

UTILIZATION OF CARROT JUICE FOR THE PREPARATION OF YOGHURT DRINK

Laxmi Patil¹, V.G. Atkare², A.S. Ingole³, Soni Gawade⁴ and Suchita Bhosale⁵

ABSTRACT

The present investigation entitled “Utilization of carrot juice for the preparation of yoghurt drink” was undertaken during the year 2016-2017 at Animal Husbandry and Dairy Science section, College of Agriculture, Nagpur. Milk was standardized to 4 per cent fat and used for preparing yoghurt. Then yoghurt drink prepared with addition of sugar at 10% (T₁) and carrot juice @ 06 per cent (T₂), 08 per cent (T₃) and 10 per cent (T₄) by weight of yoghurt. The product was analyzed for chemical composition like fat, protein, ash, total solids, moisture, titratable acidity and pH as well as for sensory attributes like flavor, colour and appearance, body and texture and overall acceptability. The data revealed that ash, moisture and titratable acidity of yoghurt drink were increased with the increase in the level of carrot juice. While fat, protein, total solids and pH were decreased with the increase in level of carrot juice. Ash (0.77 to 0.81), moisture (86.48 to 87.75), titratable acidity (0.77 to 1.02 per cent) of yoghurt drink were increased with increase in the levels of carrot juice. While fat (3.73 to 3.30 per cent), protein (4.13 to 3.82 per cent), total solids (13.50 to 12.24 per cent) and pH (4.42 to 4.30) were decreased with the increase in level of carrot juice. The significantly highest score of flavor (58.07 out of 60), body and texture (28.41 out of 30), colour and appearance (9 out of 10) and overall acceptability (8.82 out of 9) were obtained in yoghurt drink containing 8 per cent of carrot juice (T₃).

(Key words: Plain yoghurt, yoghurt, yoghurt drink, carrot juice, chemical parameters, sensory attributes)

INTRODUCTION

Dairying has become an important secondary source of income for millions of rural households engaged in agriculture. World milk production increase from 765 million tones in 2013 to 789 million tones in 2014 (Anonymous, 2016). India ranks first in milk production, accounting for 18.5 per cent of world production, achieving annual output about 155.5 million tones during 2015-16 (Anonymous, 2016).

The per capita availability of milk in India has increased from 176 g⁻¹ in 1990-91 to 327 g⁻¹ by 2015-16 (Anonymous, 2016). This represents a sustained growth in availability of milk and milk products for the growing population. Yoghurt is fermented dairy product which is western counterpart of Indian dahi.

Yoghurt is widely consumed for its nutritive, therapeutic and sensory properties. Yoghurt is prepared by fermenting the milk with the use of symbiotic culture of *Streptococcus thermophilus* and *Lactobacillus bulgaricus* as starter culture (Marshall, 1993 and Tamime and Robinson, 1999).

The regular consumption of live cultured yoghurt produces a higher level of immunity boosting interferon as these bacteria cultures stimulate infection fighting white

cells in the blood stream with antitumor effects. Yoghurt is nutritionally rich in protein, carbohydrate, vitamins and minerals (Gray, 2007).

Carrot (*Daucus carota* L.) is one of the more commonly used vegetables of human nutrition. It is rich in betacarotene, ascorbic acid, tocopherol and classified as vitaminized food (Hashimoto and Nagayama, 2004). Combination of carrot juice and yoghurt produce a nutritionally balanced food. Carrots are good source of carbohydrate, calcium, phosphorus, iron, potassium, magnesium, copper, manganese and sulphur. It is an excellent source of vitamin A, B1, B2, C, E, thiamin, folic acid and riboflavin but lack in protein and fat. Yoghurt is rich in protein and fat but is deficient in iron and vitamin C. Blending of yoghurt with carrot juice would produce a nutritionally rich food (Ikken *et al.*, 1998 and Raum, 2003). Considering the above facts present investigation was undertaken to study the effect of carrot juice on yoghurt drink.

MATERIALS AND METHODS

The present investigation entitled “Utilization of carrot juice for the preparation of yoghurt drink” was undertaken during the year 2016-2017 at section of Animal Husbandry and Dairy Science, College of Agriculture,

1, 4 and 5. P.G. Students, Animal Husbandry and Dairy Science, College of Agriculture, Nagpur

2. Professor, Animal Husbandry and Dairy Science, College of Agriculture, Nagpur

3. Professor and Head, Dept. of Animal Husbandry and Dairy Science, Dr. P.D.K.V., Akola.

Nagpur. During the entire study fresh, clean, whole cow milk was obtained from section of Animal Husbandry and Dairy Science, College of Agriculture, Nagpur. The milk was strained through clean muslin cloth and transferred into well cleaned and sterilized flat bottom stainless steel vessel and standardized at 4 per cent fat. The standardized milk was sterilized by boiling and cooling to room temperature. The freeze dried curd culture of *Streptococcus thermophilus* and *Lactobacillus bulgaricus* from National Culture Collection Unit, N.D.R.I., Karnal was added in the 1:1 proportion @ 1 per cent to standardized milk. Then yoghurt drink prepared with addition of sugar at 10 (T₁) and carrot juice 06 (T₂), 08 (T₃) and 10 (T₄) per cent by weight of yoghurt. Carrot available in market was used for the preparation of yoghurt drink. Clean crystallized sugar purchased from local market.

The observations were recorded for flavour, body and texture, colour and appearance and overall acceptability by using 100-point scale (Pal and Gupta, 1985) and on the basis of 9 point hedonic scale (Nelson and Trout, 1964). Fat contents of yoghurt drink was determine by Gerber's method and recorded (Anonymous, 1981). Protein content was estimated by micro-kjeldahl's method (Anonymous, 1961). Ash content estimated (Anonymous, 1981). Total solids was determined by gravimetric method (Anonymous, 1961). Moisture content was determined by subtraction method i.e. Moisture(per cent)=100-Total solids (per cent). Titratable acidity contents estimated (Anonymous, 1960). pH was determine by pH meter.

The experiment was laid out in CRD with 4 treatments and 5 replications. The data obtained was analyzed statistically according to method described by Snedecor and Cochran (1994).

RESULTS AND DISCUSSION

Sensory evaluation of yoghurt drink

a) Flavour

The data from table 1 showed that score obtain for flavor were 50.70, 51.90, 58.07 and 54.64 per cent under the treatments T₁ (100:00), T₂ (94:06), T₃ (92:08) and T₄ (90:10), respectively. The highest score (58.07 out of 60) was obtained by yoghurt drink prepared with 8 per cent carrot juice (T₃) as compared to other treatments. Hence, it indicated that increase in the level of carrot juice up to the certain limit resulted in better flavour of yoghurt drink. Salwa *et al.* (2004) observed that carrot yoghurt had pleasant flavor and odour (score 53 to 57 out of 60), this can be attributed to the sweet taste of the manufactured carrot yoghurt.

b) Body and texture

The data from table 1 showed that score obtain for body and texture were 24.84, 25.85, 28.41 and 26.92 per cent under the treatments T₁ (100:00), T₂ (94:06), T₃ (92:08) and T₄ (90:10), respectively. The body and texture of yoghurt drink was significantly affected due to addition of carrot juice. The highest score of body and texture (28.41 out of 30) was obtained by yoghurt drink prepared with 8 per cent carrot

juice (T₃) as compared to other treatments. Hence, it indicated that increase in the level of carrot juice up to the certain limit resulted in better body and texture of yoghurt drink. Salwa *et al.* (2004) evaluated yoghurt drink in different proportions of 100:0(T₁), 95:05(T₂), 90:10(T₃), 85:15(T₄) and 80:20(T₅) yoghurt to carrot juice. The carrot yoghurt prepared with 15 parts (score 25) of carrot juice was superior over 5, 10 and 20 parts levels. It was noticed that increase in the levels of carrot juice resulted in better the body and texture of yoghurt drink up to certain limit.

c) Colour and appearance

The data from table 1 showed that score obtain for colour and appearance were 6.67, 7.03, 9.00 and 7.56 per cent under the treatments T₁ (100:00), T₂ (94:06), T₃ (92:08) and T₄ (90:10), respectively. The highest score (9) was obtained under (T₃) yoghurt drink with 8 per cent carrot juice as compared to other treatments. The remaining two treatments 6 per cent and 10 per cent addition of carrot juice and 10 per cent sugar had significantly low score. Islam *et al.* (2016) prepared dahi from skim milk with the addition of carrot juice. The carrot juice dahi prepared with 5 parts of carrot juice was superior over 0, 10 and 15 parts levels. Hence, it indicated that increase in the level of carrot juice resulted in better colour and appearance up to certain limit and thereafter it decreased proportionately.

A) Overall acceptability

The data from table 1 showed that score obtain for overall acceptability were 6.83, 7.29, 8.82 and 7.53 under the treatments T₁ (100:00), T₂ (94:06), T₃ (92:08) and T₄ (90:10), respectively. The overall acceptability of yoghurt drink was significantly affected due to addition of carrot juice at different levels. The significantly highest score of 8.82 was received by yoghurt drink prepared with addition of 8 per cent of carrot juice which was superior to remaining treatments. Hence, it is inferred that increase in the level of carrot juice resulted in better overall acceptability score of up to 8 per cent addition of carrot juice and thereafter, it decreased proportionately. Jadhav (2016), scores for overall acceptability of yoghurt drink prepared in the proportion of 100:0 (T₁) 94:6 (T₂), 92:8 (T₃), 90:10 (T₄) and 88:12 (T₅) yoghurt drink to honey were 7.35, 6.50, 6.80, 7.07 and 8.15, respectively.

Chemical composition

Chemical quality of yoghurt drink was evaluated with respect to fat, protein, ash, total solids, moisture, titratable acidity and pH content and data are presented in table 2.

Fat

The fat percentage was significantly highest (3.73 per cent) in yoghurt drink prepared without addition of carrot juice (plain yoghurt drink). While fat content was the lowest (3.30 per cent) in yoghurt drink prepared with addition of 10 per cent carrot juice (T₄). The results indicated that with the increase in level of carrot juice, there was significant reduction in fat percentage of yoghurt drink. This may be due to the fact that fat content of carrot juice was considerably less as compared to the fat content in milk. Salwa *et al.* (2004) observed that increase in level of carrot juice, there was proportionate

decrease in the level of fat contents in yoghurt drink. Thus, the present results agree with their relations.

Protein

The highest (4.13 per cent) protein percentage was recorded in yoghurt drink prepared without addition of carrot juice (T₁) while, protein content was lowest (3.82 Per cent) in yoghurt drink prepared with addition of 10 per cent carrot juice (T₄). The level of carrot juice increased there was decrease in the protein content in the yoghurt drink. This might be due to the fact that the less amount of protein content in carrot juice as compared to the protein content in milk. Salwa *et al.* (2004) observed that increase in level of carrot juice, there was proportionate decrease in the level of protein contents in yoghurt drink. Thus, the present results agree with their relations.

Ash

The ash percentage recorded significantly highest (0.81 per cent) in yoghurt drink prepared with addition of 10 per cent carrot juice (T₄) while, ash content was lowest (0.77 per cent) in yoghurt drink prepared without addition of carrot juice (T₁). The ash content of yoghurt drink was increased with increase in the level of carrot juice. This might be due to more ash content of carrot juice.

Total Solids

The total solids percentage recorded significantly highest (13.50 per cent) in yoghurt drink prepared without addition of carrot juice (T₁) while, total solids was lowest (12.24 per cent) in yoghurt drink prepared with addition of 10 per cent carrot juice (T₄). The total solids decrease continuously with increased levels of carrot juice. This might be due to less total solids content of carrot juice. Salwa *et al.* (2004) observed that increase in level of carrot juice, there was proportionate decrease in the level of total solids contents in yoghurt drink. Thus, the present results agree with their relations.

Moisture

The highest moisture percentage (87.75 per cent) recorded in yoghurt drink prepared with addition of 10 per cent carrot juice (T₄) while, moisture content was lowest (86.48 per cent) in yoghurt drink prepared without addition of carrot juice (T₁). The moisture content of yoghurt drink was increased with increase in the level of carrot juice. This might be due to more moisture content of carrot juice. Talekar *et al.* (2015), prepared yoghurt with different combinations of cow milk and soy milk as 100:00 (T₁), 75:25 (T₂), 50:50 (T₃), 25:75 (T₄) and 00:100 (T₅) and reported 86.79, 88.49, 90.16, 91.88 and 92.91 per cent moisture respectively. The per cent moisture contain was significantly increased with the increase in rate of addition to soymilk. This might be due to more moisture content and less total solids contents of soymilk

Titratable acidity

The highest acidity percentage (1.02 per cent) recorded in yoghurt drink prepared with addition of 10 per cent carrot juice (T₄) while, acidity content was lowest (0.77 per cent) in yoghurt drink prepared without addition of carrot juice (T₁). The acidity content of yoghurt drink was increased with increase in the level of carrot juice. This might be due to the more titratable acidity of carrot juice. Salwa *et al.* (2004), observed that with the increase in the levels of carrot juice, there was proportionate increase in the acidity of yoghurt drink with different proportions of 100:0 (T₁), 95:05 (T₂), 90:10 (T₃), 85:15 (T₄) and 80:20 (T₅) yoghurt to carrot juice.

pH

The pH was significantly highest (4.42) in yoghurt drink prepared without addition of carrot juice (T₁) while, pH content was lowest (4.30) in yoghurt drink prepared with addition of carrot juice (T₄). The pH decrease continuously with increased levels of carrot juice. This might be due to less pH value of carrot juice. Salwa *et al.* (2004) observed that increase in level of carrot juice, there was proportionate decrease in the level of pH value in yoghurt drink. Thus, the present results agree with their relations.

Table 1. Effect of carrot juice on sensory evaluation and overall acceptability of yoghurt drink

Treatments Proportion (CM:CJ)	Parameters			
	Flavour (60)	Body & Texture (30)	Colour & Apperance (10)	Overall acceptability
T ₁ (100:00)	50.70 ^d	24.84 ^d	6.67 ^d	6.83 ^d
T ₂ (94:06)	51.90 ^c	25.85 ^c	7.03 ^c	7.29 ^c
T ₃ (92:08)	58.07 ^a	28.41 ^a	9.00 ^a	8.82 ^a
T ₄ (90:10)	54.64 ^b	26.92 ^b	7.56 ^b	7.53 ^b
SE (m) ±	0.686	0.601	0.435	0.106
CD at 5%	2.058	1.803	1.305	0.318

(CM-Cow Milk, CJ-Carrot juice, * P < 0.05)

Values with different superscripts differ significantly (P < 0.05)

Table 2. Chemical composition of carrot juice yoghurt drink

Constituents	Control T ₁ (100:00)	T ₂ (94:06)	T ₃ (92:08)	T ₄ (90:10)	SE (m)±	CD at 5%
Fat	3.73 ^a	3.50 ^b	3.40 ^c	3.30 ^d	0.010	0.030
Protein	4.13 ^a	3.95 ^b	3.88 ^c	3.82 ^d	0.040	0.120
Ash	0.77 ^d	0.78 ^c	0.79 ^b	0.81 ^a	0.010	0.030
Total Solids	13.50 ^a	12.55 ^b	12.35 ^c	12.24 ^d	0.116	0.350
Moisture	86.48 ^d	87.45 ^c	87.65 ^b	87.75 ^a	0.116	0.350
Titrateable acidity	0.77 ^d	0.96 ^c	0.99 ^b	1.02 ^a	0.010	0.030
pH	4.42 ^d	4.43 ^c	4.32 ^b	4.30 ^a	0.011	0.033

Values with different superscripts differ significantly (P<0.05)

It may be inferred that the superior quality carrot juice yoghurt drink can be prepared by addition of 8 per cent of carrot juice and it could be found beneficial for vitaminized food supplement in the form of carrot juice yoghurt drink and it contains fat 3.40 per cent, protein 3.88 per cent, ash 0.79 per cent, total solids 12.35 per cent, moisture 87.65 per cent, titrateable acidity 0.99 per cent and pH 4.32.

REFERENCES

- Anonymous, 1960. Methods of test for dairy industry IS:1479 (Part I): Chemical Analysis of Milk. Manak Bhavan, New Delhi.
- Anonymous, 1961. Methods of test for dairy industry IS:1479 (Part II): Chemical Analysis of Milk. Manak Bhavan, New Delhi.
- Anonymous, 1967 Indian Standard specification of milk .Indian Standard Institute, Manak Bhavan, New Delhi.
- Anonymous, 1981. Hand Book of Food Analysis. Indian Standard Institution, Manak Bhavan, 9, Bahadur shah Jafar Marg, New Delhi-110002.
- Anonymous, 2016. Dairy report.com/Markets/Drinkable-yoghurt-global-market-to-grow-by-13bn.
- Anonymous, 2016. Milk production of India.(Annual report of NDDB 2015-2016).
- Anonymous, 1977. Indian Standard Institute IS:1224 (Part I), New Delhi.
- Gray, C. 2007. Yoghurt and your health star base production, Washington, pp. 6-8.
- Hashimoto, T. and T. Nagayama, 2004. Chemical composition of ready to eat fresh carrot. J. Food Hyg. Soc. Japan. **39**: 324-328.
- Ikken, Y. I., M. Cambero, A. Marin, I. Martner, Hars and P. Morales, 1998. Antimutagenic effect of fruit and vegetable aqueous extracts against N-nitrosamine evaluated by the Amestest J. Agri. Food Chem. **46**: 5194-5200.
- Islam, M. N., A.A.M. Muzzahid, R. Habib, M. A. Mazed and M. A. Salam, 2016. Preparation of dahi from skim milk. Bang. J. Anim. Science. **45**(1):36-43.
- Jadhav, S. 2016. Utilization of Honey As Sweetener For The Preparation Of Yoghurt Drink. M. Sc. Thesis(unpub.)Dr. PDKV, Akola.
- Marshal, V. M. 1993. Starter cultures for milk fermentation and their characteristics. J. Soc. Dairy Technol. **46**: 49-56.
- Nelson, J. A. and G. M. Trout, 1964. Judging Dairy Products, 4th Edn. Olson Publ. Co. Nilwankee, pp. 296.
- Pal, D. and S. K. Gupta, 1985. Sensory evaluation of Indian milk products. Indian Dairy Man, **37** (2):465-474.
- Raum, R. 2003. Microbiological quality of health food and organic foods. Neth. Milk Dairy J. **14**: 130-134.
- Salwa, A. A., E. A. Galal and A. E. Neimat, 2004. Carrot yoghurt: sensory, chemical, microbiological properties and consumer acceptance. J. Nutri. **3** (6): 322-330.
- Snedecor, G. W. and W. G. Cochran, 1994: Statistical method, 8th edition, Oxford and IBA publishing company Calcutta. pp.172-196.
- Talekar, R.U., R.R. Shelke, R.V. Karche and A.V. Bhagat. 2015. Preparation of cow milk yoghurt blended with soy milk. DOI:10.15740/HAS/Res. J. Animal Husbandry and Dairy Sci. **6**(1):32-36.
- Tamime, A. Y. and R. K. Robinson, 1999. Yoghurt Sci. and Tech. (2nd Ed) CRC Press, Boca Raton, pp. 450.

Rec. on 07.06.2017 & Acc. on 30.06.2017