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Development of jaggery based fruit bar using sensory evaluation

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Abstract
Snacking refers to having light meals between the heavy meals. Due to rapid life style changes, demand for nutritious foods is increasing. Snack bar is a healthy and ready-to-eat food with protein, vitamins, minerals and fat. Fruits and vegetables are micronutrient dense foods which plays a protective role in controlling many degenerative diseases and improves the quality of life. Bars were developed by using pineapple, beetroot and dates with different combinations of jaggery. The best combination was selected through the sensory evaluation by semi-trained panellists. The results showed that combination with more amount of dates has highest acceptability followed by pineapple and least was for beetroot. The increase in beetroot decreased the aesthetic value of the bar. The descending order was dates > pineapple > beet root with 15% jaggery and beetroot and dates > dates > beet root for 20% jaggery.

Keywords: Pineapple, beetroot, dates, standardisation, snack bar, sensory evaluation

Introduction
The demand for bars is increasing due to convenience, exquisiteness, taste and lower price (Izzo M and Niness, 2001) [1]. Snack bars are highly favoured for their flavour and texture along with portability and cost. These bars can be consumed between meals to lower the intake of meals heavily and improve the satiety levels (Ho *et al*., 2016) [2]. The intake of fruits and vegetables has positive impact on well-being of individual as they are power packed with micronutrients and antioxidants whereas unhealthy junk snacks have many negative effects like lowering of cognitive and physical activity (Njike *et al*., 2016) [3].
The consumption of foods rich in vitamins, minerals, carbohydrates, protein and fat are helpful to maintain good health (Pinto *et al*., 2016) [4]. Bars have good shelf life because of their low moisture content but at room temperature can undergo lipid peroxidation producing free fatty acids. Sweetness and colour of bars attract the consumers (Meethal *et al*., 2017) [5].
Pineapple is known as queen of fruits due to its exotic flavour and taste and are consumed fresh, as juices, in cooked form as toffees and squashes but is highly perishable and a seasonal fruit (Smith and Rogers, 2014) [6]. It is a tropical fruit with dense health benefits and consisting of calcium, potassium, vitamin C, carbohydrates, crude fibre and other minerals. It contains the enzyme bromelain that aids in easy digestion and is used for marinating meats to improve their texture. Pineapple juice is a rich source of vitamin C and other essential minerals when freshly consumed. It is used as a supplementary food for maintaining good health and in disease (Hossian *et al*., 2015) [7].
Beetroot is a good source of fibre with no amount of fat and is a good tonic for inhibition of skin and lung cancers. Beetroot juice has anti-inflammatory properties and is used as a food colouring agent for its deep red colour which is economical and has no allergic effects. It contains vitamins, minerals, amino acids and antioxidants that help in combating anaemia, blood pressure, cancers and constipation (Yashwant, 2015) [8].
Dates are nutritious and healthy as they contain carbohydrates in the form of fructose and glucose (70-80%). It helps in maintaining the functions of digestive system properly due to its high fibre content of 6.4-11.5% (Shaheen *et al*., 2013) [9].

Materials and Methods
Procurement of raw materials: Pineapple, beetroot, dates, jaggery, groundnuts, oats and pumpkin seeds were procured from the local markets of Hyderabad.

Osmo-dehydration of pineapple: Pineapple was washed and then peeled and then sliced into small cubes and then soaked in sugar syrup for 24 hours in the ratio of 1:2 (Pineapple: sugar) and then are dried in tray dryer for 24 hours at 60 ºC (Nazanee *et al*., 2015) [10].

Drying of beetroot: Beetroot was washed, peeled, grated and dried in tray dryer at 50 ºC for 26 hours.

Soaking of dry dates: Dry dates was cut to small pieces and soaked in honey for 48 hours before use to soften their texture.

Standardization of fruit bars: Standardization is a trial process where a product is tested number of times until desired final product is obtained (Quadri and Rao, 2018) [11]. Bars were made based on the combinations and other ingredients like jaggery, groundnuts, oats and pumpkin seeds were kept constant and bars developed. All the processed ingredients were added to jaggery syrup, spread on a greased plate, cooled and cut to bars of required size.

Sensory evaluation: Standardization was done by sensory evaluation using 9-point hedonic scale at PGRC, PJTSAU where each product was coded with three-digit number and is tested by 15 semi-trained panellists. They were asked to score the product based on the sensory parameters like appearance, colour, flavour, texture, chewiness, taste and overall acceptability. They were provided water to rinse the mouth for avoiding over lapping of taste of other bars and scored from 1-9 with 1 being I dislike extremely *i.e.*, very bad and 9 being I like extremely *i.e.*, the product is excellent in that particular attribute (Meilgaard *et al*., 1999) [12].

Results and discussion

The fruit bars were developed by using 2 formulations with 3 different combinations and was evaluated for its sensory parameters as shown in Figures 1 and 2. The 15% jaggery combination with more of dates had best overall acceptability followed by pineapple and the least for beetroot added bar. Sensory scores of dates bar for colour, flavour, texture, chewiness, appearance, taste and overall acceptability were 7.53, 7.40, 7.26, 7.33, 7.60, 7.46 and 7.53 respectively. The beet root with 15% jaggery bar scored lowest for colour, appearance and overall acceptability with 7.00, 6.96 and 6.93 whereas bar with more pineapple scored lowest for texture, flavour, taste and chewiness 6.73, 7.00, 6.86 and 6.73 with groundnuts, oats and pumpkin seeds being constant.

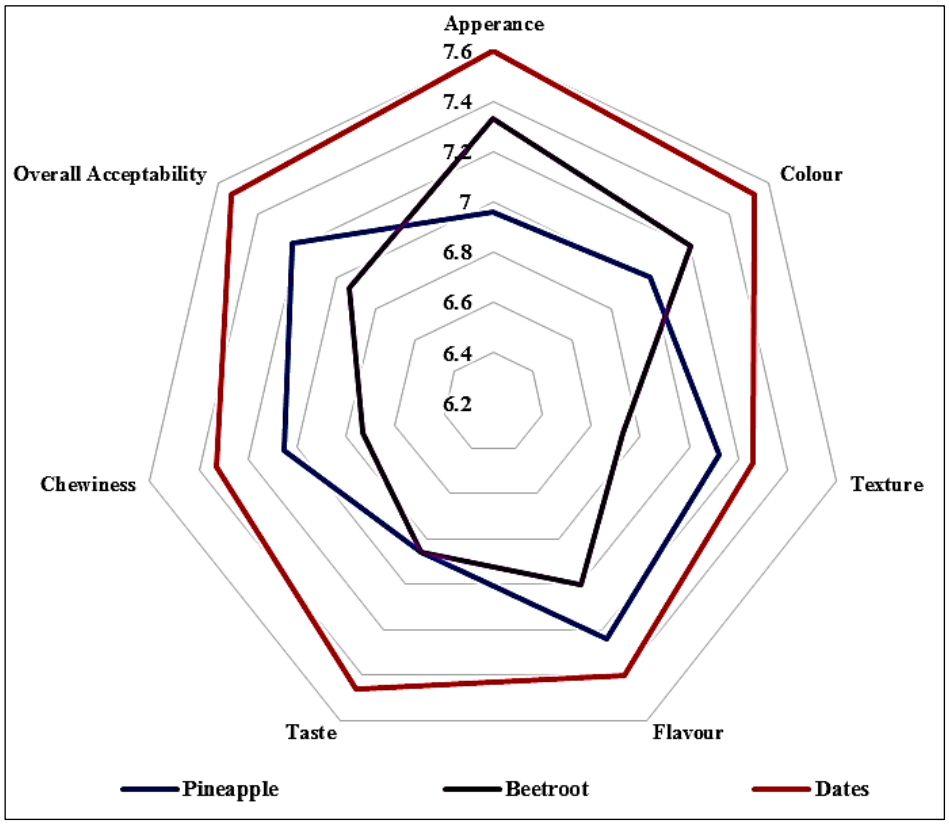

Fig 1: Sensory parameters of 15% jaggery

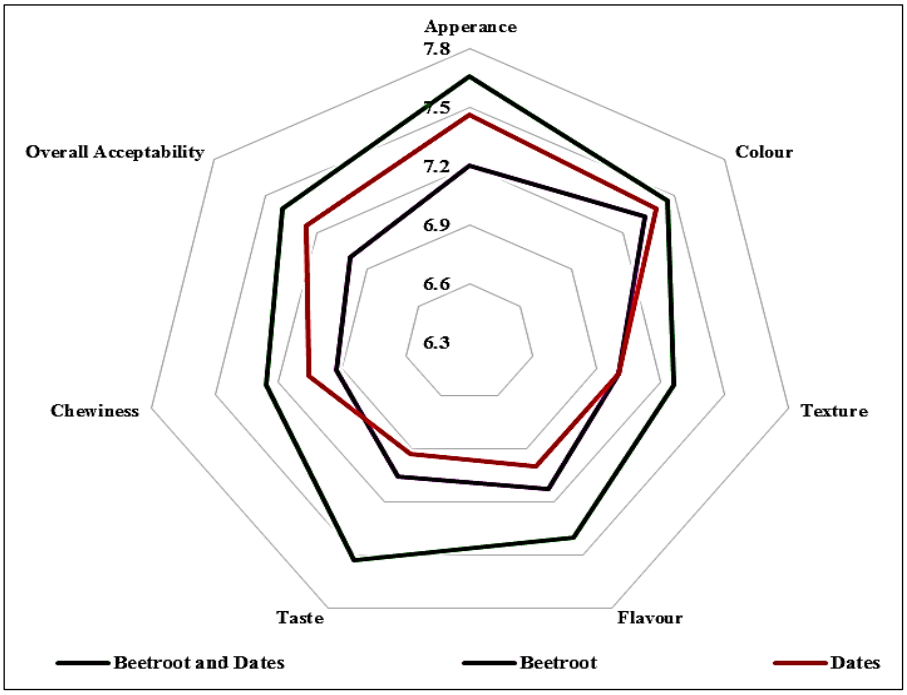

Fig 2: Sensory parameters of 20% jaggery

The fruit bars with 20% jaggery addition were best accepted for equal quantity of beetroot and dates with sensory scores for appearance, taste, colour, flavour, texture, chewiness and overall acceptability were 7.66, 7.53, 7.46, 7.40, 7.26, 7.26 and 7.40 respectively. The lowest sensory scores of colour, appearance, flavour, taste, texture, chewiness and overall acceptability were for combination with high percentage of beetroot with 7.33, 7.20, 7.00, 6.93, 7.00, 7.60 and 7.00. Pineapple and other common ingredients like groundnuts, oats and pumpkin seeds were kept constant.

Conclusion

This study on development of fruit-based snack bars with jaggery showed that 15% jaggery bars were best accepted with high amount of dates due to its appealing appearance and colour whereas with high amount of beetroot the acceptability decreased due to its appearance, colour and different taste. The ascending order was beet root < pineapple < dates.

But, when both beetroot and dates in equal amounts were used, the bar was high accepted which may also be due to the increase in jaggery percentage to 20 and it may be masking the undesirable taste of beetroot. The bar with more of dates was moderately acceptable than the one with more of beetroot even with 20% jaggery. The order for this combination was beet root < dates < beetroot and dates.

In conclusion, it may be said that although beetroot is highly nutritious with many health benefits, it is not accepted due to its distinct taste and bars can be developed in combination with other fruits as was done adding dates.

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