

Plant material Fresh (Panex ginseng): were procured from the local market, washed with distilled water and dried in an oven at 40°C, then extracted with water and stored in an airtight container under refrigeration (5)

Yoghurt manufacturing: Fresh cow milk was heated to 90±2 Co for 10 min. then cooled to 42 Co and 3% of pre-activated starter in milk was added. Then add the (0, 5, 10 and 15% of Panex ginseng) extract. Inoculated milk sample was distributed in 100 ml plastic cups and incubated at 43±1 Co for 3- 4 hours until pH decreased to 4.6 then storage at 4-5 Co, described byShori and Baba (11).

Measurement of pH and titratable acidity (TA). The pH of yogurt samples was measured at 1,7, 14 and 21 days of storage at 6°C using a pH meter with a glass electrode over the range 6.8 to 4.0. Treatable acidity (TA) expressed as a percentage of lactic acid and determined as described by Shori et al.(12).

Water holding capacity: (WHC) was determined according Yangilar F. (3), with some modifications. The samples (10g) were put into Polly Ethylene (Fisher Scientific TUL-750-036J) centrifuge tubes, and centrifuged for 20 minutes at 5770g at room temperature (23 $\pm$ 3° C). The supernatant was discarded, and pellet was weighed. WHC determined by using the Following equation:

$$\text{Water Holding Capacity \%} = \frac{\text{W. of yogurt} - \text{W. of whey}}{\text{weight of yogurt}} \times 100$$

Texture analysis: The evaluation of textural properties was conducted using a texture analyzer (CT3 (4500), Brookfield engineering lab). The operation conditions were an artificial plastic cylinder (20 mm in diameter) was inserted into each product to a depth of 20 mm with 5.0g trigger and speed of 1 mm/s (13).

Viscosity Determination:: The viscosity determination was based on Bozanic et al., (14), method, with some modification.

Determination of Total Solids: The total solids content was determined as a percentage of the procedure laid down in (AOAC, 2016) (15).

Measurement of antioxidant activity (DPPH)inhibition assay: Assay The antioxidant activity was determined by measuring the free radical scavenging ability of yogurt water extract using DPPH inhibition assay as described by Sroska et al., (16).

Sensory evaluation: Sensory evaluation was done according to Malek A, et al., (17) for cow milk yogurt to estimate the acceptability of yogurt sample from 10 panelists among the student of Chemistry Department- College of Education Science-Kalar city. **Statistical analysis**: Statistical analysis was

performed with the (F-Test), Data were analyzed to examine the effect of treatments and concentration in traits. Plant extract and different concentration tests were compared within the P values significantly less than 0.05 ($P \leq 0.05$) difference between means according (Duncan, 1955) in refer to obtained ANOVA tables and L.S.D interaction.

Results and Discussion

The physicochemical properties such as pH and storage for the studied yogurts are included in (Fig. 1). The pH plant extract concentrations were affected significantly ($p<0.05$). After mixing 5%, 10%, and 15% of *P. ginseng* extract the value was decreased with concentration at 1st days it was (4.895±0.003), (4.71±0.079) and (4.695±0.19) respectively, when compared with 21st day it was significantly decreased pH value to (4.035±0.157), (4.08±0.04) and (4.15±0.113) respectively . The result in (Fig. 1) after 14 day of storage the pH was (4.18±0.02) significantly increased when compared with control was (3.9±0.28). Previous study reported that the pH value declined whereas titratable acidity rose because of the production of acid and this results were similar to our results (18). The pH of all samples was similar value in initial and final fermentation, but it was difference between yogurt and yogurt added with red ginseng extract (5, 10, 15%), during fermentation (Fig. 1). Survival, as expected, was higher in refrigerated samples, and there was a relation between the decrease of pH and *P. ginseng* extract during the storage and bacteria count . This agrees with previous reports, which indicated that high acidity is the main reason for the lower survival of lactic acid bacteria in fermented products with low pH values (19).

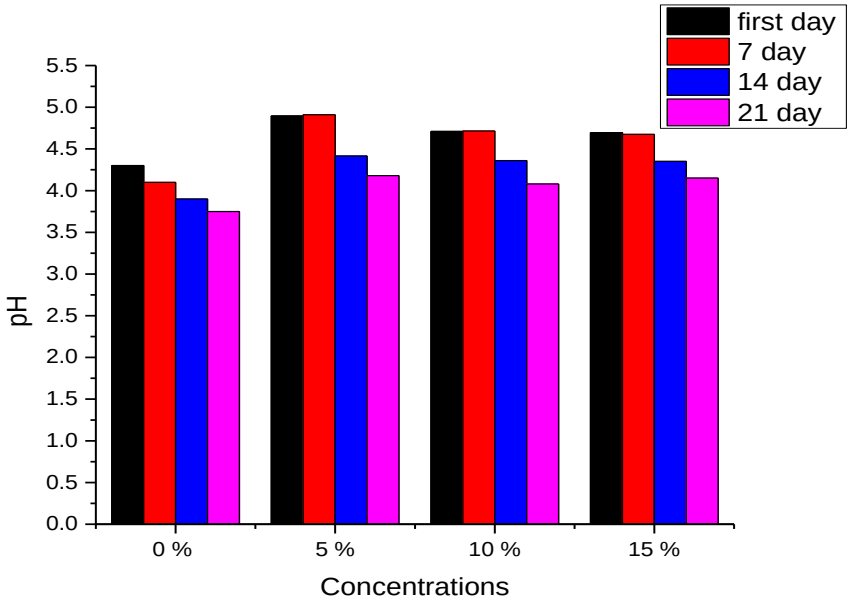

Figure 1: pH values of cow milk yogurt with different *P. ginseng* levels during 21 day of storage.

Titratable

acidity is a very main factor, which affects the shelf life and the acceptability of yogurt . The titratable acidity rate of samples displayed significant differences due to product type and storage time ($P<0.05$). In (Fig. 2), the titratable acidity of control and different herbal extract with yoghurts varied from (0.60) to (1.15 %) throughout storage time. In contrast to pH, the acidity of samples showed significant increase ($P<0.01$) during storage due to acid formation. The lowest acidity (0.60) was observed in the sample 5 % of *P. ginseng* extract at the first of the storage period. The level of acidity in herbal yogurt was found to be lower than control yogurt (20). It appears that the composition of starter culture, fermentation temperature and storage period could influence the overall level of acidity and pH of stored yoghurt samples (21).

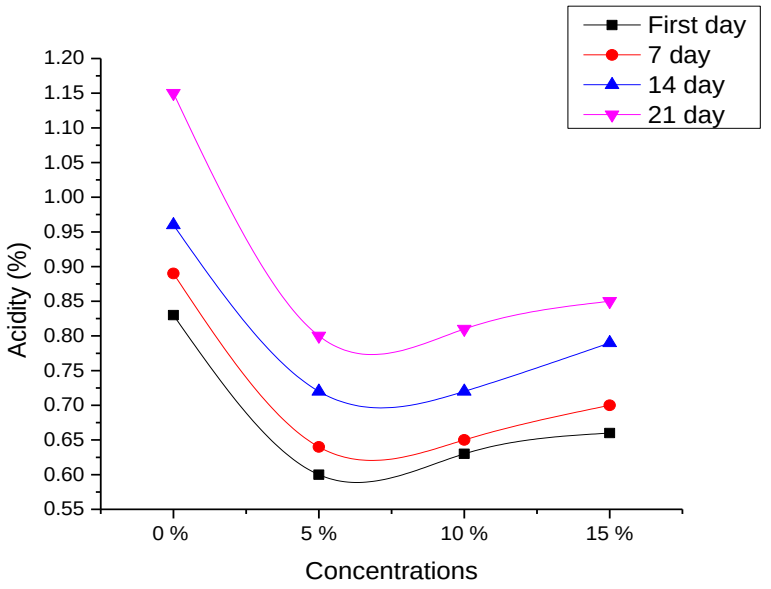

Figure 2: Titratable acidity cow milk yogurt with different *P. ginseng* levels during 21 day of storage.

The results for the DPPH radical scavenging activity of the yogurt are presented in (fig. 3) Increased the inhibition of herbal yogurt with increasing the concentration with *P. ginseng* extract were (48.5±5.1%) to (62.1±4.6%) at the first day of storage. After storage yogurt for 7 days with 15% of herbal extract were highest inhibition (64.45±5.4%), that significantly affected on inhibition more than other plant extract, but not significant in compared with control group was (63.75±5.3%). While storage of yogurt for 21 day the inhibition was significantly increased compared with control. The antioxidant activity was increased as an increase of red ginseng extract concentration. However, the antioxidant activity of yogurt fortified with red ginseng extract (5, 10, and 15%) were higher than control yogurt (10). A small amount of red ginseng extract promoted the growth of lactic acid bacteria, however, a large amount inhibited the growth of them (22).

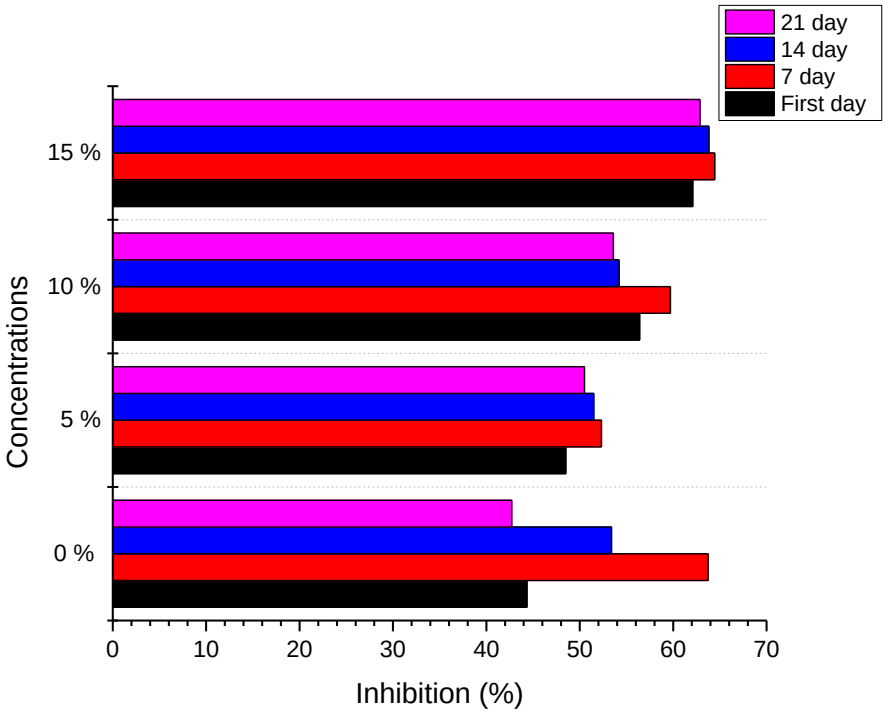

Figure 3: Inhibition percentage of cow milk yogurt with different *P. ginseng* levels during 21 day of storage.

The results of 5 % *P. ginseng* extract show in (Fig. 4), shows that the viscosity not significant ($p \leq 0.05$) between 7th and 14th of storage, but after 21 days of storage significantly increased to (2830±3.2 c.p.). But not significant between 5% and 15% after 21st of storage. The higher viscosity with 10% was (3180±4.9 c.p.), that significant when compared with 0% control was (2683.79±3.1 c.p.). We note that the viscosity is much greater in the yogurt made from herbal extract compared to those made from control 0 %. This may be due to some factors that affect the quality of cow's milk as the physiological status of the animal, its diet, race and the climate (23). According to Tamime and Marshall (23), Streptococcus thermophilus are the most germs incriminated in the production of exocellular texturizing agents called exopolysaccharides that might interact with the protein content of milk and increase the viscosity and rheological quality of products.

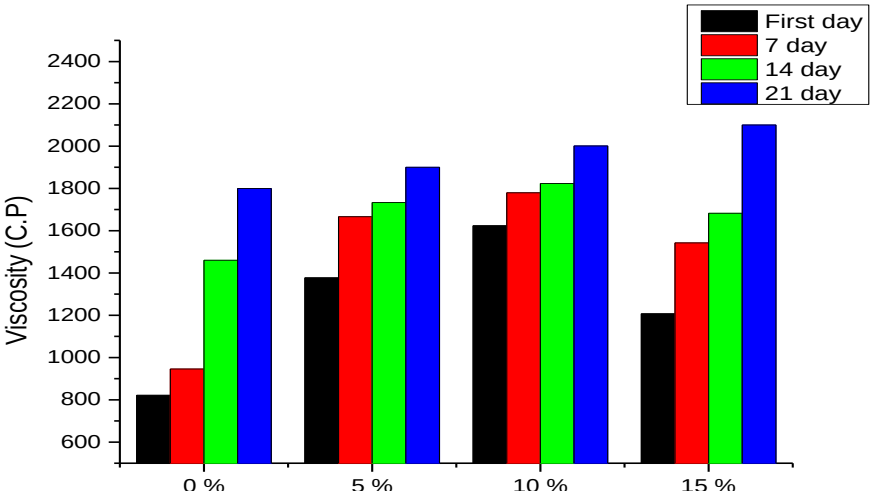

Figure 4: Viscosity (C.P) of cow milk yogurt with different *P. ginseng* levels during 21 day of storage.

According (Tab. 1) the results shows not significant between 5%, 10% and 15% of P. ginseng extract at first day of storage was (74.5±6.3g),(80.5±8.1g) and (73.5±6.3g). The higher hardness of yogurt was (104±8.37g). During the fermentation period of milk gel is produced to make yogurt, thus increasing the hardness, Increasing their concentration of herbal extract the resulted in increment of hardness, this could be related to enhancement of dry matter content (24). The result of yogurt springiness with 5%, 10% of *P. ginseng* extract not significantly between 1st and 7th of storage. The *P. ginseng* extract significantly increased in compared with control group.

The springiness reflects the structural integrity of yogurt. Greater cohesiveness and springiness may be related to stronger gel structures, indicating greater structural integrity (25). The springiness (mm) values are reported in (Tab. 1). The interaction of treatment with different herbal extract and time was significant ($p<0.05$). Table (1) shows that the result of 5% *P. ginseng* extracts was (30.54±0.54%) at 1st day after storage for 21 days decreased to (34.95±0.875%). That significantly increased water holding when compared with control was (29.65±043%) at 1st day, then after 21 days changed to (29.80±0.541%). Similar results were reported by Kucukcetin et al. (2011) (26), in which yoghurt's water holding capacity were affected by the milk type.

Table 1: Hardness (g), Springing (mm)and Water holding capacity (%) of cow milk yogurt with different *P. ginseng* levels during 21 day of storage.

	Concentrations	First day	7 day	14 day	21 day
Hardness (g)	0%	71±5	98±8.8	104.9±9.6	110±9.7
	5%	74.5±6.3	89±5.9	97±8.6	104±8.37
	10%	80.5±8.1	87.5±7.5	90±7.52	98±7.96
	15%	73.5±6.3	75±8.4	79.9±6.9	83±7.3
Springing (mm)	0%	17.6±1.4	21.5±1.31	19.6±1.8	18.6±1.7
	5%	17.98±1.8	17.1±2.8	17.5±2.1	15.8±1.2
	10%	18.7±3.1	18.1±2.1	18.7±1.8	19.2±2.3
	15%	19.8±2.9	19.3±1.71	20.1±4.1	24.1±2.4
Water Holding Capacity %	0%	29.65±2.43	28.65±1.55	29.20±1.74	29.80±1.51
	5%	30.54±0.54	33.15±0.56	33.90±0.63	34.95±0.875
	10%	32.90±2.65	33.90±0.39	34.50±0.89	35.50±2.111
	15%	33.35±1.98	34.89±0.78	35.30±0.654	35.99±0.422
Water Holding Capacity %	0%	85.95±1.14	85.7±0.12	84.4±0.07	84.785±0.01
	5%	83.36±0.23	82.905±0.07	82.805±1.07	83.1±0.4
	10%	84.32±0.18	83.835±0.043	83.1±0.067	82.84±0.25
	15%	85.195±0.47	84.505±0.03	83.45±0.17	82.55±0.03

The result of *P. ginseng* extract shows in (Tab. 1) revealed that not significantly decreased by increasing the concentration at 7 days of storage. While the total solid was not seen significant between 10% and 15% was (17.16±0.25%) and (17.45±0.03%) respectively, but when compared with control significantly increased the total solid. Chemical composition of the milk base especially total solids has the major effect on the acceptability of concentrated yoghurt. Concentrated yogurt containing < 20%, total solid assess as

"thin and tastless" and that with > 25% TS became gummy and bitter (6). Increasing yogurt total solid more than 23% decreased flavor acceptability; Samples with higher total solid had better textural properties than those with lower total.

The texture can be defined as a property on the sensory touch. The analysis of the texture allows an objective measure by mechanical action. The importance of texture in the assessment of food varies depending on the expectations of consumers.

According (Fig. 5), which the acidity tastes with *P. ginseng* extract decreased with 5% was (16±0.667) to (11.5±1.321) at 21st days. After storage of yogurt for 14th and 21st the acidity taste significantly decreased as compared with control at same time of storage. The present study shows that the significant between plant extracts and days of storage, herbs contains many phenols and flavonoied theses materials derectly effect and responsible on phesio-chemical properties of herbal- yogurt taste (27).

The lowest appearance of herbal yogurt with 15% *P. ginseng* extract was seen (5.5±0.53) after 21st days of storage. In the present study the result of appearance shows no significant difference between samples according to the desirability of the yogurt appearance lowest and highest desirability of the appearance that has been decreased by the time also the effect of storage time and the amount of plant extracts on the amount of the desirability of appearance (28).

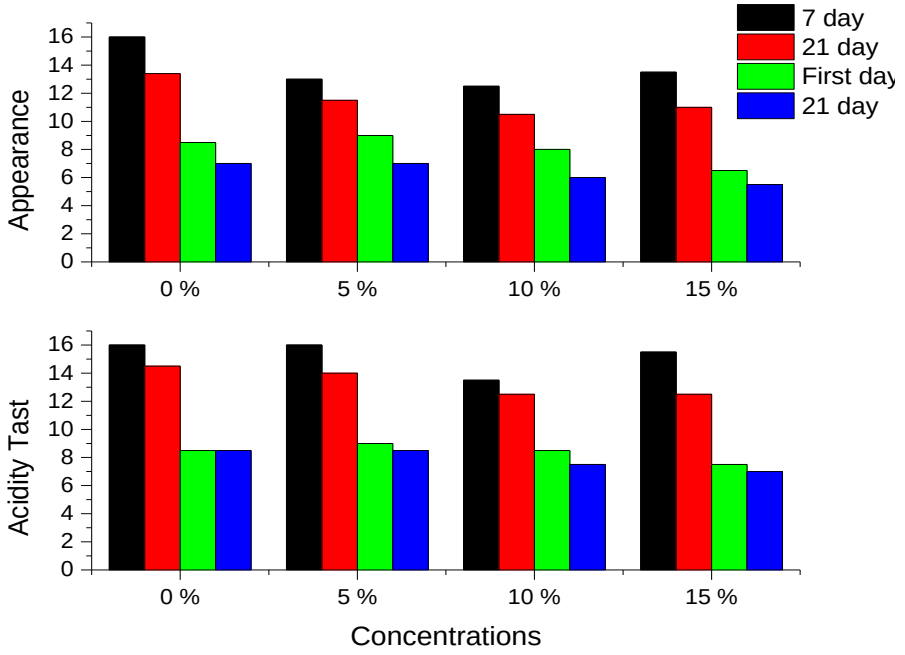

Figure 5: Appearance and Acidity as sensory properties of cow milk yogurt with different *P. ginseng* levels during 21 day of storage
Grouped fatty acid profile (means ⍰} SD, n = 3; mg/mL) of sheep milk yogurt with different inulin levels during 28 d of storage

Conclusion

The addition of ginseng extracts (5, 10, and 15 %,) in yogurt affected pH, titratable acidity, viscosity, and water holding capacity. The antioxidant activity was increased as an increase of ginseng extract concentration. However, the antioxidant activity of yogurt fortified with ginseng extract (5%, 10%, and 15 %,) was higher than control yogurt.

We found that it was to improve antioxidant activity because red ginseng extract supported the growth of lactic acid bacteria in yogurt. During the fermentation period of milk, the gel is produced to make yogurt, thus increasing the hardness and springing as a texture of yogurt. The sensory marks of the products were high and acceptance. From the foregoing Results, it can be concluded that ginseng extract can be successfully used in the formulation of dairy products.

Reference:

1. Wulansari PD, Kusmayadi A. Chemical Properties and Characteristics of Cow Milk Yogurt with Different Additional Fruit and Storage Time. Anim Prod. 2016;18(2):113.
2. Hernandez K, Park YW. Evaluation of 20 Macro and Trace Mineral Concentrations in Commercial Goat Milk Yogurt and Its Cow Milk Counterpart. 2014;(May):889–95.
3. Yangilar F. As a potentially functional food: goat's milk and products. Food Nutr Res. 2013;1:68–81.
4. Magenis RB, ES Prudencio, RDMC Amboni, NGC Junior, RVB Oliveira VS and HB. Compotition and Physical Properties of Yogurt Manufacture from Milk and Whey Cheese Concentrated by Ultrafiltration. Int J Food Sci. 2006;41(5):560–8.
5. A.B. Shori ASB. Antioxidant activity and inhibition ofkey enzymes linked to type-2 diabetes and hypertension byAzadirachta indica-yogurt,. J Saudi Chem Soc. 2011;
6. To LV, N Ngu, ND. Duc, DTK Trinh, NC Thanh, DVH Mien, CN Hai and TN Long E. Quality Assurance System for Dragon Fruit Quality assurance in agricultural produce. In: Quality Assurance in Agricultural Produce. J Pascapanen. 2000;5(1):50–5.
7. Mahmood A NA and AG. Quality Stirred Buffalo Blended Apple and Banana Fruits. Park J Agri Sci. 2008;45:275–9.
8. Joo, S. J., Choi, K. J., Kim, K. S., Lee, J. W. & Park SK. Characteristics of yogurt prepared with 'jinpum' bean and swordbean (Canavalin gladiata). Int J Postharvest Technol Innov. 2001;8:308–12.
9. Seervi C, Kirtawade R, Dhabale P. Ginseng- Multipurpose Herb. J Biomed Sci Res. 2010;2(1):6–17.
10. Lee S-K, Jeewanthi RKC, Li X, Jung J, Paik H-D, Jee H-S, et al. Physicochemical Characteristics and Antioxidant Capacity in Yogurt Fortified with Red Ginseng Extract. Korean J Food Sci Anim Resour. 2016;36(3):412–20.
11. A.B. Shori ASB. Comparative antioxidant activity,proteolysis and in vitro _-amylase and _-glucosidase inhi-bition of Allium sativum-yogurts made from cow andcamel milk,. J Saudi Chem Soc. 2011;
12. A.B. Shori, A.S. Baba, P.F. Chuah. The effects of fish colla-gen on the proteolysis of milk proteins, ACE inhibitory activityand sensory evaluation of plain- and Allium sativum-yogurt,. J Taiwan Inst Chem Eng. 2013;1.
13. Domagala J. Instrumental texture, syneresis and microstructure of yoghurts prepared from goat, cow and sheep milk. Int J Food Prop. 2009;12:605–170.
14. Bozanic R, Tratnik L MO. The influence of goat milk on the viscosity and microbiological quality of yogurt during storage. Mljekarstvo. 1998;48:63 74.
15. Al-mentafji HN. Of fi cial Methods of Anal y sis of AOAC IN TER NA TIONAL. 2016;(February).
16. Z. Sroska WC. Hydrogen peroxide scavenging, antiox-idant and anti-radical activity of some phenolic acids. Food andChemical Toxicol. 2003;41:8–16.
17. Malek A, Shadarevian, S TI. Sensory properties and consumer acceptance of concentrated yoghurt made from cow's, goat's and sheep's milk. Milchwissenschaft. 2001;56(12):687–90.
18. Bae, H. C. and Nam MS. Properties of the mixed fermentation milk added with red ginseng extracts. Korean J Food Sci An. 2006;26:127–35.
19. Hassan LK, Haggag HF, El- Kalyoubi MH E-AME-SM, AF S. Physico-chemical properties of yoghurt containing cress seed mucilage or guar gum. Ann Agri Sci. 2015;60(1):08-21.
20. G. Singh, I. P. S. Kapoor, and P. Singh. Effect of volatile oil and oleoresin of anise on the shelf life of yoghurt. J Food Process Preserv. 2011;35:778–83.
21. B. Ozer, A. Kirmaci, S. Oztekin, A. A. Hayaloglu, and M. Atamer. Incorporation of microbial transglutaminase into non – fat yoghurt production,. Int Dairy J. 2007;17:199–207.
22. Ramchandran, L. and Shah NP. Effect of exopolysacchrides and inulin on the proteolytic, angiotensin-I-converting enzyme- and α-glucosidase-inhibitory activities as well as on textural and rheological properties of low-fat yogurt during refrigerated storage. Dairy Sci Technol. 2009;89:583–600.
23. Tamime AY R. Yoghurt: Science and Technology. 2nd ed. Cambridge: Woolhead Publishing Limited,; 1999. 619 p.

24. Joon R, Mishra SK, Brar GS, Singh PK PH. Instrumental texture and syneresis analysis of yoghurt prepared from goat and cow milk. Pharma Innov. 2017;6(7):971–4.
25. Rawson, H.L. and V.M. Marschall. Effect of evaluation of dairy product. FIL-IDF Standard 99A, 'ropy' strains of Lactobacillus delbrueckii ssp. Bruxelles, Belgium. bulgaricus and Streptococcus thermophilus on 10. International Dairy Federation, (IDF)., 1995. rheology of stirred yoghurt. Int J Food Sci Fermented non-fermented milk Prod Technol. 1997;32:213–220.
26. Kucukcetin A, Demir M, Asci A CE. Graininess and roughness of stirred yoghurt made with goat's, cow's or a mixture of goat's and cow's milk. Small Rumin Res. 2011;96:173–7.
27. Balthazar, C. F., L. V. Gaze, H. L. A. Silva, C. S. Pereira RM, Franco, C. A. Conte Junior, M. Q. Freitas and ACOS. Sensory evaluation of ovine milk yoghurt with inulin addition. Int J Dairy Technol. 2015;68:281–90.
28. Rathnayaka MTNR and R. Comparison of physicochemical and sensory properties of probiotic and natural yoghurt. J Biol Food Sci Res. 2013;2:1–6.