Chapter 29
Debregeasia longifolia: Biochemistry, Functions and Utilization

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29.1 Introduction

29.1.1 Plant Description

Debregeasia longifolia (Burm. F) Wedd., belongs to the family Urticaceae, is a shrub grown in a wide range in Asia, in India, Sirlanka, Japan, China, and Indonesia (Wilmot–Dear, 1989). Leaves are tight, serrulate, with green upper surface, glabrous when develop, have a white-tomentose on lower surface. Flowers orchestrated in axillary branched, conservative heads. Shrestha, (2014) described the tree as small tree about 5 m high, have whitish flower, it occurs in moist shady places (Fig. 29.1). Fruits are orange-yellow when ripe (Fig. 29.2). Usually in wet shaded valleys (Upreti et al. 2010). The plant is portrayed by woody stem, interchange leaf, catkin inflorescence with dense, white bloom. It is open fundamentally in the autumn time season (Padmakumar et al. 2015).

29.1.2 Plant Distribution

The plant sustains to grow in hard climate and has the ability to grow in acidic water, and become prevailing in East Java, Indonesia (Hapsari et al. 2014). The plant can also grow on the surface of rocks near the entrance of a dry limestone cave on the upper part of a karst hill in the county-level city of western Guangxi, China (Chen et al. 2008). Wang et al. (2018) studied the plant species abundance in the main forest on karst soils in China and revealed that *Debregeasia longifolia* is found in both forms of Deciduous tree or shrub. This tree is also grown beside the stream

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Fig. 29.1 *Debregeasia longifolia* tree. (Source: https://commons.wikimedia.org)

Fig. 29.2 *Debregeasia longifolia* fruits (Source: https://commons.wikimedia.org)

sides in evergreen forests (Rajilesh et al. 2016). *Debregeasia longifolia* known locally as Awukhunain in Zunheboto, Nagaland, Northeast India, it spread from middle to higher height (600-2000 m) it is a cultivated crop (Sumi and Shohe 2018). In Nagaland, India the tree also is known as Orange Wild Rhea, it is abundant from June–November (Khruom and Deb 2018). It is a wild weed, it is also known as the pan and nicchia by the tribes of Tripura, northeast India (Majumdar and Datta 2013).

29.2 Chemical and Biochemical Constituents

Kumar et al. (2015) analyzed the polyphenls of *debregeasia longifolia* leaves using ultra high performance liquid chromatography (UHPLC) and found that the presence of chlorogenic acid (6.25 ug/g dw), gallic acid (0.02 ug/g dw), catechin (0.39 ug/g dw), coumaric acid (0.29 ug/g dw), epicatechin (1.99 ug/g dw), caffeic acid (3.09 ug/g dw), rutin (46.91 ug/g dw) umbelliferone (0.8 ug/g dw), kaempferol (16.07 ug/g dw), ellagic acid (0.93 ug/g dw) and total polyphenols (76.79 ug/g dw).

Debregeasia longifolia fruits grown in India were extracted using four different solvents (chloroform, benzene, acetone and methanol) and estimated the efficiency of each solvent on the antioxidants activity of the fruit. Flavonol, total phenolic and flavonoid contents of each extract were determined as well as 2,2′-azino-bis (3-eth ylbenzothiazoline-6-sulphonic acid) ABTS radical scavenging ability, reducing power capacity and 1,1-diphenyl-2-picryl hydrazyl (DPPH) radical scavenging activity. The results revealed the fruit as a potential source of antioxidant. Methanol is found to be more efficient in extraction, compared to other solvents (Seal and Chaudhuri, 2015).

Radhamani and Britto (2016), studied the preliminary phytochemicals and their free radical scavenging activities of both ethanolic extracts of *Debregeasia longifolia* leaf and stem and discovered that both extracts contains flavonoids, phenols, tannins, alkaloids and saponin, they also evaluated the role of both extracts in preventing conformation of hydroxyl radicals, 1, 1-diphenyl 2-picrl – hydrazyl free radical (DDPH), lipid peroxidation and superoxide anions and concluded that both ethanolic extract were prospective sources of natural antioxidants.

Devi et al. (2016a) studied the abundance of both ascorbic acid (vitamin C) and tocopherol (vitamin E) in *Debregeasia longifolia* and found that ascorbic acid content was found to be (26.49) while the tocopherol content was (3.36) and concluded that probably the cause of their using as healing traditionally is due to their anti-inflammatory property. Devi and Chongtham (2016) analyzed the methanolic extracts of *Deprgeasia longifolia* leaves and found that the DPPH radical scavenging activity was 65.41 inhibition, the reducing power ability was 1.66 as a ascorbic acid equivalents. The total phenol content was 72.11 mg/100 g as catechol equivalents. The flavonoid content was 45.15 mg/100 g as quercetin equivalent, the carotenoids content was 2.56 mg/100 g and the total alkaloids were 18.07 mg/100 g as caffeine equivalents. For that reason, it can be supportive in the prevention and healing of oxidative stress induced inflammatory diseases like diabetes, cardiovas-

cular diseases, cancer, arthritis, gout, neurodegenerative diseases, respiratory tract infections and skin disorders. Besides the free radical scavenging activity, these plants also have high reducing power which provides the potentiality or ability of these medicinal plants to reduce and scavenge free radicals (Devi and Chongtham 2016).

29.3 Nutritional Value

The main compounds noticed in*Debregeasialongifolia* leaves USING GC-MS were cis-jasmone (19.03%) and benzene propanoic acid, 3, 5-bis (1,1-dimethyl ethyl) -4-hydroxy-, methyl ester (14.98%) (Kumar et al. 2016). The proximate analysis of *Debregeasia longifolia* leaves was the dry matter was found to be 91.42%, the ash content 18.65%, the ether extract (2.86%), the crude fiber (10.74%) and the crude ash (19.56%), P (1.98 ug.g^{-1}) Zn (30.18 ug.g^{-1}), Fe (753.4 ug.g^{-1}), Mg (4.031 ug.g$^{-1)}$, Ca (51.050 ug.g$^{-1)}$, Na (41.80 ug.g^{-1}), K (8.11 ug.g^{-1}), and S (2.131 ug.g^{-1}) (Lihong et al. 2007). The chemical contents of this plant are found to be: (19.15%) crude protein, (62.60%) neutral detergent fiber, (45.51%) acid detergent fiber and (8.48%) ADL while the total phenolic compounds was to be (2.52%) (Padmakumar et al. 2015).

The Proximate composition of *Debregeasia longifolia* fruit is analyzed by Seal and Chaudhuri (2014) and revealed that the fruit contains (16.19%) ash, (65.56%) moisture, (2.39%) crude fat, (1.26%) crude fiber, (11.99%) protein, (68.15%) carbohydrate and nutritive value (342.15) kcal/100 g, Na (0.38), K (20.46), Ca (19.49), Mn (0.12), Cu (0.016), Fe (3.000), Mg (0.91) and Zn (0.51) mg /g.

Nazarudeen (2010) found that the fruits of *Debregeasia longifolia* in Kerala, India contains 81.72% moisture, 3.01% protein, 2.31% fat, 7.15% reducing sugar, 2.7% non-reducing sugar, 9.9% total sugar, 2.0% fiber, 0.9% ash, 3.9 vitamin C, 7.3 mg/100 g iron, 8.5 mg/100 g sodium, 193.5 mg/100 g potassium and 72.51 Kcal energy content. Devi et al. (2016b) found that the calcium content of *Debregeasia longifolia* leaves was found to be 117.77 mg/100 g, the selenium content was 100.48 mg/100 g and the iron content was 112.37 mg/100 g and they concluded that this plant probably is a prospective resource of natural antioxidants.

29.4 Uses of *Debregeasia longifolia*

The Ethnobotanical details of *Debregeasia longifolia* were studied within 64 species in South India and revealed that its fine fiber taken from the bark and used as string to sew clothes (Sajeev and Sasidharan 1997). It is abundant as tree in India, its fruits and barks are used as shampoos and for digestion by the Sumi tribe in Zunheboto district in Nagaland (Jamir et al. 2015). The tree tender leaves are taken as a vegetable during dysentery, while the crushed leaves paste is used as poultice

for arthritis (Majumdar and Datta 2013). The ripped fruits are also eaten raw (Khruom and Deb 2018). *Debregeasia longifolia* (Sindari) leaves are used as a veterinary medicine precisely for diarrhea and flatulence in Poonch Valley Azad Kash (Khan et al. 2012). The leaf of *debregeasia longifolia* was used as a treatment for Scabies (Shah et al. 2014). The tree which is known as Zangrushing found in Tree form in Tshothang Chiwog, Lauri Gewog, Bhutan forests, its fruits and leaves juice was used as a treatment for skin scabies (Jamba and Kumar 2018). This use for skin scabies was also reported by Shrestha, (2014). It is bark is used as shampoos by local tribes (Folk and Sidha system) and the fruits are palatable and used to enhance digestion (Sumi and Shohe 2018). In Indonesia the tree is known as daramanuk the bark is used as building material, and as firewood (Hidayat 2017). Purba et al. (2018) reported that, the ethnic group (Batak Karo) utilize the leaves of this shrub in a combination with 28 other plants for preparing their traditional food (Terites), which is considered as a therapy for digestive disorders. Kichu et al. (2015) reported that the leaf decoction of *Debregeasia longifolia* (Natsulawa) is taken orally by Chungtia villagers to treat diabetes, fever and high blood pressure and sometimes boiled leaves used as food while bark is used as a cure for bone fractures in Kumaun Himalaya, India (Joshi et al. 2010). The fruits are used as birds food (Srivastava 2009). Leaves are used as feed for pigs by farmers (Padmakumar et al. 2015). The tree of *Debregeasia longifolia* sold in local markets of Ukhrul in India for their remedial values and their leaves are cooked with pork (Salam et al. 2012). Chungtia villagers mix *Debregeasia longifolia* with *C. pareira* and *Gynura crepidioides* plants to treat diabetes disease as mentioned by Kichu et al. (2015). *Debregeasia longifolia* is used as a cure of skin illnesses, indigestion, and sunburn (Sameer et al. 2014). It is also used as bone fracture as well as enhancing lactation in animals in Himalaya in India (Pande et al. 2007). In Hariyali the fodder used in making ropes. It is also used as a treatment for scabies (Singh et al. 2017). *Debregeasialongifolia* leaves extract showed inhibition of the growth of *Staphylococcus aureus* using micro broth dilution but it has no effect when using the agar diffusion method as reported by Mariani et al. (2014).

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