

Standardization and evaluation of ginger-apple Peda (Indian sweet)

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ABSTRACT

The investigations were aimed at standardization and nutritional evaluation of recipe of ginger-apple Peda (Indian sweet). Out of different combinations tried Peda prepared with ginger-apple pulp in the ratio of 50:50 concentrated to a TSS of 76°B by adding sugar (70%), glucose (8%), cocoa powder (2%), pectin (1%), milk powder (18%) and ghee (5%) was rated best on the basis of sensory evaluation. The findings revealed that the standardized recipe of ginger Peda contained 76.60°B TSS, 18.24 per cent moisture content with total phenolic content and antioxidant activity of 31.54 mg/100 g and 48.33 per cent respectively.

Keywords: Ginger; apple; pulp; Peda; physico-chemical characteristics; recipe

INTRODUCTION

Ginger (*Zingiber officinale* Roscoe, Zingiberaceae) is one of the most important cash crops and principal spices in India and abroad (Bartley and Jacobs 2000). It is a source of large number of antioxidants especially polyphenols such as gingerol and its derivatives (Chen et al 1986) comprising zingiberone, bisabolene, camphene, geranial, linalool, borneol and oleoresin (combination of volatile oils and resin) that account for its characteristic aroma and therapeutic properties. Ginger is known for its medicinal properties for the treatment of nausea, vomiting, rheumatoid arthritis and osteoarthritis and has also been found useful in pregnancy related morning sickness apart from being natural pain reliever and an anti-inflammatory agent which signifies its utilization for product development. In India it is grown in an area of 133000 hectares with a production of 655000 tons while in Himachal Pradesh it is an important cash crop of mid-hill regions covering an area of 2812 hectares with an annual production of 31503 tons (Anon 2015). Apple (*Malus x domestica* Borkh, Rosaceae) is commercially the most important fruit of temperate regions of the world and is a rich source of vitamins, phenols and minerals that are known to prevent cancer and cardiovascular diseases (Clausi 1995). In Himachal

Pradesh apples are grown in an area of 107690 hectares with a production of 588970 tons (Anon 2015). Therefore blending of ginger with apple will be an avenue for immediate exploration to match the challenges of increased production and fluctuating prices thereby augmenting the income of growers.

MATERIAL and METHODS

Fresh tender ginger rhizomes and apple fruits used for conducting study were procured from local market and brought to the Department of Food Science and Technology, Dr YS Parmar University of Horticulture and Forestry Nauni, Solan, Himachal Pradesh. Different ingredients like sugar, glucose, pectin, milk powder, cocoa, ghee etc were also procured from the local market. Ginger rhizomes and apple fruits were cleaned and washed under tap water to remove dirt and dust and the pulp was extracted by the hot break method and preserved by pasteurization method (pasteurization by overflow method) as advocated by Rahman (1999).

Standardization of recipe of ginger apple Peda

To find out the most acceptable pulp combination for ginger-apple Peda (India sweet), the Peda was prepared by combining different proportions

(100:0, 90:10, 80:20, 70:30, 60:40, 50:50 and 0:100) of ginger and apple pulp with standardized recipe of toffee (Recipe 1) given in Table 1 (Anon 2009). The pulp combination was homogenized properly, heated and the total soluble solids (TSS) were raised to 50°B by adding sugar powder. Glucose and cocoa powder were added at 52 and 54°B TSS respectively and pectin was added with small amount of powdered sugar (10 g) at 60°B TSS. The milk powder and

ghee were added when TSS reached 68 and 71°B respectively followed by cooking up to the final TSS of 76°B. The ginger-apple Peda of total soluble solids at 76°B was cooled slightly and small flattened Pedas were made from this mixture. The different combinations of ginger-apple Peda were evaluated on the basis of sensory characteristics and the optimum combination with the highest score was further taken for recipe standardization (Table 1).

Table 1. Recipe* detail for preparation of ginger-apple Peda

Ingredients	Recipe 1 (Anon 2009)	Recipe 2 (Mewada et al 2013)	Recipe 3
Sugar (g)	700	700	700
Glucose (g)	80	-	80
Cocoa powder (g)	-	-	20
Pectin (g)	-	-	10
Milk powder (g)	160	50	180
Ghee (g)	100	120	50

*Recipe for 1 kg pulp

Physico-chemical analysis

The developed products were evaluated organoleptically using a 9-point Hednic scale as described by Amerine et al (1965). Their proximate composition (moisture, total soluble solids, titratable acidity, sugars, crude fibre and ash) was also analysed using standard methods (Ranganna 2009, Gould 1978). Total phenols were determined on the basis of their reaction with an oxidizing agent phosphomolybdate in

Folin-Ciocalteu reagent under alkaline conditions. The blue colour developed was measured at 650 nm in a spectronic-20 spectrophotometer as described by Bray and Thorpe (1954). The antioxidant activity was analyzed by free radical scavenging activity as per the method of Brand-Williams et al (1995) whereas the absorbance was measured at 515 nm and was calculated using the following equation. The results were statistically analyzed using ANOVA.

$$\text{Antioxidant activity (\%)} = \frac{Ab_{(B)} - Ab_{(S)}}{Ab_{(B)}}$$

where $Ab_{(B)}$ = Absorbance of blank, $Ab_{(S)}$ = Absorbance of sample

RESULTS and DISCUSSION

The ginger and apple pulp was evaluated on the basis of physico-chemical characteristics before product development (Table 2). The data on quality characteristics of ginger pulp (Table 2) indicate a moisture content and total soluble solids of 85.65 ± 0.69 per cent and $2.67 \pm 0.04^\circ\text{B}$ respectively with reducing and total sugars 1.23 ± 0.04 and 2.25 ± 0.06 per cent respectively. It contained appreciable amount of total phenols (38.69 ± 0.04 mg/100 g), antioxidant activity ($51.14 \pm 0.50\%$), crude fibre ($1.23 \pm 0.08\%$) and total ash ($1.08 \pm 0.06\%$) thus emphasizing its

nutritional importance. The quality characteristics of apple pulp (Golden Delicious) containing moisture content, total soluble solids, titratable acidity (as malic acid) and pH values 83.99 ± 0.88 per cent, $12.38 \pm 0.09^\circ\text{B}$, 0.29 ± 0.03 per cent and 3.68 ± 0.02 respectively which were near to the values reported by Durrani et al (2010), Muhammad et al (2011) and Henriquez et al (2010) with an appreciable amount of total phenols of 24.72 ± 0.31 mg/100 g and antioxidant activity of 33.86 ± 0.04 per cent. The apple pulp also contained crude fibre ($0.79 \pm 0.01\%$) and total ash ($0.05 \pm 0.04\%$) which were near to the values found by Ghaemi et al (2014).

Table 2. Physico-chemical characteristics of ginger and apple pulp

Characteristic	Mean $\pm$ SD	
	Ginger pulp	Apple pulp
Moisture (%)	85.65 $\pm$ 0.69	83.99 $\pm$ 0.88
TSS ($^{\circ}$ B)	2.67 $\pm$ 0.04	12.38 $\pm$ 0.09
Titrateable acidity (% citric acid for ginger, % malic acid for apple)	0.22 $\pm$ 0.07	0.29 $\pm$ 0.03
pH	5.58 $\pm$ 0.01	3.68 $\pm$ 0.02
Reducing sugars (%)	1.23 $\pm$ 0.04	7.21 $\pm$ 0.01
Total sugars (%)	2.25 $\pm$ 0.06	8.96 $\pm$ 0.09
Total phenols (mg/100 g)	38.69 $\pm$ 0.04	24.72 $\pm$ 0.31
Antioxidant activity (%)	51.14 $\pm$ 0.50	33.86 $\pm$ 0.04
Crude fibre (%)	1.23 $\pm$ 0.08	0.79 $\pm$ 0.01
Total ash (%)	1.08 $\pm$ 0.06	0.05 $\pm$ 0.04
Recovery (%)	67.00 $\pm$ 0.09	86.67 $\pm$ 0.03

Values are means of 10 observations; SD= Standard deviation

The results pertaining to the standardization of ginger-apple pulp combination for the preparation of ginger-apple Peda presented in Table 3 show that significantly higher scores for different parameters such as colour (7.34), texture (7.95), flavour (8.11), taste (8.01) and overall acceptability (7.85) were received by treatment ginger-apple 50:50. The Peda prepared by using 100 per cent ginger was rated as least preferred with colour, texture, flavour, taste and overall acceptability scores of 3.98, 3.43, 3.68, 3.04 and 3.08 respectively by the panelists due to substantial increase in the pungency of Peda with an increase in the concentration of ginger pulp.

Standardization of the recipe for the development of ginger-apple Peda

The results pertaining to the standardization of recipes for the preparation of ginger-apple Peda presented in Fig 1 show that significantly higher scores for different parameters such as colour (7.78), texture (7.64), flavour (7.78), taste (8.05) and overall acceptability (7.96) were received by Recipe 3 while the Peda prepared by using Recipe 2 was rated as least preferred by the panelists among the three recipes with colour, texture, flavour, taste and overall acceptability scores of 7.41, 6.89, 7.06, 7.13 and 7.36 respectively.

Nutritional characteristics of the ginger-apple Peda

The data on the physico-chemical constituents of standardized recipe of Peda (Table 3) show that it contained total soluble solids of 76.60 $\pm$ 0.14 $^{\circ}$ B with a

mean moisture content of 18.24 $\pm$ 0.22 per cent. The mean reducing and total sugars recorded in ginger-apple Peda were 52.41 $\pm$ 0.12 and 68.57 $\pm$ 0.01 per cent with total phenolic content and antioxidant activity of 31.54 $\pm$ 0.03 mg/100 g and 48.33 $\pm$ 0.15 per cent respectively. The standardized ginger-apple Peda contained 0.68 $\pm$ 0.04 and 0.96 $\pm$ 0.05 per cent of crude fibre and total ash respectively.

Table 3. Physico-chemical characteristics of ginger-apple Peda

Characteristic	Mean $\pm$ SD
Moisture (%)	18.24 $\pm$ 0.22
TSS ($^{\circ}$ B)	76.60 $\pm$ 0.14
pH	5.52 $\pm$ 0.11
Reducing sugars (%)	52.41 $\pm$ 0.12
Total sugars (%)	68.57 $\pm$ 0.01
Total phenols (mg/ 100 g)	31.54 $\pm$ 0.03
Antioxidant activity (%)	48.33 $\pm$ 0.15
Crude fibre (%)	0.68 $\pm$ 0.04
Total ash (%)	0.96 $\pm$ 0.05

Values are means of 10 observations; SD= Standard deviation

CONCLUSION

A ginger-apple pulp combination of 50:50 with Recipe 3 was standardized for the preparation of ginger-apple Peda in terms of all the sensory characteristics with substantial amount of nutritional characteristics. Thus the commercial adoption of this technology seems to be a profitable proposition for efficient storage and utilization of fresh ginger rhizome thereby augmenting the income of growers with minimum losses.

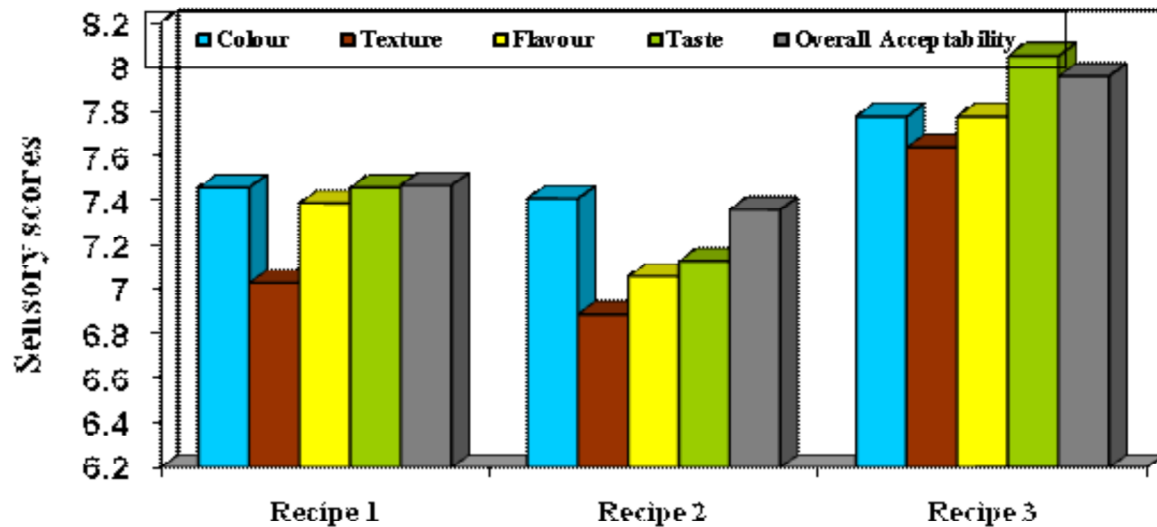


Fig 1. Sensory scores of different recipes for the preparation of ginger-apple Peda

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