



## Research Article

### ANTIOXIDANT ACTIVITY OF *GARCINIA* SPECIES OF ASSAM

GOGOI B.<sup>1\*</sup>, DAS R.P.<sup>1</sup> AND BARUA U.<sup>2</sup>

<sup>1</sup>Department of Horticulture, Assam Agricultural University, Jorhat, 785013, Assam

<sup>2</sup>Krishi Vigyan Kendra, Ribhoi, ICAR NEH, Umiam, 793104, Meghalaya

\*Corresponding Author: Email-bornalihandique84@gmail.com

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**Abstract-** The present research work deals with the antioxidant activity of *Garcinia species* e.g. *Garcinia pedunculata*, *Garcinia cowa*, *Garcinia lanceifolia* and *Garcinia xanthochymus* of Assam. Ascorbic acid content varied from 35.37 mg/100g in *Garcinia xanthochymus* to 88.92mg/100g in *Garcinia pedunculata*. Total phenol content was found highest (2.74 mg/g) in *Garcinia lanceifolia*. However the carotenoid content was maximum (30.34 µg/g) in *Garcinia xanthochymus* and total antioxidant activity in terms of IC<sub>50</sub> value was found highest (11.61) in *Garcinia pedunculata*. The results indicate that these *Garcinia species* of Assam can be used as a source of antioxidant.

**Keywords-** *Garcinia*, Antioxidant, Ascorbic acid, carotenoid, Assam.

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#### Introduction

Fruits have been used as a dietary source of nutrition and play as well as it also protect human body from several diseases. Fruits are the major source of dietary antioxidant, vitamins such as ascorbic acids, vitamin E, carotene, phenolic compounds and also have antioxidant and they are widely distributed in nature. An antioxidant is a molecule capable of inhibiting the oxidation of other molecules. Assam occupies a special place in NE India located between 24°44' N to 27°45' N and 89°41' to 96°02' E longitude covering 2.4% geographic area of the country. This region is blessed with nature's unique gift for flora and fauna and besides major fruits, flowers and vegetable crops are still found in wild and semi wild condition. A large number of minor fruits are grown widely as backyard plants. These minor fruits have medicinal values, which are consumed by the people of the state.

Among these minor fruits, *Garcinia species* are one of the important minor fruits grown in this region. *Garcinia species* belong to the family *Guttiferae* and it is native to southern part of Philippines [1]. In India, the genus is reported by 35 species [2]. Among these 15 species are included in NE India and 8 and 9 species were reported from Assam [3,4]. The present investigation was carried out with the evaluation of antioxidant activity of four *Garcinia species* i.e. *Garcinia pedunculata*, *Garcinia cowa*, *Garcinia lanceifolia* and *Garcinia xanthochymus* found in Assam. The main objective of the present investigation was to examine the total phenol content, ascorbic acid content, carotene content and total antioxidant activity of the selected *Garcinia species*. The traditional use and ethnobotanical importance of the *Garcinia species* were described below

#### *Garcinia pedunculata*

**Family** : Guttiferae

**Local name** : Borthechera

*Garcinia pedunculata* is a large evergreen tree with fluted trunk with short

spreading branches. Leaf blade is oblong, obovate or oblong-lanceolate. Fruits are yellow when ripe, large and oblate and concave on both ends when mature. It is mostly available in North Eastern region of India. Mature fruits are eaten as cooked or raw. Old dried fruits are good for dysentery and it is a good source of antioxidant. Pedunxanthones A-C was obtained from the bark of the tree [5]. *Garcinia pedunculata* is a rich source of hydroxycitric acid (HCA).

#### *Garcinia cowa* Roxb.

**Family** : Guttiferae

**Local name** : Kuji-thechera, Kau-thechera-kangach (Ass.)

It is an evergreen middle sized tree up to 12 m height with an oval crown and dark green foliage found in East Bengal, North-East India, East Peninsula, Andaman Island and Nepal. Leaf blade is lanceolate or oblong lanceolate in shape. Mature fruits are opaquely red, ovoid-globose and usually apiculate. Fruits are used in dysentery, nausea and vomiting. The fruit pulp is used for making jam. The latex and bark of *G. cowa* revealed the presence of prenylated xanthenes (Cowaxanthone, cowanin, cowanol, 1,3,6-trihydroxy-7-methoxy-2,5-bis (3-methyl-2 butenyl)). Some of these compounds have been tested for anti-malarial and antimicrobial activity [6].

#### *Garcinia lanceifolia*

**Family** : Guttiferae

**Local name** : Rupahi thechera

*Garcinia lanceifolia* is a tropical evergreen plant. It has small thick-skinned fruit with a juicy, acid, fragrant pulp. Tender leaves of *G. lanceifolia* are consumed as vegetable by some tribes of Cachar district, Assam. The plant is used for treatment of headache. Decoction of fruits is used in stomach problem in Assam. The leaves of *Garcinia lanceifolia* is used as stomachic diabetic and the fruit is

used for dysentery and diarrhoea. A decoction of fruit with salt, is swallowed for fever. The crude fruit extracts were reported to be antibacterial.

#### *Garcinia xanthochymus*

**Family** : Guttiferae  
**Local name** : Tepor tenga

It is a medium sized, glabrous deciduous tree with narrow crown. Leaves are coriaceous, linear oblong or lanceolate. Fruits are large as medium sized apple, smooth and pointed at the apex and deep yellow when ripe. It has been widely used as folk medicine for bilious conditions, diarrhoea and dysentery. The fruit of this species are used in many recipes especially for making curries. The fruit juice has anti-scorbutic, anthelmintic and cardiotonic properties. Hence, it is find application in piles, dysentery, tumors.

#### Materials and Methods

The four species of *Garcinia* were collected from Jorhat district of Assam during 2013. Ripe fruits were collected cut in to slices and oven dried and stored in a airtight container for further use.

**Total phenol content:** The total phenol of the sample were determined by by spectro-photometric method [7] against a standard curve of pyracatechol read to 650 nm with a reagent blank and from the standard curve concentration of phenols in the samples were expressed in mg phenols/100 g material.

**Ascorbic acid:** The ascorbic acid content of fruits was determined by direct colorimetric method [8]. For estimation, 5 g of fruit pulp were taken and extracted with 6 per cent  $\text{HPO}_3$ . Then 5 ml of extracted sample was taken in a test tube and 10 ml of dye was added to it. Measure the red colour at 518 nm against the standard ascorbic acid solution (1 ml = 0.1 mg of ascorbic acid).

$$\text{mg of ascorbic acid/100 g of sample} = \frac{\text{Ascorbic acid concn.}}{\text{ml of solution taken for estimation}} \times \frac{\text{Volume made up} \times 100}{1000 \times \text{wt. of volume of sample taken}}$$

**Carotenoid content:** 5 g of sample with 3 g of alite powder was ground with 50 ml cold acetone and filtered through Wattman no. 4 filter paper 40 ml of petroleum ether (PE) was taken in a 500 ml reparatory funnel. There after the solution was washed 3-4 times with distilled water to discard the lower aqueous phase without discarding the upper phase. The upper phase was collected in 50 ml volumetric flask and 15 g of anhydrous sodium sulphate was added to remove the residual water. The solution was again filtered and volume was made up with PE. The absorbance was recorded at 450 nm in a UV-VIS spectrophotometer and total crotenoid content ( $\mu\text{g}$ ) [9].

$$\text{Total carotenoid } (\mu\text{g/g}) = \frac{\text{Absorbance} \times \text{Volume (ml)} \times 10^4}{\text{Absorbance coefficient (2592)} \times \text{Sample weight (g)}}$$

**Total antioxidant activity:** The antioxidant activity was determined by the method given by [10]. Free radical scavenging ability of DPPH (1,1-diphenyl-2-picrylhydrazyl) was determined on methanol extracts of dried fruit samples. One gram of dried fruit sample was extracted in 10 ml methanol, centrifuged at 10,000 rpm for 20 minutes and the supernatant was used for assay, after making up volume to 10 ml by methanol. To 50  $\mu\text{l}$  – 700  $\mu\text{l}$  of methanolic sample extract methanol was added to make up the volume to 1 ml. To it 1 ml of DPPH (0.1 mM in methanol) was added and the mixture was incubated at room temperature in dark for 30 minutes. The absorbance was measured at 517 nm taking methanol as blank. A mixture of equal volume of methanol and DPPH reagent served as control. A decreasing intensity of the purple colouration was taken as increasing scavenging activity. Antioxidant activity of L-ascorbic acid and quercetin were also assayed as standard. The inhibition of DPPH radicals by the sample was calculated as –

$$\text{DPPH inhibition (\%)} = \frac{\text{Absorbance of control} - \text{Absorbance of sample}}{\text{Absorbance of control}} \times 100$$

The amount of sample necessary to decrease the absorbance of DPPH by 50 per

cent i.e.  $\text{IC}_{50}$  was derived from the per cent disappearance vs. concentration plot.

#### Results and Discussion

From the experiment, it has been observed that there was a great variation in terms of ascorbic acid content of *Garcinia* species. The highest (88.92 mg/100g) amount of ascorbic acid was found in *Garcinia pedunculata* followed by *Garcinia cowa* (63.86 mg/100 g) and lowest (35.37 mg/100g) was observed in *Garcinia xanthochymus*. Similarly in terms of total phenol content it was found to be highest (3.50g/100g) in *Garcinia xanthochymus* and lowest (1.89 g/100g) in *Garcinia cowa*. However carotenoid content of *Garcinia xanthochymus* was found highest (30.34  $\mu\text{g/g}$ ) among the four species and *Garcinia lanceifolia* has lowest (12.44  $\mu\text{g/g}$ ) carotenoid content.

**Table-1** Ascorbic acid, total phenol and corotenoid content of *Garcinia* species

<i>Garcinia</i> species	Ascorbic acid (mg/100g)	Total phenol (g/100g)	Carotenoid ( $\mu\text{g/g}$ )
<i>G. pedunculata</i>	88.92 $\pm$ 0.263	1.94 $\pm$ 0.035	22.48 $\pm$ 0.042
<i>G.cowa</i>	63.86 $\pm$ 0.115	1.89 $\pm$ 0.026	8.85 $\pm$ 0.030
<i>G. lanceifolia</i>	46.99 $\pm$ 0.046	2.74 $\pm$ 0.066	12.44 $\pm$ 0.068
<i>G. xanthochymus</i>	35.37 $\pm$ 0.366	3.50 $\pm$ 0.042	30.34 $\pm$ 0.051

Total antioxidant activity was found highest (9.45%) with an  $\text{IC}_{50}$  value of 8.63 in *Garcinia xanthochymus* and lowest (5.22 %) TAA was found in *Garcinia pedunculata* with an  $\text{IC}_{50}$  of 11.61.

**Table-2** Total antioxidant activity and  $\text{IC}_{50}$  value of *Garcinia* species

<i>Garcinia</i> species	TAA (%)	$\text{IC}_{50}$
<i>G. pedunculata</i>	5.22 $\pm$ 0.011	11.61 $\pm$ 0.046
<i>G.cowa</i>	5.45 $\pm$ 0.010	10.34 $\pm$ 0.012
<i>G. lanceifolia</i>	7.46 $\pm$ 0.020	9.60 $\pm$ 0.019
<i>G. xanthochymus</i>	9.45 $\pm$ 0.026	8.63 $\pm$ 0.082

From the experiment, it has been established that phenolic compounds are a class of antioxidant agents, which absorbed and neutralise free radicals [11]. Ascorbic acid and carotenoids are the natural constituents found in plants and they shows antioxidant activity. Similar results were also found in *Garcinia mangostana* and are closer to orange, pummel, grapes and papaya [12]. The results strongly suggest that ascorbic acid and phenol are the important component of *Garcinia* species and high content of ascorbic acid in *Garcinia pedunculata* and high phenol content of *Garcinia xanthochymus* can explain their good antioxidant scavenging activity.

#### Conflict of Interest: None declared

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