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Bochare SS

Department of Food Engineering, College of Food Technology, Vasant Rao Naik Marathwada Krishi Vidyapeeth, Parbhani, Maharashtra, India

Kshirsagar RB

Department of Food Engineering, College of Food Technology, Vasant Rao Naik Marathwada Krishi Vidyapeeth, Parbhani, Maharashtra, India

Sawate AR

Department of Food Engineering, College of Food Technology, Vasant Rao Naik Marathwada Krishi Vidyapeeth, Parbhani, Maharashtra, India

Agarkar BS

Department of Food Engineering, College of Food Technology, Vasant Rao Naik Marathwada Krishi Vidyapeeth, Parbhani, Maharashtra, India

Patil BM

Department of Food Engineering, College of Food Technology, Vasant Rao Naik Marathwada Krishi Vidyapeeth, Parbhani, Maharashtra, India

Corresponding Author:**Bochare SS**

Department of Food Engineering, College of Food Technology, Vasant Rao Naik Marathwada Krishi Vidyapeeth, Parbhani, Maharashtra, India

Studies on effect of guar gum as stabilizer on kiwi fruit ready to serve beverage incorporated with lemongrass

Bochare SS, Kshirsagar RB, Sawate AR, Agarkar BS and Patil BM

Abstract

In this Study, effect of guar gum as stabilizer on physicochemical and organoleptic properties were determined at different concentration in kiwi fruit ready to serve beverage incorporated with lemongrass. Different samples of kiwi fruit RTS incorporated with lemongrass were prepared using different concentration of guar gum (0 to 0.3%). Study revealed that increasing the guar gum concentration increases the TSS, titrable acidity and viscosity. Organoleptic properties *viz.* as mouthfeel and flavor are significantly affecting than the other parameters. Sample containing 0.2% of guar gum got the highest sensory score and found to be the most preferred with respect to the sensory properties such as colour, flavour, taste and overall acceptability.

Keywords: Beverage, lemongrass and guar gum

Introduction

Ready to Serve Fruit Beverages means an unfermented product which is prepared from juice or Pulp/ Puree or concentrated juice or pulp of sound mature fruit and shall contain Total Soluble solid not less than 10.0% and fruit juice content not less than 10.0% (FSSR 2011) [11]. Kiwi fruit is introduced into the world in 20th century. In recent years, its production and consumption has increased (Izali *et al.*, 2007) [13]. Kiwi fruit is obtained from woody, deciduous and fruiting vine. It belongs to the genus *Actinidia* and family *Actinidaceae* (Ferguson and Seal, 2008) [10]. Kiwifruit is cultivated in 14 countries in world (Belrose 2013) [4]. Italy produces more kiwifruits than any other country. Italy and newzeland are biggest exporter of kiwifruit (Testolin and Ferguson, 2009) [27].

Kiwifruit is considered as antioxidant rich fruit and studied for decreasing oxidative damage and it is observed that human kiwifruit increased the resistance of DNA to oxidative damage induced by H₂O₂ (Collins *et al.*, 2001) [6]. Consumption of kiwi fruit per day reduce the systolic and diastolic blood pressure and also reduces the platelet aggregation (karlsen *et al.*, 2014) [14]. Kiwifruit extracts are analyzed for different biological activities which shows the cytotoxic activity (Noboru and Joseph 2002) [19].

The kiwifruit is unique because of its high nutritional content, different flavors, vitamins, minerals, antioxidants, phytochemicals and fiber content. In terms of nutrient content, the kiwifruit is amongst the richest fruits: it is also very valuable in terms of health. It is usually consumed fresh but in recent years along with increased production, industrial use is increasing. It is used in the canned food industry, for marmalades, fruit sauces and candies and for fruit juice concentrates, either separately or mixed with strawberries or apples. The fruit is also canned, dried, frozen, and used for the preparation of nectars (Göksel and Atak 2016) [12]. Kiwi-based snacks (bars) were developed from kiwi pulp with the addition of gelling agents and some other ingredients (Raquel and Salmon 2017) [23]. Using the kiwi fruit, jam is prepared for the production of a preserved product. Here, along with kiwi fruit, another fruit which is rich in pectin content is utilized i.e., apple. Apple is incorporated in the preparation of kiwi jam to set the product easily (Kodandram *et al.*, 2015) [15].

Lemongrass (*Cymbopogon citratus*) is tall and aromatic grass which belongs to family Graminaceae (poaceae), genus Cymbopogon and species citratus, Cymbopogon has about 55 species. Their leaves are arising from rhizomatous root stock and can grow up to 1.8m in height and 1.2m in width (Shah *et al.*, 2011) [24]. Lemongrass is largely cultivated in tropical and subtropical countries, such as in India, Indonesia, Madagascar and countries in Africa and South America (Anaruma *et al.*, 2010; Weiss 1997) [1, 28]. In India, it is grown along Western Ghats, Tamil Nadu, Arunachal Pradesh, Karnataka and Sikkim.

While Kerala is a largest producer and exporters (Srivastava *et al.*, 2013) [25].

Lemongrass tea contains several bio-compounds in its decoction, infusion and essential oil extracts. Anti-oxidant, anti-inflammatory, anti-bacterial, anti-obesity, anti-nociceptive, anxiolytic and antihypertensive supports pharmacological claims (Olorunnisola *et al.*, 2012) [20]. Lemongrass folk medicine associated with health claims such as treatment in coughs, constipation, elephantiasis flu, gingivitis, headache leprosy, malaria, ophthalmia, pneumonia, vascular disorders, diarrhoea and stomach ache. It has been claimed to be anti-inflammatory, vasorelaxing, diuretic, remedy in treating ringworm infestation, for nervous, gastrointestinal disturbances, fevers and hypertension (Nambiar and Matela 2010) [18].

Guar gum is a highly viscous water soluble heteropolysaccharide composed of linear backbone of β -1, 4-linked mannose units with α -1, 6-linked galactose units randomly attached as side chains (Dea and Morrison 1975) [7]. It is derived from the seeds of plant *Cyamopsis tetragonolobus* (Cluster bean), an annual plant indigenous to Indian sub-continent growing in semi-arid conditions. Guar gum finds extensive application as an additive in various food products, *viz.* sauces, soups, desserts and baked food products due to its stabilizing and thickening properties (Krotkiewski 1984; Ellis *et al.*, 1996; Butt *et al.*, 2007; Mudgil *et al.*, 2011.) [16, 8, 5, 17].

For fruit juice products that contain a large amount of pulp, it is difficult to stabilize the pulp suspension for long periods. However, the addition of a minimal amount of gum (Anonymous 1981) [2] or an appropriate mixture of natural gums (Ticaloid 550), can yield products with low viscosity and good taste. Additionally, these gums increase the stability of the turbidity of fruit juice stored in bottles (Padival *et al.*, 1980) [21]. The addition of gum to juices can help resolve these problems.

This study aims to determine the effect of guar gum on the physico-chemical and organoleptic properties of kiwi fruit ready to serve beverage incorporated with lemongrass stored in glass bottles at 4 °C, which had been pasteurized.

Materials and Methods

Materials

The fresh kiwi fruits were obtained from local market, Parbhani and lemongrass was obtained from college garden. The proposed research was carried out in Department of Food Engineering, College of Food Technology, VNMKV, Parbhani.

Methods

Preparation of kiwi fruit RTS incorporated with lemongrass

Lemongrass leaves aqueous extract is prepared by decoction, obtained extract is clarified, centrifuged and concentrated in rotary vacuum concentrator. Prepared concentrate is incorporated in the kiwi fruit Ready-to-serve beverage as per the FSSAI specifications. Four samples prepared with different concentration of guar gum *viz.* as 0, 0.1%, 0.2% and 0.3%. Prepared RTS beverage pasteurized and effect of guar gum at different concentration on various physico-chemical parameters like TSS (°Bx), pH, titratable acidity and viscosity were determined. Also, organoleptic evaluation of samples were analyzed as recommended by (Ranganna, 2001) [22].

Table 1: Recipe for 100ml RTS

Ingredients	Quantity			
	T ₀	T ₁	T ₂	T ₃
Kiwi fruit pulp(ml)	10	10	10	10
Lemongrass extract concentrate(ml)	2	2	2	2
Sugar(g)	12	12	12	12
Citric acid(g)	0.1	0.1	0.1	0.1
Guar gum (g)	0	0.1	0.2	0.3

Determination of Physico-chemical characteristics

- Total Soluble Solid (TSS):** Total soluble solid (TSS) of juice was determined by digital hand refractometer of range 0-30°Bx. The reading was corrected to 20°C and the mean value was expressed as the per cent °Bx (AOAC, 2000) [3].
- pH:** The pH values were determined with the help of a digital pH meter after calibrating it with buffer solution of pH 4 and 7 (AOAC, 2000) [3].
- Titratable Acidity:** Titratable acidity was estimated by titrating 5 ml aliquot of the sample against standard 0.1N sodium hydroxide solution using phenolphthalein as an indicator. The total titratable acidity was expressed as per cent citric acid present in 100 ml liquid sample (Ranganna, 2011) [22]. It was calculated by formula,

$$\text{Acidity (\%)} = \frac{\text{Titre value} \times \text{N of alkali} \times \text{Volume made up} \times \text{Equivalent weight of acid} \times 100}{\text{Aliquot} \times \text{Volume of sample taken} \times 1000}$$

- Viscosity:** Viscosity of the prepared herbal beverages was measured using a Brookfield LVDV-E Viscometer with LV Spindle #1 (65). All measurements were recorded in centipoise at room temperature and 100rpm. (AOAC, 2000) [3].

Result and Discussion

Determination of Physico-chemical properties

Table 2: Physico- chemical properties of RTS

Sample	TSS	pH	Titratable acidity (%)	Viscosity(cp)
T ₀	12.1	3.41	0.342	5.42
T ₁	12.5	3.35	0.362	6.12
T ₂	12.8	3.28	0.384	6.96
T ₃	13.0	3.02	0.392	8.90

Data indicated in above table 2. Showed that guar gum slightly affecting the physicochemical properties of ready to serve beverage. Increase in the concentration of guar gum increases TSS, titratable acidity and viscosity linearly and decreases the pH. The results found close to that of (Suthida and Sirikhwan) [26].

Organoleptic evaluation of ready to serve beverage

Table 3: Mean sensory score values for kiwi fruit RTS incorporated with lemongrass with different concentration of guar gum

Samples	Appearance	Colour	Flavor	After taste	Mouth feel	Overall acceptability
T ₀	8.7	8.2	8.2	8.7	8.9	8.5
T ₁	7.5	7.9	7.9	8.0	8.5	7.9
T ₂	8.5	8.1	8.1	8.3	8.7	8.3
T ₃	7.6	7.3	7.3	7.3	7.2	7.3

Data indicated in above table 3. Showed that kiwi fruit RTS incorporated with lemongrass with 0% guar gum received highest sensory score (i.e., 8.7) in case of all sensory attributes followed by RTS having 0.2% guar gum and scored (i.e., 8.4) compared to rest of the samples. Mouthfeel and flavor of the RTS were majorly affected compare to other organoleptic parameters. The effect of guar gum on kiwi fruit RTS incorporated with lemongrass was significantly affected at 0.3%. The results of organoleptic evaluation for appearance, color, taste, texture, and overall acceptability showed no significant difference between the ready to serve beverage containing guar gum up to 0.2%. The results found close to that of (Enriquez and Flick 1989) [9].

Conclusion

In present investigation efforts were made to study the effect of addition of organoleptic and physicochemical properties of kiwi fruit RTS incorporated with lemongrass. The study revealed that guar gum has stabilizing ability with slightly affecting the physicochemical and organoleptic properties. Increase in the concentration of guar gum increases TSS, titrable acidity and viscosity linearly. There is significant change in flavour and mouthfeel than other organoleptic properties. It can be finally concluded that 0.2% concentration of guar gum as stabilizer considered as desirable for the addition in ready to serve beverage.

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