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Standardization of Peel Shape and Sugar Levels in Steeping Solution on the Physico-chemical and Sensory Attributes of Acid Lime (*Citrus aurantifolia* Swingle) Peel Candy

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ABSTRACT: Acid lime peel is a byproduct of processing industry, can serve as a valuable raw material in this study, offering the dual benefits of waste reduction and enhanced value for acid lime fruits. With this background, acid lime peel candy was prepared under nine different treatments comprising the different initial steeping sugar concentrations (40, 50 and 60 °B) with varied shape of the peel (Halves, Quarters and Long slices) and addition of the citric acid (1 %) for all the treatments. At the end all the treatments stabilized at 70 °B sugar concentrations. The peel candy samples were tested for the physical, bio-chemical changes and sensory evaluation on the 9-point hedonic scale. The treatment T_7 (Long slices + blanching for 5 minutes + steeping in 40 °B syrup + 1 % citric acid) proved superior in terms of candy recovery, solid gain, acceptable textural properties, instrumental colour values with better bio-chemical properties and organoleptic score in terms of colour, taste, texture and flavour of candied lime peel.

Keywords: Acid lime peel, *Citrus aurantifolia*, Peel candy, sugar syrup, Kagzi lime.

INTRODUCTION

Fruits hold a paramount status in human nutrition, offering essential nutrients crucial for maintaining health. Abundant in carbohydrates, minerals, vitamins, and dietary fibers, they form a vital component of our daily dietary intake. Moreover, they add flavour and diversity to diet. Kagzi lime, known as 'Neebu or Nimbu' in Hindi and 'limbe hannu' in Kannada. It is a citrus fruit belonging to the Rutaceae family. Its botanical name is *Citrus aurantifolia* Swingle (Mishra *et al*., 2021). This acid lime variety holds significant importance as a source of vitamin C and pleasant flavour. In India, lime cultivation in an area of 316 (000 Ha), yielding an annual production of 3628 (000 MT) metric tonnes (MT) with a productivity of 11.48 MT/Ha (Anon, 2021).

Karnataka ranks 5th in production of acid lime with 2.83 lakh tonnes accounting to 12,150 Ha area (JADHAV *et al*., 2020). The prominent growth of commercial Kagzi lime farming is predominantly observed in the arid Western and Northern districts of Vijayapura, Bagalkot, Kalaburgi, Raichur, Bellary and Bidar in Karnataka but most of the time farmers get less price due to glut in market.

Lime fruits were generally utilized for preparation zesty and tangy juice, as well as pickle (Kuna *et al*., 2018). Of the vast amount of citrus production, only one-third is processed. Those consist of peels (albedo and flavedo), which are almost one-fourth of the whole fruit mass, seeds and fruit pulp, remaining after juice and essential oil extraction (Haque *et al*., 2015). Fruit peels, often regarded as waste, are actually more nutritious than the juice and can be transformed into candies with simple processing methods (Kaur and Singh 2021). This approach doesn't require complex equipment or technology, making it a feasible option for the citrus processing industry to produce candied peels that have a readily available market in the confectionery sector.

Candy is a delightful confection prepared from fruits or vegetables and are infused with a sugary syrup, followed by drained out excess syrup finally, the product is dried to achieve a state suitable for long-term storage (Dar *et al*., 2011). Various fruits and vegetables, such as apples, ginger, mangoes, guava, carrots, and citrus peels, have been used in the preparation of candy. Candy making is a fairly simple process. In traditional candy production, a mixture of sugar, water and possibly corn syrup are mixed and boiled until sufficient water has been boiled out of the candy mass (Shruthi *et al.*, 2020). With this view, the study was undertaken to develop consumer-friendly candies from peels of *Citrus aurantifolia*, fruits to standardize different shapes and levels of initial steeping of sugar for product development of peel candy.

MATERIALS AND METHODS

Raw materials. Fresh acid lime fruits *cv*. Kagzi were collected from HREC Tidagundi. The albedo parts of fruit are removed by using fruit peeler then extract the juice. After extraction flavedo and juicy segments are selected for preparation of candy. These segments are washed thoroughly under running tap water. Remaining yellow part that was attached to the upper surface was removed manually. Then the peels were cut in the desired shape (Halves, Quarters and long slices).

Pre-treatment. After cutting the peels (flavedo) were blanched for 10 minutes at 95°C temperature. Blanching was done twice since the *C. aurantifolia* peels were bitter, the blanched peels were washed with freshwater.

Preparation of Candy. Sugar syrup prepared with concentration of 40, 50, 60°B by adding required quantity of sugar and strength of sugar syrup was measured using hand refractometer. Lime peels were steeped in prepared specific sugar syrup and required quantity of citric acid added to the steeping solution. The pieces were left overnight in syrup. After 24 hours, syrup was drained out; TSS and weight of syrup were recorded. The TSS of drained out syrup was raised 10˚B by adding table sugar and then pieces were again kept in syrup for overnight. The process was repeated till the TSS of syrup stabilized to 70 ˚B for all the treatments. Then pieces were rinsed in warm water for 30 seconds and dried in solar tunnel drier. After dehydration, samples of lime peel candy were packed in the polyethylene bag which was sealed air tight and used for further observations (Rajeshbhai *et al.*, 2018). The same process was carried out with three repetitions as per experimental design (CRD).

Experimental details

Treatments: 9

Replication: 3

Design: CRD

Treatments

T_1 – Halves + Steeping in 40 °B syrup

T_2 – Halves + Steeping in 50 °B syrup

T_3 – Halves + Steeping in 60 °B syrup

T_4 – Quarters+ Steeping in 40 °B syrup

T_5 – Quarters+ Steeping in 50 °B syrup

T_6 – Quarters+ Steeping in 60 °B syrup

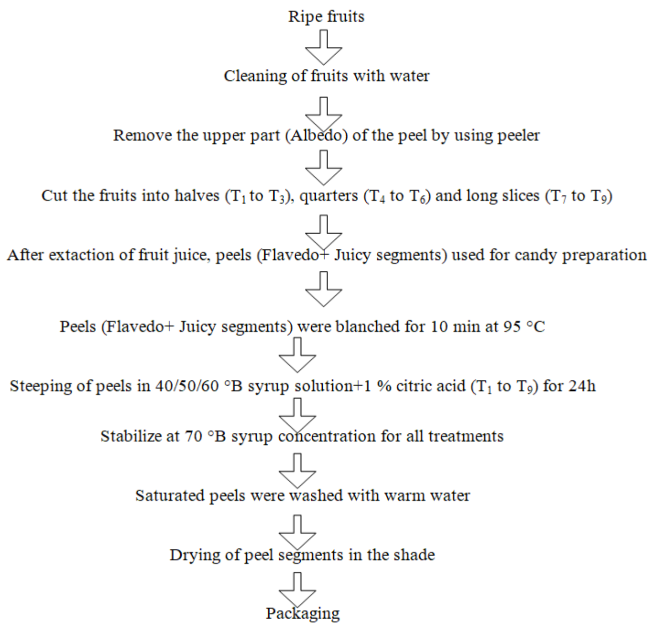
T_7 – Long slices + steeping in 40 °B syrup

T_8 – Long slices + steeping in 50 °B syrup

T_9 – Long slices + steeping in 60 °B syrup

Constants for all treatments: Blanching for 10 minutes at 95 °C + 1 per cent citric acid

Flow chart for preparation:



Observations recorded:

Physical parameters

Candy recovery (%). The weight of raw material before drying and the weight at the end of drying from each treatment were noted (Bharathkumar, 2018) and recovery was calculated in percentage using the formula:

$$\text{Dried recovery (\%)} = \frac{W_2}{W_1} \times 100$$

Where,

W_2: Weight of dried lime peel candy

W_1: Weight of fresh lime fruit peel

Moisture content (%). The moisture content of lime peel candy was estimated using the Radwag moisture analyzer (Model: MAC 50, Make Poland). One gram of dried candy was placed in the sample dish. The moisture analyzer indicated the end point of measurement by a beep sound giving constant value for moisture.

Water activity (a_w). Water activity of candy was measured using water activity meter. Candy was cut into small pieces and then placed in the sample chamber of water activity meter. After it got stabilized, the observation was directly read in the instrument and recorded.

Solid gain (%)

The solid gain after steeping in the sugar solution was calculated using the equation (Zapata *et al.*, 2011)

$$\text{Solid gain (SG) \%} = \frac{\text{Brix}_f - \text{Brix}_i}{\text{Brix}_i} \times 100$$

Where: Brix_f represents final Brix degrees (after dehydration) and Brix_i represents initial Brix degrees before treatment.

Instrumental colour value (*L, *a** and *b**).** The color of the samples was assessed using a Colour Flex EZ colorimeter (Model: CFEZ 1919) equipped with a 45 mm diameter aperture. The instrument was calibrated using two reference color tiles: a black tile and a white tile provided for calibration purposes. The color characteristics of the samples were expressed in terms of *L** (representing lightness/darkness), *a** (indicating redness/greenness) and *b** (reflecting yellowness/blueness) (Urooj, 2021).

Texture (N). Texture of the dried samples was determined with TAXT plus texture analyser (Make: Stable Micro System, Model: Texture Export Version 1.22). The force with which the sample gets cut was recorded in the graph and the peak force value in the graph was taken as the texture value in terms of Newton force (N) (Urooj, 2021). The following instrument settings were used for texture measurement:

Type of probe used	: Blade set
Test option	: Return to start
Test speed	: 5.0 mm/s
Post-test speed	: 10.0 mm/s
Distance	: 25 mm
Load cell	: 5 kg

Bio-chemical parameters

Total soluble solids (°B) and pH. Total soluble solids in lime peel candy were measured using hand refractometer (Ranganna, 1997). pH of the candy was measured by using pH meter (Muzzaffar *et al*., 2016).

Titratable acidity (%). The titratable acidity of lime peel candy was calculated by the titration method. A known quantity of sample (5 g) was taken and titrated against standard 0.1N NaOH using phenolphthalein as an indicator. The endpoint of titration was determined by appearance of pink colour. The value was expressed in terms of citric acid as per cent titratable acidity (Srivastava and Sanjeevkumar 1998).

$$\text{Titratable acidity (\%)} = \frac{\text{Titre value} \times \text{N of NaOH} \times \text{Vol. made up} \times \text{Eq. weight of citric acid}}{\text{Vol. of aliquot} \times \text{Wt. of sample taken} \times 1000} \times 100$$

Ascorbic acid (mg/100 g). Ascorbic acid content analyzed by titrimetric method using 2, 6-dichlorophenol indophenols dye as per modified procedure of AOAC (Anon, 1984). Five gram candy was taken grind with oxalic acid and diluted to known volume by using four per cent oxalic acid. 5 ml aliquot was titrated against 2, 6- dichlorophenol indophenol. The result was expressed as mg of ascorbic acid per 100 g of candy.

$$\text{Ascorbic acid (mg/100 g)} = \frac{0.5\ \text{mg}}{V_1} \times \frac{V_2}{5\ \text{ml}} \times \frac{\text{Total sample (ml)}}{\text{Wt. of the sample}}$$

Where V_1- Titre value for standard

V_2- Titre value for sample

Sensory evaluation (9 -point hedonic scale)

Sensory evaluation of candy was carried out by a semi-trained panel consisting of teachers and Post-Graduate students of Department of Post Harvest Management, College of Horticulture, Bagalkot with the help of nine point hedonic scale (1 -dislike extremely, 2-like only slightly, 3 - dislike moderately, 4 - dislike slightly, 5 - neither like nor dislike, 6-like slightly, 7 like moderately, 8- like very much and 9- like extremely). Sensory parameters considered in the evaluation included colour and appearance, texture, taste, flavour and overall acceptability (Swaminathan, 1974).

Statistical analysis. The data in respect of all the above parameters were tabulated and subjected to the statistical analysis using WASP software for Completely Randomized Design with critical difference (CD at 1%) was worked out.

RESULT AND DISCUSSION

Physical properties of candied lime peel

Candy recovery (%). The highest candy recovery percentage was observed in T_7 at 93.68 per cent, while the lowest recovery percentage was documented in T_3 at 84.21 per cent (Table 1). This discrepancy in recovery percentages among longitudinally sliced candies can be attributed to the diffusion of the sugar solution into the intercellular spaces. This diffusion is driven by the density difference between the steeped sugar solution and the entrapped air within the intercellular spaces, Furthermore, the enhanced recovery percentage in longitudinally sliced candies linked to increased surface area and prolonged immersion time. These factors contribute to a more substantial absorption of sugar or solutes from the steeping solution compared to other treatments as previously discussed by Mavroudis *et al*. (1998); Khan and Vincent (1990).

Solid gain (%). The treatment T_7 reported highest solid gain (37.42 per cent). Longitudinal lime peel pieces have more surface area leads to reduced resistance to sugar uptake when steeped in a sugar solution. As the surface area available for sugar absorption increases, solid gain also increased proportionally from 33.75 to 37.42 per cent (Table 1). Solid gain was found to be significantly lower in halves, particularly in T_3 (33.75 %), where the tissue was minimally disturbed, and the surface area exposure was limited. Similar results found by Khan and Vincent (1990).

Texture (N). Texture is a one of the fundamental property associated with the rheological and structural qualities of the food. During the osmotic dehydration process, the food, particularly fruits, begin to losing water and enhance the uptake of solids (sugar), which contributed to the modification of textural characteristics and changed the appearance of the final product. In this study, candy that required minimum pressure to penetrate the probe is preferable and it is indicative of palatable soft texture. The data related to texture (N) of lime peel candy showed maximal value in T_7 (22.11 N) and minimum value in T_6 (21.07 N). The textural values in this study are very narrow *i.e.* in between 21.07 to 22.11N (Table 1). Therefore, all the prepared lime peels candy is desirable from the consumer point of view (Prinzivalli *et al*., 2006).

Instrumental colour values (*L, *a** and *b**).** Long slices T_7, T_8 and T_9 showed highest ***L**** value (47.86, 47.94 and 48.05 respectively) and these are at par with each other and minimum value was recorded in T_1 (44.05). These values indicate that long slices of lime peel candy was lighter in colour compared to other treatments indicating lesser degradation in colour because of the faster drying rate (Sagar and Kumar, 2010).

Halves (1.23) showed maximum *a** value particularly in treatment T_3 (1.23), which was followed by T_2 (1.11) and minimum *a** value was recorded in long slices *i.e.* T_7 and T_8 (0.23). This may be due to the increased time taken by the halve fruit peel candy for drying which results in more browning.

Highest yellowness value observed in the treatment T_9 (14.12) followed by T_8 (13.92), T_7 (13.25). While, least yellowness value 11.34 reported by the treatment T_1 (Table 1). Reduction in *b** value indicates browning of the product due to non-enzymatic browning reaction during drying process.

Bio-chemical properties of candied lime peel

Total soluble solids (°B). Long slices with longer duration of exposing peel in osmotic solution (T_7) reported the highest TSS (15.07 °B) compared to other treatments. It is because of the increased surface area available in the long slices for the absorption of sugar which in turn improved the solid gain/ solute uptake proportionately compared to halves and quarters where the surface area availability for sugar absorption is less (Nieuwenhuijzen *et al*., 2001). Statistically minimum TSS (14.74°B) obtained in the treatment T_3 (Table 2). This might be because of less surface area and less exposure to osmotic solution.

Titratable acidity (%). Minimum acidity was noticed in T_7 (0.58 %) and highest observed in T_1 (0.72 %) which was on par with T_3 (0.71 %). The proportion of sugar was more in the steeping solution than the added acidity in it. The difference in the absorption of different elements by the tissues could be the reason for higher TSS than the titratable acidity in T_7 followed by T_8 and T_9 (Table 2). The reduced absorption of sugar by T_3 may probably be the reason for the observed higher apparent acidity. Bharathkumar (2018) in his studies on dehydrated fig has attributed it to the increased sugar absorption by quarters as the greater surface of the fruit is exposed to osmotic solution compared to halves and wholes.

pH. The significantly lowest pH was observed in T_7 (2.85). The variation in the absorption of different elements by the fruit tissues could explain the higher total soluble solids (TSS) content compared to titratable acidity, resulting in the highest pH in T_7, followed by T_8 **(**Table 2). Conversely, the reduced absorption of sugar in T_3 may be the reason for the observed higher apparent acidity, which in turn leads to a lower pH (2.75) (Bharathkumar, 2018).

Ascorbic acid (mg/100 g). The ascorbic acid loss mainly depended on the leakage of ascorbic acid in osmotic solution, but at high temperature it mainly depended on the oxidation of ascorbic acid. In current there is no significant difference among the treatments. Higher the surface area and infusion duration leads maximum leaching of the ascorbic acid from the candied lime. Therefore, T_7 had maximum loss of ascorbic acid (16.66 mg/100 g) while, minimum loss of ascorbic acid obtained in treatment T_3 because of exposure time to osmotic solution is short and surface area also less. This result is in similarity with osmotic dehydration of pineapple candy studied by Bhattacherjee *et al*. (2013).

Water activity. Maximum water activity (0.54) noticed in treatments T_1, T_2, T_3 and T_9, where as lowest was recorded in treatment T_7 (0.51). This is due to the presence of lower moisture (Low free water) content in long slices particularly T_7 (21.73 %). However, water activity of the all treated samples in this study falls under the acceptable safe range (< 0.60). This range of reduced water activity helps in inhibiting the spoilage of low moisture foods by microorganisms (Troller and Cristiana, 1978) by reducing the availability of free moisture required for microbial growth.

Moisture content (%). The statistically highest moisture content (22.33 %) was found in treatments T_1 and least moisture content recorded by the treatments T_7 (21.73 %) related data depicted in Table 2. In current study tried to maintain the moisture content nearly 20 per cent this is more acceptable for the consumer point of view. As the long slices are attributed to have larger surface area, the extent of reduction in moisture content will be higher in long slices compared to halves lime fruits peel and quarters. Similar trend was observed by Adom *et al.* (1997) on okra solar drying, Kordylas (1990) and on drying of some vegetables.

Sensory evaluation

Colour and appearance. Colour and appearance of the food product influence the consumer by making it eye catching and is influence the market price. Long slice T_7 showed the highest colour and appearance value (9.00) because of less browning and short term of drying (Table 3). Therefore, it maintains the visual quality of the candied lime peel. Less score for candied lime peel recorded T_2 (7.93). This might be due to longer duration of drying leads to reduce in the visual appeal. Similar findings observed by Patankar *et al*. (2017) in pumpkin candy.

Texture. Texture is an important quality factor that influences the consumer's acceptance of food (Table 3). Within different shapes maximal score was recorded in T_7 (7.50) and the least was noted in T_3 (6.83). This is because of the presence of optimum moisture content and acceptable texture value in long slices (Albarracin *et al*., 2011).

Flavour. The treatment with the significantly highest flavor score was T_1, receiving a score of 9.00 (Table 3). It was parity with treatments T_4 (8.90) and T_7 (8.97) with relatively good flavor scores. On the other hand, the treatment with the lowest flavor scores was T_9 (8.00). Since flavor is a composite of taste, aroma, and texture, the higher texture scores obtained for treatments T_7 and T_4 provide complementation for the higher flavor scores (Janagale, 2016).

Taste. Higher average score for taste was noticed in T_7 (7.81) followed by T_8 (7.71) (Table 3). Panel members gave maximum score for T_7 because of the presence of proper sugar acid blend in the sample. Similar result was recorded by Janagale (2016) in his studies on aonla preserve. The combination of sugar, acid resulted in good blending of taste which was highly acceptable by the panel members. In this study T_7 raises TSS from 40 to 70 °B so it infused in 3 days in osmotic solution. Therefore, it absorb more sugar content, hence it result the better taste compare to other treatments. Similar result was recorded by Janagale (2016) in his studies on aonla preserve.

Overall acceptability. The treatment T_7 (8.32) recorded noticeablly higher value for overall acceptability which was followed, by T_4 (8.08) whereas lower score was observed in T_3 (7.57) followed by T_6 (7.72) (Table 3). Lime peel is very bitter in nature so the sensory score for all the treatment is comparatively less as compare to the other fruit candy. Long slices which were raised the TSS content from 40 to 70 °B reduces the bitter content of peel. Therefore, most of the panelists felt T_7 is better for overall acceptability. Janagale (2016) in aonla preserve and Patel *et al*. (2014) in aonla murabba studies were correlated to this study. This study was similar to the studies conducted by Mohanta *et al*. (2021) in preparation of candy from orange (*Citrus sinensis*) peel.

Table 1: Effect of different treatments on physical parameters and instrumental colour (*L, *a** and *b**) of candied lime peel.**

Treatments	Candy recovery (%)	Solid gain (%)	Texture (N)	Instrumental colour		
				*L**	*a**	*b**
T_1	86.08^{bcd}	34.88^{cd}	21.54^{c}	44.05^{d}	0.75^{c}	11.34^{g}
T_2	85.21^{cd}	33.75^{e}	21.28^{de}	45.53^{c}	1.11^{b}	11.38^{g}
T_3	84.21^{d}	34.42^{de}	21.13^{ef}	45.74^{c}	1.23^{a}	11.81^{f}
T_4	87.54^{bc}	35.43^{c}	21.45^{cd}	44.17^{d}	0.54^{d}	11.88^{f}
T_5	86.04^{bcd}	34.36^{de}	21.27^{def}	45.62^{c}	0.58^{d}	12.26^{e}
T_6	85.79^{bcd}	34.25^{de}	21.07^{f}	46.17^{b}	0.69^{c}	12.69^{d}
T_7	93.68^{a}	37.42^{a}	22.11^{a}	47.86^{a}	0.23^{f}	13.25^{c}
T_8	88.34^{b}	36.42^{b}	21.85^{b}	47.94^{a}	0.23^{f}	13.92^{b}
T_9	86.63^{bcd}	35.51^{c}	21.82^{b}	48.05^{a}	0.35^{e}	14.12^{a}
Mean	87.06	35.16	**21.50**	46.12	**0.63**	**12.52**
S. Em±	0.67	0.19	0.05	0.10	0.02	0.02
CD at1%	2.74	0.76	0.19	0.40	4.22	0.09

Similar alphabets within the column represent non-significant differences at ($p<0.01$).
Treatments
T_1 – Halves + Steeping in 40 °B syrup; T_2 – Halves + Steeping in 50 °B syrup; T_3 – Halves + Steeping in 60 °B syrup; T_4 – Quarters + Steeping in 40 °B syrup; T_5 – Quarters + Steeping in 50 °B syrup; T_6 – Quarters+ Steeping in 60 °B syrup; T_7 – Long slices + steeping in 40 °B syrup; T_8 – Long slices + steeping in 50 °B syrup; T_9 – Long slices + steeping in 60 °B syrup
Constants for all treatments: Blanching for 10 minutes at 95 °C + 1 per cent citric acid

Table 2: Effect of different treatments on bio-chemical properties of candied lime peel.

Treatments	TSS	Titratable acidity (%)	pH	Ascorbic acid (mg/100 g)	Water activity (a_w)	Moisture content (%)
T_1	14.94^{abc}	0.72^{a}	2.64^{c}	16.91	0.54^{a}	22.33^{a}
T_2	14.82^{bc}	0.70^{ab}	2.71^{bc}	16.92	0.54^{ab}	22.30^{a}
T_3	14.74^{c}	0.71^{a}	2.75^{abc}	16.95	0.54^{ab}	22.33^{a}
T_4	15.00^{ab}	0.69^{abc}	2.76^{abc}	16.76	0.52^{b}	22.02^{c}
T_5	14.88^{abc}	0.70^{ab}	2.76^{abc}	16.78	0.53^{ab}	21.98^{c}
T_6	14.86^{abc}	0.68^{abcd}	2.74^{abc}	16.83	0.53^{ab}	22.17^{b}
T_7	15.07^{a}	0.58^{d}	2.85^{a}	16.66	0.51^{c}	21.73^{e}
T_8	15.0^{1ab}	0.59^{cd}	2.72^{bc}	16.75	0.52^{ab}	21.86^{d}
T_9	14.94^{abc}	0.60^{bcd}	2.74^{abc}	16.76	0.54^{ab}	21.83^{d}
Mean	14.92	0.66	2.75	16.81	0.53	22.06
S. Em±	0.05	0.03	0.03	0.05	0.00	0.02
CD at 1%	0.19	0.10	0.11	NS	0.01	0.08

Similar alphabets within the column represent non-significant differences at ($p<0.01$).
Treatments
T_1 – Halves + Steeping in 40 ° B syrup; T_2 – Halves + Steeping in 50 °B syrup; T_3 – Halves + Steeping in 60 °B syrup; T_4 – Quarters+ Steeping in 40 °B syrup; T_5 – Quarters + Steeping in 50 °B syrup; T_6 – Quarters + Steeping in 60 °B syrup
T_7 – Long slices + steeping in 40 °B syrup
T_8 – Long slices + steeping in 50 °B syrup
T_9 – Long slices + steeping in 60 °B syrup
Constants for all treatments: Blanching for 10 minutes at 95 °C + 1 per cent citric acid

Table 3: Effect of different treatments on sensory evaluation of candied lime peel (9 point hedonic scale).

Treatments	Colour/Appearance	Texture	Flavour	Taste	Overall acceptability
T_1	8.33[c]	7.04[c]	9.00[a]	7.49[d]	7.96[c]
T_2	7.93[d]	6.90[de]	8.87[b]	7.25[e]	7.73[e]
T_3	8.00[d]	6.83[e]	8.29[d]	7.16[f]	7.57[f]
T_4	8.52[bc]	7.30[b]	8.90[ab]	7.60[c]	8.08[b]
T_5	8.44[c]	6.99[cd]	8.48[c]	7.66[bc]	7.85[d]
T_6	8.00[d]	6.97[cd]	8.28[d]	7.21[ef]	7.72[e]
T_7	9.00[a]	7.50[a]	8.97[ab]	7.81[a]	8.32[a]
T_8	8.90[d]	7.08[c]	8.27[d]	7.71[b]	7.99[c]
T_9	8.65[b]	7.01[cd]	8.00[e]	7.47[d]	7.78[e]
Mean	**8.42**	**7.07**	**8.56**	**7.49**	**7.88**
S. Em±	0.05	0.03	0.03	0.02	0.02
CD at 1%	0.20	0.20	0.11	0.07	0.06

Similar alphabets within the column represent non-significant differences at ($p<0.01$).

Treatments

T_1 – Halves + Steeping in 40 °B syrup; T_2 – Halves + Steeping in 50 °B syrup; T_3 – Halves + Steeping in 60 °B syrup; T_4 – Quarters + Steeping in 40 °B syrup; T_5 – Quarters+ Steeping in 50 °B syrup; T_6 – Quarters+ Steeping in 60 °B syrup; T_7 – Long slices + steeping in 40 °B syrup; T_8 – Long slices + steeping in 50 °B syrup; T_9 – Long slices + steeping in 60 °B syrup

Constants for all treatments: Blanching for 10 minutes at 95 °C + 1 per cent citric acid

CONCLUSIONS

It was concluded from the present investigation that the citrus peels considered to be the waste from the processing industries can also be efficiently used by converting them into commercially utilized by-products. High sugar concentration imparted good colour, flavour, and texture to *C. aurantifolia* peel candy. The treatment T_7 (long slices) proved superior in terms of recovery, solid gain, acceptable texture, instrumental colour values with better bio-chemical properties and overall acceptability scores in terms of colour, taste, texture and flavour of candied lime peel.

FUTURE WORK

— Based on the current investigation following suggestions have been put forth for future line of work:

— Storage study can be conducted with the promising treatments of the present study to know its storage stability

Effect of other steeping solutions like honey and fructose may be experimented for the preparation of acid lime peel candy

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Conflict of Interest. None.

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