

## UTILIZATION OF KIWI (*Actinidia deliciosa*) PULP FOR YOGHURT DRINK PREPARATION

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### ABSTRACT

The present investigation entitled “Utilization of kiwi (*Actinidia deliciosa*) pulp for yoghurt drink preparation “ was undertaken during the year 2022-2023 at Animal Husbandry and Dairy Science Section, college of Agriculture, Nagpur. Milk was standardized to 4.0 per cent fat and used for preparing dahi. Then yoghurt drink prepared with addition of sugar at 15% (T1) and kiwi pulp @ 2.5% (T2), 5% (T3) 7.5% (T4) and (T5) 10% per cent by weight of yoghurt. The product was analyzed for chemical composition like fat, protein, total solids, titratable acidity, ash and moisture as well as for sensory attribute like colour and appearance, body and texture, flavour and overall acceptability. The cost of production was also calculated by considering the retail market prices of different ingredients used. The data revealed that fat, protein, moisture, titratable acidity, and pH percentage decreased, while ash, total solids were significantly increased with increased levels of kiwi pulp in yoghurt drink. The fat content was decreased from 3.22 to 1.62 per cent, protein content decreased from 3.68 to 3.49 per cent, moisture content decreased from 90.63 to 88.57 per cent, titratable acidity decreased from 0.86 to 0.52, ash content increased from 0.63 to 0.69 and total solids content increased from 9.63 to per cent respectively. The significantly highest score for colour and appearance (8.50 out of 9), body and texture (8.25 out of 9), flavour (8.25 out of 9) and overall acceptability (8.50 out of 9) was obtained in yoghurt drink containing 12 per cent of kiwi pulp. The cost of production of yoghurt drink was increased with the increase in the level of kiwi pulp. The cost of production was higher with 10 per cent honey level (Rs. 71.11 kg<sup>1</sup>), while cost of the yoghurt drink prepared by blending with 5 parts of kiwi pulp level was Rs. 69.36 kg<sup>1</sup>.

(Keywords: Yoghurt, kiwi pulp, sensory properties)

### INTRODUCTION

Yoghurt is a staple food in several cultures, originating from countries in Western Asia and the Middle East. The word yoghurt is believed to be derived from the Turkish word “yogurtmak” which means to thicken, coagulate or curdle. Yoghurt is the well known and widely acceptable product in the world among other fermented milk product (Coisson *et al.*, 2005). There is good market opportunity for different milk product. Milk production must be accompanied by processing to produced variety of product to meet market opportunity (Agarkar *et al.*, 2023). Previously, only natural or plain yoghurt was available in the world market but now there has been good demand for fruit yoghurt. The fruit enrich yoghurt add variety to the consumer select. Recently popularity of yoghurt is due to the with sugar fruits. Yoghurt are well known for its nutritional value, therapeutic effect and functional properties. It is excellent source of protein, calcium, potassium, vitamin B2, B6 and B12. It is also effective in curing diarrhoea,

dysentery, constipation, lowering blood pressure, cholesterol and cancer (Roy *et al.*, 2015). The popularity of yoghurt due to its sensory properly, which are consumed medley around the world and its high nutritional value (Pereira, 2014). Kiwi fruit terribly popular during the past two decades due to its various medicinal properties such as to improve the digestion of protein (Tyagi *et al.*, 2015). The industry must consider providing milk product like yoghurt with natural flavour with fortification. There is more valuable and demand to product like yoghurt with addition of kiwi pulp. There is demand to value addition in milk and milk product due to changes in its life style, healthy and nutritional concern. So, yoghurt drink with addition of kiwi pulp will be worthwhile buying and consuming value added food products of future.

The present paper focused on Utilization of kiwi (*Actinidia deliciosa*) pulp for yoghurt drink preparation with the objective to standardize the acceptable level of kiwi pulp along with physico-chemical quality and its cost structure.

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## MATERIALS AND METHODS

The present investigation on evaluating physico-chemical and sensory qualities of kiwi pulp yoghurt drink was carried out in the laboratory of Animal Husbandry and Dairy Science section, College of Agriculture, Nagpur during year 2022-2023. In this trial following Kiwi yoghurt drink were prepared with different levels i.e. T<sub>1</sub> - Control (yoghurt without addition of kiwi pulp), T<sub>2</sub> - yoghurt drink + 2.5% kiwi pulp, T<sub>3</sub> - yoghurt drink + 5% kiwi pulp, T<sub>4</sub> - yoghurt drink + 7.5% kiwi pulp and T<sub>5</sub>-yoghurt drink + 10% kiwi pulp.

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

First kiwi fruit was washed with clean water. The skin was peeled. Slices were made with the help of knife and finally it was converted in to homogenous mass of pulp by putting into mixer.

Method of preparation of yoghurt drink was suggested by Lee and Lucey (2010), also the fat content was determined by Gerber's method as described in IS: 1224 part-1), (Anonymous, 1977). The protein was determined by estimating the per cent nitrogen by Macro Kjeldahl method as recommended in IS: 1479 ,Part II, (Anonymous, 1961). The ash per cent was determined by the method recommended in B.I.S Handbook of food analysis IS: 1165 ((Anonymous, 1967). The total solids content in yoghurt drink was determined by gravimetric method described in BIS Hand book of Food Analysis Dairy products in IS:1479 (Part-II), (Anonymous, 1961). Moisture content of yoghurt drink samples were determined as per formula such as total solids subtracted from 100. Acidity percentage of yoghurt drink was determined as per the procedure recommended in BIS-1960, IS-1479 Part I (Anonymous,1960). pH calculated with the help of digital pH meter.

The quality of yoghurt drink was judged by sensory evaluation in respect of flavour, body and texture and colour and appearance by trained panel of judge (5 members) on 9 point Hedonic scale by Nelson and Trout (1964).

## RESULTS AND DISCUSSION

Data regarding chemical quality of kiwi pulp yoghurt drink was evaluated with respect to fat, protein, moisture, total solids, titratable acidity and pH content are presented in Table 1.

### Fat content

Fat content recorded significantly highest (3.22 per cent) in yoghurt drink prepared without addition of Kiwi pulp (T<sub>1</sub>), While, fat content was lowest (1.62 per cent) in yoghurt drink prepared with the addition of 10 per cent Kiwi pulp (T<sub>5</sub>).

The results indicated that, with the increase in the levels of Kiwi pulp there was significant decrease in fat percentage of yoghurt drink. This might be due to the fact that fat content of Kiwi pulp was considerably low as compared to fat content of milk.

The findings of present studies are in agreement with the results obtained by Jadhav *et al.* (2016). They analyzed fat content of honey yoghurt in different proportion of 100:0 (T<sub>1</sub>), 94:06 (T<sub>2</sub>), 92:08 (T<sub>3</sub>), 90:10 (T<sub>4</sub>) and 88: 12 (T<sub>5</sub>), yoghurt drink to honey percentage were 3.43, 3.33, 3.27, 3.19 and 3.09, respectively.

### Protein

The protein percentage was significantly highest (3.68 per cent) in yoghurt drink prepared without addition of kiwi pulp (T<sub>1</sub>), while protein content was lowest (3.49 per cent) in yoghurt drink prepared with 10 per cent Kiwi pulp (T<sub>5</sub>).

The present findings are in agreement with the results obtained by Patil *et al.* (2017). They evaluated protein content of carrot yoghurt drink in different proportion of 100:00 (T<sub>1</sub>), 94:06 (T<sub>2</sub>), 92:08 (T<sub>3</sub>) and 9:10 (T<sub>4</sub>). Yoghurt to carrot juice were recorded as 4.13, 3.95, 3.88 and 3.82 per cent, respectively.

### Ash

The ash percentage was significantly highest (0.69 per cent) in yoghurt drink prepared with addition of Kiwi pulp (T<sub>5</sub>) while, ash content was lowest (0.63 per cent) in yoghurt drink prepared without addition of Kiwi pulp (T<sub>1</sub>).

The present findings are in agreement with the results obtained by Patil *et al.* (2017). They evaluated ash content of carrot juice yoghurt drink in different proportion of 100:00 (T<sub>1</sub>), 94:06 (T<sub>2</sub>), 92:08 (T<sub>3</sub>) and 9:10 (T<sub>4</sub>). Yoghurt to carrot juice was recorded as 0.77, 0.78, 0.79 and 0.81 per cent, respectively.

### Total solids

The total solids percentage was significantly lowest (9.36 per cent) in yoghurt drink prepared without addition of Kiwi pulp (T<sub>1</sub>) while, total solids content was highest (11.42 per cent) in yoghurt drink prepared with addition of 10 per cent Kiwi pulp (T<sub>5</sub>).

The present findings are in agreements with the results obtained by Raut *et al.* (2014). They evaluated that total solids content of mango pulp yoghurt in different proportions i.e. 100:00 (T<sub>1</sub>), 97:03 (T<sub>2</sub>), 94:03 (T<sub>3</sub>), 91:09 (T<sub>4</sub>), yoghurt to mango pulp were recorded as 21.06, 21.88, 22.94 and 23.31 per cent, respectively.

### Moisture

The moisture per cent was significantly highest (90.63 per cent) in yoghurt drink prepared without addition of Kiwi pulp (T<sub>1</sub>) while, moisture content was lowest (88.57 per cent) at yoghurt drink prepared with addition of yoghurt drink (T<sub>5</sub>).

The present findings are in agreement with the results obtained by Patil *et al.* (2017). They evaluated

moisture content of carrot juice yoghurt drink in different proportion of 100:00 (T<sub>1</sub>), 94:06 (T<sub>2</sub>), 92:08 (T<sub>3</sub>) and 90:10 (T<sub>4</sub>). Yoghurt to carrot juice were recorded as 86.48, 87.45, 87.65 and 87.75 per cent, respectively.

#### **Titrateable acidity**

The acidity content in the yoghurt drink prepared with addition of Kiwi pulp at 0 per cent (T<sub>1</sub>), 2.5 per cent (T<sub>2</sub>), 5 per cent (T<sub>3</sub>), 7.5 per cent (T<sub>4</sub>) and 10 per cent (T<sub>5</sub>) was recorded as 0.86, 0.71, 0.61 0.56 and 0.52 per cent, respectively.

The findings of present studies are in agreement with the results obtained by Patil *et al.* (2017), they evaluated titrateable acidity content of carrot juice yoghurt drink in different proportion i.e. 100:00 (T<sub>1</sub>), 94:6 (T<sub>2</sub>), 92: 08 (T<sub>3</sub>) and 90: 10 (T<sub>4</sub>) yoghurt to carrot juice were as average per cent acidity of carrot were 0.77, 0.96, 0.99 and 1.02 per cent, respectively.

#### **pH**

The pH was significantly highest (5.60) in yoghurt drink prepared without addition of Kiwi pulp (T<sub>5</sub>) while, pH content was lowest (4.20) with addition of kiwi pulp (T<sub>5</sub>).

The result obtained in present study are comparable with the results reported by Patil *et al.* (2017), they evaluated pH content in carrot juice yoghurt drink in different proportions of 100:00 (T<sub>1</sub>), 94:06 (T<sub>2</sub>), 92:08 (T<sub>3</sub>), 90:10 (T<sub>4</sub>) yoghurt to carrot juice were as 4.42, 4.33, 4.32, 4.30 per cent, respectively.

#### **Sensory evaluation of lassi**

The data with respect to sensory evaluation of yoghurt drink are presented in Table 2.

#### **Flavour**

Significantly the highest score (8.25 out of 9) was obtained by yoghurt drink prepared with 05% Kiwi pulp (T<sub>3</sub>) was appreciated, followed by T<sub>1</sub>, T<sub>2</sub>, T<sub>4</sub> and T<sub>5</sub>. The Kiwi yoghurt prepared with 5 parts (8.5) of Kiwi pulp was superior over 0, 2.5, 7.5 and 10 parts levels.

Islam *et al.* (2016) prepared Dahi from skim milk with addition of carrot juice. The carrot juice dahi prepared with 5 parts of carrot juice was superior over 0, 10 and 15 parts levels. Results indicated that increase in the levels of carrot juice resulted in better flavour and odour of dahi up to certain limit.

#### **Body and texture**

Significantly highest score (8.25 out of 9) was obtained by yoghurt drink prepared with 5 per cent Kiwi pulp (T<sub>3</sub>) was appreciated followed by T<sub>1</sub>, T<sub>2</sub>, T<sub>4</sub> and T<sub>5</sub>. The yoghurt drink prepared with 5 parts (8.25) of Kiwi pulp was superior over 0, 2.5, 7.5 and 10 parts levels.

Patil *et al.* (2017) evaluated yoghurt drink in different proportion i.e. 100:00 (T<sub>1</sub>), 94:06(T<sub>2</sub>), 92:08 (T<sub>3</sub>) and

90:10 (T<sub>4</sub>), yoghurt to carrot juice were recorded as 24.83, 25.85, 28.41 and 26.92 per cent, respectively.

#### **Colour and appearance**

Significantly highest score (8.5 out of 9) was obtained by yoghurt drink prepared with 5 per cent Kiwi pulp (T<sub>3</sub>) was appreciated followed by T<sub>1</sub>, T<sub>2</sub>, T<sub>4</sub> and T<sub>5</sub>. The yoghurt drink prepared with 5 parts (8.25) of Kiwi pulp was superior over 0, 2.5, 7.5 and 10 parts levels.

Hence, it indicates that increase in the levels of Kiwi pulp resulted in better colour appearance of yoghurt drink up to a certain limits.

More or less similar results were reported by Raut *et al.* (2016), they prepared yoghurt drink with addition of honey. They observed that the honey yoghurt prepared with 12 parts of honey was superior over 0, 06, 08, 10, parts. These results are in conformity with present study.

#### **Overall acceptability**

The overall acceptability of yoghurt drink was significantly affected due to addition of kiwi pulp at different levels. The average score for overall acceptability attributes of lassi prepared under each treatment range from 5.50 to 8.50. The significantly highest score of 7.25 was received by yoghurt drink prepared with addition of 15% kiwi pulp which was superior to remaining treatments. Hence, it is inferred that increase in the level of kiwi pulp resulted in better the overall acceptability score up to 5 per cent addition of kiwi pulp and thereafter, it decreased proportionately.

#### **Cost of production**

The data presented in Table 2 indicated that cost of production of 1 kg<sup>-1</sup> yoghurt drink prepared with addition of sugar at 15% (T<sub>1</sub>), kiwi pulp @ 2.5 (T<sub>2</sub>), kiwi pulp @ 5 % (T<sub>3</sub>) kiwi pulp @ 7.5 % (T<sub>4</sub>) kiwi pulp @ 10 % (T<sub>5</sub>) was Rs. 66.80, 68.55, 69.36, 70.21 and 71.11 respectively. The increase in the level of kiwi pulp showed the increase in cost of production. These differences were mainly because of cost of kiwi pulp.

The lowest cost of production Rs. 66.80 kg<sup>-1</sup> was calculated in case of yoghurt drink prepared with addition of sugar at 15 per cent treatment. The highest cost of production (Rs. 71.11/- kg<sup>-1</sup>) was recorded in case of yoghurt drink prepared without addition of kiwi pulp. However, the cost of production of yoghurt drink prepared with 5 % kiwi pulp was found to be Rs. 69.36/- kg<sup>-1</sup> which was the best treatment selected by judges for sensory evaluation.

Raut *et al.* (2014) observed that, cost of finished product was increased with increase in the levels of mango pulp. The cost production of treatments 0 per cent (T<sub>1</sub>), 3 per cent (T<sub>2</sub>), 6 per cent (T<sub>3</sub>) and 9 per cent (T<sub>4</sub>) were Rs. 36.78, Rs. 40.02, Rs. 43.26 and Rs. 46.50, respectively. And treatment T<sub>3</sub> was superiorly accepted by the panel of judges.

**Table 1. Chemical composition of honey lassi**

Treatments	Fat	Protein	Ash	Total solids	Moisture	Titratable acidity	pH
T <sub>1</sub> 0 per cent kiwi	3.22	3.68	0.63	9.36	90.63	0.86	5.42
T <sub>2</sub> 2.5 per cent kiwi	2.75	3.59	0.64	9.64	90.36	0.71	5.05
T <sub>3</sub> 5 per cent kiwi	2.25	3.56	0.66	10.12	89.87	0.61	4.26
T <sub>4</sub> 7.5 per cent kiwi	1.75	3.50	0.68	10.66	89.33	0.56	4.26
T <sub>5</sub> 10 per cent kiwi	1.62	3.49	0.69	11.42	88.57	0.52	4.24
SE (m) ±	0.13	0.05	0.005	0.10	0.07	0.008	0.03
CD @ 5 %	0.39	0.15	0.015	0.30	0.21	0.024	0.09

Values with different superscripts differ significantly (P<0.05)

**Table 2. Table for sensory evaluation of yoghurt drink as affected by different levels of kiwi pulp**

Treatments	Flavour	Body and texture	Colour and appearance	Overall acceptability
T <sub>1</sub> 15 per cent kiwi	7.50	7.50	7.25	7.25
T <sub>2</sub> 10 per cent kiwi	6.00	6.00	6.00	6.00
T <sub>3</sub> 12 per cent kiwi	8.25	8.25	8.50	8.50
T <sub>4</sub> 14 per cent kiwi	6.75	6.50	6.25	6.75
T <sub>5</sub> 10 per cent kiwi	5.50	5.25	5.25	5.50
SE(m) ±	0.30	0.30	0.29	0.30
CD@ 5 %	0.90	0.90	0.87	0.90

Values with different superscripts differ significantly (P<0.05)

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