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## Physico-chemical properties of the taro (*Colocasia esculenta*) root

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### Abstract

The physico-chemical characteristics of the 20 randomly chosen taro roots have been investigated in this paper. The taro root's total weight, edible portion weight, and non-edible portion weight which ranges from 41.74 to 76.13 g, 32.79 to 56.11 g, and 8.95 to 20.02 g, respectively averages 53.84, 40.88, and 12.96 g respectively. The average length of a taro root is 76.197 mm, and they vary from 30.01 to 112.45 mm. The top portion of taro root has a diameter ranging from 32.1 to 42.75 mm, with an average diameter of 39.180 mm. Similar to the top portion; the middle and bottom portion has an average diameter of 28.784 and 17.801 mm and ranges from 18.06 to 38.21 mm and 11.8 to 23.5 mm, respectively. The sample's average hardness was determined to be 45.77 kg. The average value of moisture content, protein, fat, crude fibre, ash content and carbohydrate of fresh taro roots are 77.96%, 2.153%, 0.261%, 1.844%, 1.222% and 15.239% on a wet basis, and 353.80%, 9.770%, 1.185%, 8.368%, 5.546% and 69.155% on a dry basis, respectively.

**Keywords:** Taro root, physico-chemical properties, proximate analysis

### 1. Introduction

The perennial herbaceous plant known as taro (*Colocasia esculenta*) is only found in tropical and subtropical climates. Other names for taro root include *Aravi* in Hindi, *Alupam* in Sanskrit, *Alavi* in Gujrati, *Alu* in Marathi, *Sempu* in Tamil, and *Kochai* in Chhattisgarh. The taro root originates from South East Asia and is propagated vegetatively. It is grown in Africa, making it the tenth most widespread food crop worldwide (Rashmi *et al.* 2018) [8]. Taro is the fourteenth most popular vegetable consumed globally and is a staple food for people all over the world (Rao *et al.* 2010) [7]. It is planted in various farming methods as a pure crop or as an intercrop and can withstand salinity (Grubben and Denton, 2004) [4]. In world harvested area of taro is 1.81 million hectares with productivity of 7095.2 kg/ha with a total production of 12.84 million tonnes. In Asia, 0.15 million hectares of taro are farmed, producing 2.39 million tonnes with a productivity of 16273.6 kg/ha (FAOSTAT, 2020) [3]. Taro plants can reach heights of up to 1-2 metre. Cooked taro root is the most common way to eat it as like potato and sweet potato.

The fresh Taro root contains about 63 - 85% moisture (wet basis), 1.3 - 4% protein, 2 - 4% fat, 13 - 29% carbohydrates, 0.6 - 1.3% ash, 0.6 - 1.2% fibre, and significant amounts of Vitamins B and C (Netam *et al.* 2022) [5]. India uses taro in many different foods, such as taro chips, taro fries, and taro root powder. Taro root, when kept undamaged and stored in a shady area, has a shelf life of up to one month. All fruits and vegetables are perishable and have a limited shelf life due to their high moisture content.

### 2. Material and methods

#### 2.1 Selection of raw material

The taro root (*Colocasia esculenta*) used in this experiment was freshly harvested. The entire supply of taro roots was purchased from Raipur local market. The study used freshly collected, fully-matured taro roots that were uniform in size and free of spots or blemishes.

#### 2.2 Physical Properties of Fresh Taro Root

##### 2.2.1 Weight of taro root

Each taro root was weighed with the help of precise electric balance (Make: Shimadzu, Least count: 0.0001 g). Randomly selected twenty taro roots were weighed, and the average weight of taro roots was determined.



**Fig 1:** Fresh taro root

### 2.2.2 Weight of the edible portion of the taro root

The weight of the edible portion of randomly selected twenty taro roots was determined in grams using an electrical balance after the taro root had been peeled. The average weight of the taro root's edible portion was noted.

### 2.2.3 Weight of the non-edible portion of the taro root

By subtracting the weight of the edible component from the total weight in grams, the weight of the non-edible portion of the twenty taro roots was computed.

### 2.2.4 Length of the taro root

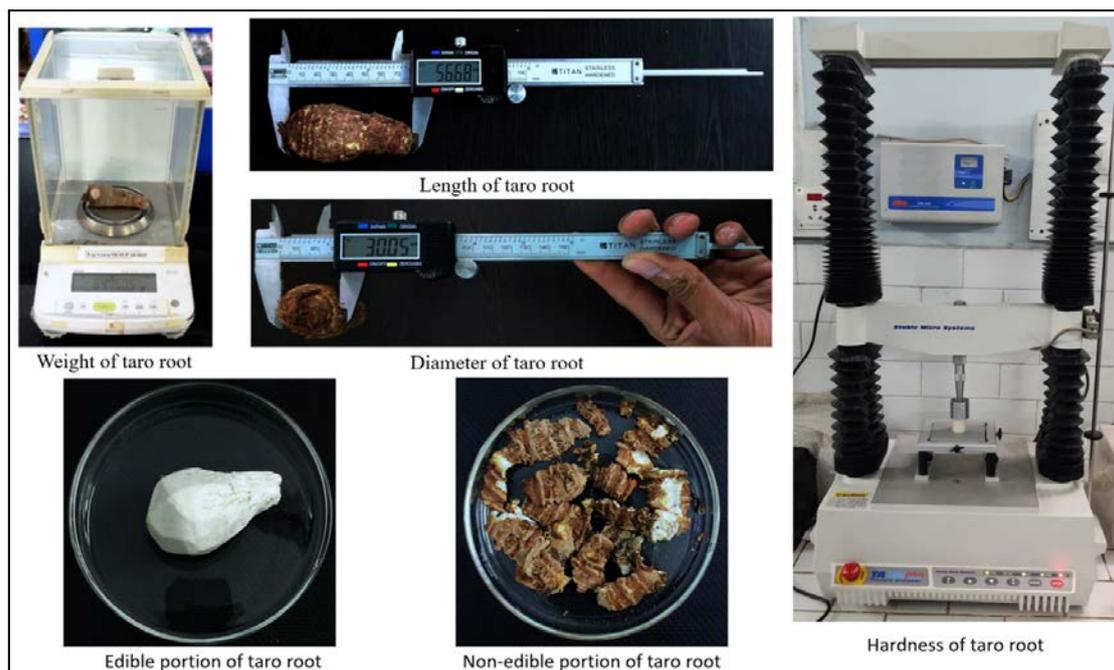
The length of the taro root in millimetre (mm) was measured using a digital vernier calliper (Make: Titan, Least count: 0.01 mm). Twenty taro roots were measured, and the average length of a taro root was determined.

### 2.2.5 Diameter of the taro root

The taro root has different diameters over its length. Therefore, the top, middle, and bottom diameters of the taro root were measured in millimetre (mm) using a digital vernier calliper (Make: Titan, Least count: 0.01 mm). Twenty taro roots' average diameters were calculated.

### 2.2.6 Hardness of taro root

Texture analyzer (TA. HD. Plus-C) was used to assess the hardness of taro roots. Pre and post speeds were set to 10 mm/sec, and the probe depth was set to 50% of each roots diameter. Preload was reached on the first cycle as the test probe entered the rhizome at a speed of 1 mm/sec and exited at the same location.



**Fig 2:** Physical properties of taro root

## 2.3 Proximate analysis of fresh taro root

### 2.3.1 Moisture content

Using the hot air oven drying process (Ranganna, 2000) [6] moisture content of fresh taro root, was determined using a hot air oven (Make: Esteem Industries Inc.)

### 2.3.2 Protein

Using Micro-Kjeldhal method, the protein content of raw taro root samples was determined by determining nitrogen content in the taro root samples (AOAC, 2000) [1].

### 2.3.3 Ash content

A muffle furnace (Make: Exacta furnace) was used to

measure the ash content of fresh taro root samples (AOAC, 2000) [1].

### 2.3.4 Fat content

A Soxhlet Apparatus (Model- SOCSPLUS SCS-03E, Make: Pelican equipment) was used to find out fat content of fresh taro root samples (AOAC, 2000) [1].

### 2.3.5 Crude Fibre

A Fibra Plus apparatus (Model: FES-6, Make: Pelican Equipments) was used to find out crude fibre content of the fresh taro root samples (AOAC, 2000) [1].

### 2.3.6 Carbohydrate

Total carbohydrate of fresh taro root sample was determined by Anthrone method (Choudhary *et al.* 2020) [2].

## 3. Results and discussion

### 3.1 Physical properties of taro root

#### 3.1.1 Weight and Length of taro root

Table 1 shows the average length and weight of 20 randomly selected fresh taro roots.

**Table 1:** Weight and length of the taro root

S. No.	Parameter	Values		Mean	SD	CV, %
		Maximum	Minimum			
1	Total weight, g	41.74	76.13	53.84	9.397	17.454
2	Edible portion weight, g	32.79	56.11	40.88	6.208	15.185
3	Non-edible portion weight, g	8.95	20.02	12.96	3.320	25.625
4	Length, mm	30.01	112.45	76.197	21.563	28.300

SD- Standard deviation, CV- Coefficient of variation

**Table 3:** Proximate analysis of taro root

Parameter	Range, % (wb)		Mean, % (wb)	% (db)	SD	CV, %
	Minimum	Maximum				
Moisture content	77.061	79.451	77.964	353.803	1.298	1.665
Protein	2.108	2.183	2.153	9.770	0.040	1.858
Fat	0.225	0.281	0.261	1.185	0.032	12.261
Crude Fibre	1.746	1.814	1.844	8.368	0.117	6.345
Ash content	1.161	1.290	1.222	5.546	0.065	5.319
Carbohydrate	14.856	15.661	15.239	69.155	0.404	2.651

## 4. Conclusion

The overall average weight of fresh taro root is 53.84 g and edible portions and non-edible portions weight is 40.88 g and 12.96 g respectively. The average length of fresh taro root is 76.197 mm. The average diameter at top, middle, and bottom portions of fresh taro root is 39.180, 28.784, and 17.801 mm respectively. The hardness value is 45.77 kg. The average value of moisture content, protein, fat, crude fibre, ash content and carbohydrate of fresh taro roots are 77.96%, 2.153%, 0.261%, 1.844%, 1.222% and 15.239% on a wet basis, and 353.80%, 9.770%, 1.185%, 8.368%, 5.546% and 69.155% on a dry basis, respectively.

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### 3.1.2 Diameter of taro root

Table 2 shows the average diameter (top, middle and bottom) of fresh taro root.

**Table 2:** Diameter of fresh taro root

S. No.	Parameter	Values		Mean	SD	CV, %
		Maximum	Minimum			
1	Top	32.1	42.75	39.180	3.361	8.580
2	Middle	18.06	38.21	28.784	4.758	16.528
3	Bottom	11.8	23.5	17.801	3.124	17.552

SD- Standard deviation, CV- Coefficient of variation

### 3.1.3 Hardness of taro root

The sample's average hardness was determined to be 45.77 kg, with a range of 43.00 to 46.67 kg, standard deviation of 2.451, and coefficient of variation of 5.355%.

## 3.2 Proximate analysis of taro root

Table 3 shows the proximate analysis of fresh taro root in % wet basis and % dry basis.

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