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ORIGINAL ARTICLE

Evaluation of Physicochemical properties, Nutritional properties and Functional attributes of Selected Mango Cultivars; with Special Reference to Hambantota district, Sri Lanka.

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Abstract

The mango (*Mangifera indica* L.), one of the leading tropical fruits, is well-known for its exquisite flavour and profound nutritional profile. More than 20 different mango cultivars can be found in Sri Lanka. However, detailed studies on comparison of their comprehensive properties are limited. Thus, five different mango cultivars namely Tom JC (TJC), Willard, *Vellaikolumban*, *Karthakolomban* and *Neelam* that are commonly grown in Hambantota district, Sri Lanka were recognized for their physicochemical, nutritional and functional properties. Amongst all the tested cultivars, the significant ($p < 0.05$) highest weight (328.63±34.13 g) and thickness (7.91±1.08 cm) were recorded by TJC, while *Karthakolomban* showed significantly highest fruit length (12.56±0.29 cm), pH value (6.74±0.15) and total soluble solids (25.36±0.05 ˚Bx). The cultivar Willard recorded the highest fruit width (7.32±0.12 cm) and the highest sugar content (22.34±0.03 g/100 g), and *Neelam* obtained the highest titratable acidity (0.28±0.03 g/100 mL) and ascorbic acid content (24.73±1.22 mg/100 g). *Karthakolomban* obtained the highest moisture content (84.43±0.97%) and the highest fibre content (2.06±0.50%). The highest protein content (1.84±0.12%) was observed in both *Karthakolomban* and Willard. The highest fat content (0.63±0.04%) was observed the cultivar Willard. Considering the functional properties, the cultivar Willard recorded the highest flavonoid (107.43±31.37 mg QE/100 g) and phenolic contents (32.09±1.49 mg GAE/100 g), while TJC recorded the highest antioxidant content (272.06±0.00 mmol TE/g). It can be concluded that the most nutritious mango cultivars are *Karthakolomban* and Willard, and the findings show that these mangoes are a rich source of nutrients, and this may assist consumers, food processors and nutritionists for future research and developments.

Keywords: *functional properties, mango varieties, nutrient analysis, physicochemical properties*

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1. Introduction

Mango (*Mangifera indica* L.), one of the leading tropical fruits, is well-known for both its rich nutritional profile and delicious flavour. The genus Mangifera belongs to the Anacardiaceae family, native to South Asia and has been cultivated for thousands of years (Bini et al., 2024). With its numerous agro-climatic zones, Sri Lanka is home to a large number of mango cultivars. Since each cultivar demonstrates distinct physicochemical, nutritional, and functional characteristics, they have become valuable assets to the nation's agriculture sector and export industry.

There are reportedly more than 20 different mango cultivars growing in the nation. Some popular mango cultivars include Tom JC, *Neelam, Seeni Amba, Kohu Amba*, Willard*, Gira Amba, Vellaikolumban* and *Karthakolomban*, each of which has its own flavour profile and physical traits. The nation's tropical environment supports year-round cultivation, enabling multiple harvests per year. This variation strengthens the nation's reputation for producing mango fruits with unique flavours, shapes, and sizes.

Mango fruits have rich nutritional profile including higher amounts of carbohydrates, natural sugars and dietary fibre. They are also rich in vitamins such as ascorbic acid and retinol, which are strong antioxidants essential for immune support, maintaining skin health, and preventing cells from oxidative damage. It also supports heart health and general wellbeing, because, mangoes include potassium (168–176 mg) and α-tocopherol (vitamin E) (1.3 mg, 5-6% of the Daily Value) (Lebeka et al., 2021). They are advantageous for weight management as their dietary fibre assists digestion, prevents constipation, and encourages a feeling of fullness. The high beta-carotene content is crucial for keeping healthy eyes and vision since it is converted to retinol. Mangoes also contain phytochemicals and antioxidants, which may help prevent cancer and offering an array of health benefits. Overall, mangoes are a delectable and nutrient-rich addition to a healthy diet, offer a wide range of health benefits (Wall-Medrano et al., 2020).

This research aimed to analyse and compare physicochemical, functional and nutritional characteristics of selected mango cultivars (Tom JC, Willard, *Vellaikolumban*, *Karthakolomban*, and *Neelam*) in Sri Lanka with special reference to Hambantota District. Despite the economic significance of mango cultivation in Sri Lanka, there exists a knowledge gap regarding the comprehensive characterization of these mango cultivars. Limited research has been conducted to systematically analyse their comprehensive properties. Kothalawala and Jayasinghe (2017) discussed only about the chemical and nutritional characteristics of Willard, *Karthakolomban, Malwana, Betti Amba* and *Gira Amba.* KrishnaPillai, and Wijeratne (2016) have examined and evaluated morphological variance and fruit quality of 18 mango cultivars in Northern Province, Sri Lanka. Hence findings of this research will be helpful for studying all of these physical, chemical, functional and nutritional characteristics within one study. In addition, expecting to contribute significantly to the knowledge base of mango cultivars and the identification of mango cultivars with enhanced nutritional and functional attributes could foster innovative product development and promote the consumption of locally grown mangoes for improved public health.

2. Materials and Methods

During the current study, five different mango cultivars namely *TOM JC, Karthakolomban, Vellaikolumban, Neelam* and Willard that are commonly grown in Southern province, Sri Lanka were selected. All the samples for chemical analysis were taken at the fifth stage of maturity, corresponding to the colour break where most cultivars exhibited a change from green to yellow/red on more than half of the peel surface, while *Vellaikolumban* and *Neelam* remained dark green at this stage (Tavassoli-Kafrani *et al*., 2022). Three replicates were conducted for each analysis. In each replicate, nine mangoes were used, and the average value of each parameter was taken as the final value.

2.1 Sample preparation

Fresh mango samples, without diseases and insect bites were taken and washed with deionized water to remove dirt. After eliminating surplus dripping water from the surface by blotting paper, the mangoes were cut into small pieces, and then homogenized separately. For each different analysis, an accurate quantity was weighed.

In order to determine the functional properties, one gram of each mango pulp was mixed with 10 mL of methanol and the mixture was vortexed and centrifuged at 5000 rpm for 20 minutes, the supernatant was taken. This procedure was repeated for three times and the resultant supernatant was pooled and taken for further analysis.

2.1.2 Fruit characteristics of selected mango cultivars

The mango cultivars used in this study were visually inspected and photographed (Fig. 1).

a. Tom JC *b. Vellaikolumban* *c. Karthakolomban* *d.* Willard *e. Neelam*

Figure 1: Fruit characteristics of selected mango cultivars

2.2. Determination of physicochemical properties

2.2.1. Weight of the fresh fruit

The fresh fruit weight was accurately measured using analytical balance.

2.2.2. Fruit width and thickness

Fruit width and thickness were determined by using Vernier calliper at the widest midpoint, distal and proximal end of each individual drupe (Anyasi, Jideani, and Mchau, 2015). The length of the mango drupes was determined by measuring individual fruits with a tape from the distal end to the point at the proximal end of the fruit. Determination involved measuring the outer and inner curve of the individual fruits with a tape from the distal end of the fruit to the point at the proximal end (Anyasi, Jideani, and Mchau, 2015).

2.2.3. Fruit firmness

Firmness was determined by using digital push pull gauge (SH-500B, China), and the firmness of each fruit was measured at the proximal, distal and mid points of each mango fruit (Harker, Maindonald, and Jackson, 1996).

Mango pulp was taken and placed on porcelain tile and the colour was measured immediately using a colorimeter (BCM -200, China) as described by Wainwright and Hughes (1990) with some modifications.

2.2.4. pH value

In order to determine the pH of the Mangoes, the flesh of each mango variety was blended separately and ten grams of each pulp was homogenized with 40 mL of distilled water. The pH of the pulp was determined by inserting the electrode of a pH meter (AD 132, Romania) to the diluted pulp (Anyasi, Jideani, and Mchau, 2015).

2.2.5. Total soluble solids (TSS)

The total soluble solid (TSS) content of each mango variety was determined as described by Ali *et al*. (2018). Ten grams of mango pulp was mixed with 40 mL of distilled water, and the TSS values were determined using a digital refractometer (PAL-17S, China).

2.2.6. Titratable acidity (TA)

The methods given by Products, (2012) and Anyasi, Jideani, and Mchau (2015) were used to measure the titratable acidity (TA) of the mango samples with some modifications. Ten millilitres of the diluted pulp of each cultivar prepared as described in determination of the pH was used in determination of the titratable acidity. Each pulp was titrated against 0.8N NaOH in the presence of phenolphthalein as an indicator. The TA was indicated as a percentage that is equivalent to citric acid which is the predominant acid in mangoes.

2.2.6. Total sugar content

Total sugar content of each mango sample was determined using the phenol sulphuric method as described by Fernando *et al.* (2014) with some modifications. A known volume of (1.6 mL) the prepared mango pulp was mixed with 1.6 mL of 5% phenol solution, and 8 mL of concentrated sulphuric acid was added to the mixture. The solution was incubated in the dark for 30 minutes, and the readings were recorded at 490 nm using a UV–Vis spectrophotometer (HACH DR 3900, Germany).

2.3. Determination of nutritional properties of the selected mango varieties

2.3.1. Proximate analysis

Determination of moisture, crude fat, total crude protein, total fibre and total ash content were carried out according to the AOAC, (2000). The total carbohydrate content was determined by the following equation;

Total Carbohydrate (%) =100 – {moisture (%) + ash (%) + fat (%) + protein (%)}

2.3.2. Ascorbic acid content

Ascorbic acid content in each mango sample was determined by the method given by Baker and Flatman (2007) with some modifications. Ten grams of mango pulp was mixed with 20 mL acetic acid solution (10 % v/v), then the juice was filtered and the filtrate was taken for the titration. The filtrate of each sample was titrated against the DI reagent until the light pink endpoint lasted for five seconds. The ascorbic acid content was calculated as mg of L-ascorbic acid in 100 g of the sample.

2.4. Determination of the functional properties of the selected mango varieties

2.4.1. Total flavonoid content

The total flavonoid content was determined by an alkaline reagent test as described by Chandra *et al.* (2014). One millilitre of the sample or the standard solution was added into a ten millilitres volumetric flask and mixed with four millilitres distilled water. Then, 0.3 mL of 5% $NaNO_2$ was added and the mixture was kept for five minutes under normal room temperature conditions. Next, 0.3 mL of 10% $AlCl_3$ was added to the mixture. At the sixth minute, 2 mL of NaOH was added to the above solution, and the solution was volume up by adding ten millilitres of distilled water. Then the mixture was vortexed properly and kept for 15 minutes at room temperature for incubation at a dark place. The absorbance of the sample was measured at 415 nm using a UV–Vis spectrophotometer, and the flavonoid content was expressed as milligrams of quercetin equivalents (QE) per 100 mL of the sample. Quercetin was used as the reference standard because it is a well-characterized flavonoid with a strong absorbance peak in the visible range (around 415 nm), which corresponds to the maximum absorbance of quercetin–aluminium complex. The calibration curve was prepared using quercetin in the range of 31.25–500 μg/mL, and sample concentrations were expressed accordingly (Chandra *et al.,* 2014).

2.4.2. Total phenolic content

The total phenolic content was estimated by Folin-Ciocalteu method following Chandra *et al.* (2014). Two millilitres of Folin-ciocalteu were added to the 400 μL of the sample. The solution was kept for two minutes and four millilitres of 7.5% w/v sodium carbonate solution was added. The solution was volume up to ten millilitres and the mixture was mixed well using the vortex. The resultant mixture was kept in a dark place for 120 minutes, and the absorbance was taken using a spectrophotometer at 765 nm wave length. Gallic acid was used as the standard and the total phenolic content was expressed as milligrams of GAE per 100 g of the sample.

2.4.3. Total antioxidant content

The total antioxidant content was estimated by DPPH assay method following Cuvelier and Berset (1995). Four hundred micro litres of the prepared sample or Trolox standard were taken and 4 mL of DPPH solution were added. The solution was kept in a dark place for 30 minutes. The spectrophotometric readings were taken at 415 nm wavelength. The result was calculated as the Trolox equivalent (TE) in mmol per gram using an equation created by linearly regressing.

2.5. Statistical analysis

All the readings were taken in triplicate and expressed as mean± SD. The data were statistically analysed by ANOVA-One-way and Tuckey's post-hoc multiple comparison tests (confidence level- 95 %) using SPSS (Statistical Package for Social Sciences version 22.00) to evaluate and compare the comprehensive properties of the selected mango varieties.

3. Results and Discussion

3.1. Physicochemical properties of the selected Mango varieties

The values obtained for the physicochemical properties such as weight, length and girth of the fruit, pulp colour, firmness, pH value, total soluble solids (TSS), titratable acidity (TA), and total sugar content of the flesh of the selected mango cultivars were are summarized in Table 1.

Table 1. Physicochemical properties of selected mango cultivars.

Characters		Tom JC	*Vellaikolumban*	*Karthakolomban*	Willard	*Neelam*
Weight of the fresh fruit (g)		328.63±34.13^{a}	192.66±19.16 ^{b}	250.51±22.12^{b}	190.8±14.29^{b}	173.92±23.5^{c}
Length (cm)		11.94±0.2^{a}	11.7±0.7^{a}	12.56±0.29^{a}	9.05±0.75^{b}	8.83±0.34^{b}
Width (cm)		7.15±0.65^{ab}	6.31±0.15^{b}	7.15±0.22^{ab}	7.32±0.12^{a}	7.28±0.21^{a}
Thickness (cm)		7.91±1.08^{a}	4.52±0.16^{b}	5.6±0.22^{b}	5.38±0.42^{b}	5.47±0.29^{b}
Colour	L*	29.14±0.07^{ab}	29.36±0.01^{ab}	34.52±0.11^{a}	28.4±0.03^{b}	29.36±0.2^{ab}
	a*	26.64±0.15^{a}	14.25±0.8^{b}	16.52±0.0^{b}	9.65±0.5^{c}	14.25±0.02^{b}
	b*	13.27±0.31^{bc}	15.3±1.66^{b}	17.31±0.9^{a}	9.4±0.77^{c}	15.3±0.63^{b}
	Yellowness index	64.98±1.32^{bc}	74.44±3.01^{a}	71.63±1.53^{b}	47.28±3.11^{c}	74.44±1.63^{a}
Firmness ($Kgcm^{-2}$)	Top	1.73±0.05^{b}	0.76±0.05^{c}	0.93±0.05^{c}	0.23±0.05^{d}	2.83±0.35^{a}
	Mid	2.9±0.7^{a}	0.87±0.12^{b}	1.06±0.12^{b}	1.3±0.00^{b}	2.26±0.06^{a}
	Bottom	1.73±0.05^{b}	0.76±0.05^{c}	0.93±0.05^{c}	0.23±0.05^{d}	2.8±0.2^{a}
pH		5.63± 0.09^{b}	4.76±0.01^{d}	6.74±0.15^{a}	5.35±0.01^{c}	4.82±0.01^{d}
TSS (°Bx)		25.5±0.1^{a}	14.23±0.05^{d}	25.36±0.05^{a}	15.9±0.05^{c}	18.06±0.06^{b}
Titratable Acidity (g/100 ml)		0.15±0.03^{b}	0.15±0.01^{b}	0.17±0.03^{b}	0.28±0.03^{a}	0.28±0.03^{a}
Sugar content (g/100 g)		14.95±0.09^{c}	13.21±0.03^{d}	17.02±0.03^{b}	22.34±0.03^{a}	9.33±0.24^{e}

The values are mean ± SD of three replicates. Means with different superscripts on the same row are statistically different ($p < 0.05$).

When considering the weight of mango, the highest value was obtained by Tom JC (328.63±34.13 g) followed by *Karthakolomban*, *Vellaikolumban*, Willard and *Neelam*. *Karthakolomban* obtained the longest fruit length (12.56±0.29 cm) followed by the other cultivars, Tom JC, *Vellaikolumban*, Willard and *Neelam*. The cultivar Willard recorded the highest average fruit width (7.23±0.12 cm) while *Vellaikolumban* displayed the lowest values. According to the results shown in Table 1, Tom JC obtained the maximum average fruit thickness (7.91±1.08 cm) while the *Vellaikolumban* showed the lowest values (4.52±0.16 cm). Differences in the physical properties of mango fruits are mostly due to the variation in cultivars. As reported by Amaral and Walsh (2023), studying the fruit size is very important in forecast of the harvest time as well as the fruit yield in the orchard. Moreover, studying fruit size is also important in designing the grading and sorting equipment in mango processing plants (Wasala, 2015).

The colour of the flesh of each cultivar was tested, and the obtained values were recorded as L*, a* and b* values (Table 1). L* value depicts the lightness of the fruit. The highest L value was received by *Karthakolomban* while the lowest L* value was obtained by Willard. However, compared to other four cultivars, when consider the ΔL values, the cultivar Tom JC was found to be having the darkest pulp colour while the cultivar Willard is having the lightest pulp colour. Moreover, the yellowness index was calculated by the L*, a*, b* values (Table 1), and the highest values were obtained by *Vellaikolumban* and *Neelam*.

The texture perception is an important aspect in evaluating the quality of fruits and vegetables and it is important in determining the acceptability of fresh fruits (Konopacka and Plocharski, 2004). Other than the colour and aroma, the firmness of a fruit is one of the most important quality characteristics when selecting fruits. Thus, the firmness of each mango drupe was recorded at the top, mid and bottom points (Table 1) and as per the results, the cultivar *Neelam* (2.83±0.35 Kgcm-2, 2.26±0.06 Kgcm-2, 2.8±0.2 Kgcm-2) showed the highest average firmness and the lowest firmness values were recorded by the variety Vellaikolumban (0.76±0.05 Kgcm-2,0.87±0.12 Kgcm-2,0.76±0.05 Kgcm-2). As stated by Singh et al., (2025) the texture of the flesh could be depending on the cultivar, growing practices and the ripening procedures.

The cultivar *Karthakolomban* displayed a significantly higher value of pH (6.74±0.15) than that of Tom JC, Willard, *Neelam* and *Vellaikolumban* in decreasing order ($p<0.05$). Cultivar differences, harvesting time, genetic factors and some cultural practices may have contributed to those differences (Léchaudel and Joas, 2007). As reported by Kothalawala and Jayasinghe (2016), the pH value of Willard and *Karthakolomban*, were 4.34±0.14 and 4.41±0.13 respectively, and the findings of the current study were in accordance with it.

The cultivars Tom JC and *Karthakolomban* obtained a significantly highest level of TSS values (25.5 ± 0.1˚Bx) while the cultivar *Vellaikolomban* gave the lowest brix value (14.23 ± 0.05 ˚Bx). As stated by Hossain et al., (2014), the TSS of mango fruits elevated gradually with the increase in the storage duration at ambient temperature. Moreover, according to the Kothalawala and Jayasinghe (2016), the TSS content of Willard and *Karthakolomban* were 20.17 ± 0.32˚Bx and 23.96 ± 1.24˚Bx respectively, and the results of the current study were also within the reported range.

When considering the titratable acidity, the cultivar *Neelam* and *Vellaikolumban* obtained the highest titratable acidity (0.28±0.03 g/100 mL) while the cultivar Tom JC and Willard obtained the lowest values (0.15±0.01 g/100 mL). According to Islam et al., (2013), acidity of mangoes is reduced during storage period due to maturity and ripening. However, as a general guideline, titratable acidity in mangoes typically falls within the range of 0.15% to 0.8% citric acid (Ogodo et al. 2018). But specific range of acidity may vary for different mango cultivars and stages of ripeness.

There is significant variation ($p < 0.05$) in total sugar contents among the different cultivars of mango (Table 1). The cultivar Willard gave a significantly higher level of sugar content (22.34±0.03 g/100 g) and *Neelam* gave the lowest value for the sugar content (9.33±0.24 g/100 g).

3.2. Nutritional properties of selected mango varieties

In order to determine the nutritional composition, the proximate composition of each mango cultivar was determined, and the obtained results were summarized in Table 2.

Table 2. Nutritional properties of selected mango varieties

Character	Tom JC	*Karthakolomban*	Willard	*Vellaikolumban*	*Neelam*
Moisture content (%)	$73.52±1.7^{bc}$	$84.43±0.97^{a}$	$73.06±3.52^{c}$	$80.66±3.52^{ab}$	$81.05±4.35^{ab}$
Ash (%)	$0.83±0.24^{a}$	$0.66±0.00^{a}$	$0.33±0.00^{a}$	$0.5±0.23^{a}$	$0.66±0.00^{a}$
Crude fat (%)	$0.39±0.01^{bc}$	$0.51±0.04^{ab}$	$0.63±0.04^{a}$	$0.51±0.09^{ab}$	$0.24±0.02^{c}$
Crude fibre (%)	$1.52±0.51^{a}$	$2.06±0.50^{a}$	$1.4±0.13^{a}$	$1.63±0.70^{a}$	$1.92±1.30^{a}$
Crude protein (%)	$1.48±0.37^{a}$	$1.84±0.12^{a}$	$1.84±0.12^{a}$	$1.75±0.00^{a}$	$1.31±0.12^{a}$
Total carbohydrate (%)	$29.25±0.28^{a}$	$19.57±0.00^{c}$	$29.72±0.00^{a}$	$22.09±0.18^{b}$	$21.06±0.12^{b}$
Ascorbic acid (mg/100 g)	$18.37±1.22^{a}$	$21.2±2.12^{a}$	$22.61±3.23^{a}$	$23.32±4.24^{a}$	$24.73±1.22^{a}$

The values are mean ± SD of three replicates and the comparison done within the row. Means with different superscripts on the same row are statistically different ($p<0.05$).

Proximate composition typically includes moisture, protein, fat, ash, fibre, and carbohydrate contents; while moisture is essentially a physicochemical property, it is conventionally reported as part of the proximate composition in food science and nutrition studies. As per the results, *Karthakolomban* displayed the highest moisture content (84.43±0.97 %), while the cultivar Willard gave the lowest (73.06±3.52 %). A study by Kothalawala and Jayasinghe, (2016), reported that the moisture content of Willard and *Karthakolomban*, varied in a range of 71.63 ± 4.66% to 84.28 ± 2.39% and the results of the current study were also in accordance with it. As per the results, there is no significant difference in ash content as observed in tested cultivars. As reported by Kothalawala and Jayasinghe, (2016), the ash content of Willard and *Karthakolomban*, varied in a range of 0.24 ±0.03% to 0.58 ± 0.03%. The values obtained in the present study were slightly higher but remained comparable, which may be attributed to differences in climate and environmental conditions, ripeness stage, genetic and physiological variations, farming and irrigation practices, as well as storage and handling conditions.

The cultivar Willard was found to be rich in total crude fat content (0.63±0.04%) and *Neelam* was found with the minimal value of fat content (0.24±0.02%). According to the study by Kothalawala and Jayasinghe, (2016), the fat content of Willard and *Karthakolomban*, varied in a range in 0.41 ± 0.02% to 0.86 ±0.02% and the results of the current study are also found to be within that range. Moreover, as reported by Norman (1976), the fat content of all tested mango cultivars did not exceed 1%. This is consistent with more recent data, as the National Mango Board (2023), indicates that mangoes are low-fat fruits, with each serving being essentially fat-free, sodium-free, and cholesterol-free.

There is no significant difference in the fibre content within the tested five mango cultivars. A study by Kothalawala and Jayasinghe, (2016), the fibre content of Willard and *Karthakolomban*, varied in a range in 1.17±0.05 % to 3.16±0.06 %. The fibre content observed in the present study falls within this reported range, though slightly lower than the upper limit, which may be attributed to factors such as climate and environmental conditions, ripeness stage, genetic and physiological variations, farming and irrigation practices, and storage conditions. As per the results, the cultivars, *Karthakolomban* and Willard showed a higher protein content (1.84±0.12 %) while *Neelam* showed the lowest protein content (1.31±0.12 %). As stated by Maldonado-Celis et al. (2019), the mango varieties grown in the South Asian region consist of one to two percent of total protein content. According to the Kothalawala and Jayasinghe, (2016), the protein content of Willard and *Karthakolomban*, varied in a range in 0.17±0.05% to 0.28±0.02% and the results of the current study are also in accordance with it.

Total carbohydrate content of these five mango varieties was significantly ($p<0.05$) varied (Table 2). The cultivars, Tom JC and Willard obtained the highest carbohydrate content (29.72±0.00 %) while *Karthakolomban* obtained the lowest carbohydrate value (19.57±0.00 %).

The ascorbic acid content of the tested mango cultivars was also examined (Table 1), and according to the results, the highest ascorbic acid content of 24.73±1.22 mg/100 g was obtained by the cultivar Neelam. The cultivars *Vellaikolumban, Karthakolomban* and Willard displayed 21.2-23.32 mg/100 g of ascorbic acid content while Tom JC obtained the lowest value (18.37±1.22 mg/100 g).

3.3. Functional properties of selected mango varieties

In order to evaluate the functional properties, the total phenolic content, flavonoid content and total antioxidant content of each mango variety was determined, and the obtained results are summarized in Table 3.

Table 3. Functional Properties of selected mango varieties

Variety	Total Flavonoid content (mg QE/100 g)	Total Phenolic content (mg GAE/100 g)	Antioxidant content (mmol TE/g)
Tom JC	101.19±0.44[a]	17.38±0.68[c]	272.06±0.00[a]
Karthakolomban	105.56±1.32[a]	17.38±0.54 [c]	205.73±1.76[b]
Willard	107.43±31.37[a]	32.09±1.49 [a]	181.96±0.00[d]
Vellaikolumban	81.5±0.00[a]	24.4±0.4[b]	114.38±0.00[e]
Neelam	87.12±0.00[a]	9.69±0.27[d]	198.22±1.76[c]

The values are mean ± SD of three replicates. Means with different superscripts on the same row are statistically different (p<0.05).

There is a significant difference (p<0.05) in the total phenolic content within the tested cultivars. As per the results, the cultivar Willard showed the highest total phenolic content (32.09±1.49 mg GAE/100 g), while Neelam gave the lowest (9.69±0.27 mg GAE/100 g). According to the Kuganesan et al. (2017), the phenolic content of the cultivars Willard, *Karthakolomban* and *Vellaikolumban* varied in a range in 16.67±3.34 mg GAE/g to 110.88±6.62 mg GAE/g. Similarly, the study by Abbasi et al. (2015), the phenolic content of the nine mango varieties (Keitt, Criollo, Azuca, Filipino, Farchis, Yuima, Tommy Atkins, Van-dyke and Manzano) varied in a range in 0.93 mg/100 g-33.75 mg/100 g. The results of the current study are comparable to those studies, with minor deviations that may be attributed to differences in cultivar, ripeness, environmental conditions, or cultivation practices.

There is no significant difference (p< 0.05) in the total flavonoid content within the tested cultivars. As per the results, Willard obtained the highest flavonoid content (107.43±31.37 mg QE/100 g), while Vellaikolumban gave the lowest (81.5±0.00 mg QE/100 g). A study by Kuganesan et al. (2017), the flavonoid content of the cultivars Willard, *Karthakolomban* and *Vellaikolumban* varied in a range in 120.20±10.29 mg QE/g to 479.80±15.30 mg QE/g. According to the Ediriweera, Tennekoon, and Samarakoon (2017); Matheyambath, Subramanian, and Paliyath (2016), the flavonoid content of some mango cultivars grown in Thailand (Tommy Atkins, Mani, Ngowe, R2E2, Kent, Jose, Mini-mango, Haden, Heidi, and Kaew Mon Duen Gao) varied in a range in 3.5 mg – 1309.1 mg/100 g of fruit. The findings of the current study fall within this range, although some variation was observed, which may be attributed to differences in cultivar, ripeness, environmental conditions, cultivation practices, or storage conditions.

There is a significant difference (p<0.05) in the total antioxidant content within the tested cultivars. The cultivar Tom JC showed the highest antioxidant content (272.06 ± 0.00 mmol TE/g), while

Willard had the lowest (114.38 ± 0.00 mmol TE/g). Although Kuganesan et al. (2017) reported antioxidant activity as IC_{50} values (7.73 ± 0.26 to 13.68 ± 0.31 μg/mL) for Willard, *Karthakolomban,* and *Vellaikolumban*, the relative trend of higher activity in certain cultivars is consistent with our observations, with Tom JC showing comparatively higher antioxidant potential than Willard.

4. Conclusions

In conclusion, the physicochemical, nutritional, and functional properties of these mango cultivars in Sri Lanka were systematically addressed under responsible parameters. Overall, the cultivar *Karthakolomban* is nutritionally superior, exhibiting higher moisture, crude protein, crude fibre, total carbohydrate, total flavonoid and phenolic contents, as well as stronger antioxidant activity compared to the other cultivars. Moreover, the cultivar *Neelam* and *Vellaikolumban* contains higher percentage of ascorbic acid content. Willard contains more sugar, fat, phenols and flavonoids, and Tom JC is rich in antioxidants and carbohydrates. The study's findings indicate that mangoes are a nutrient-rich fruit. For example, a 100 g serving of mango provides significant amounts of vitamin C and dietary fibre, contributing to the recommended daily intake and offering higher levels of certain bioactive compounds compared to other commonly consumed tropical fruits.

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