Review article

A comprehensive analysis of wild edible fruits from the Rangayyanadurga four-horned antelope wildlife sanctuary

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ABSTRACT

Fruits play a primary role in the diet and several studies based on health report the importance of fruits because of their nutritional components that serve a protective role against many diseases. The most prevalent non-timber forest products and significant sources of food and medicine are wild edible fruits (WEFs). The WEFs must greet potential sources of crucial nutrients majorly of children and old age people suffering from malnutrition. The Rangayyanadurga Four-Horned Antelope (FHA) wildlife sanctuary, situated in Jagalur, of central Karnataka, India, harbours many indigenous, unexploited, edible, and unfamiliar fruits, which are important sources of income and food for rural communities. These fruits play a crucial role in health care and they contain several phytochemicals like, flavonoids, polyphenols, glycoside, tannins, essential oils, malic acid, and oleanolic acid. The wild edible fruits have health benefits such as anticancer, anti-diabetic, anti-diarrhoal, anti-inflammatory, antimicrobial, anti-hyoplipidemic, antiscorbutic, antioxidant, neuroprotective and piles curing properties. The research in this review focuses on 15 edible wild fruit species from 11 families that have been spotted in the Rangayyanadurga Sanctuary and was tabulated with botanical name, mode of consumption, bioactive compounds and biological effects. The more signified families are Rutaceae, Rubiaceae, Moraceae, Apocynaceae, Boraginaceae, Cucurbitaceae, Fabaceae, Arecaceae, Myrtaceae, Cactaceae and Rhamnaceae. The findings pointed to the need for additional research into the nutritional composition, environmental impact, and therapeutic properties of wild edible species as well as the potential benefits of the different WEF types identified here as neuroprotective agents.

Keywords: Wild edible fruits; phytochemicals; nutrition; Rangayyanadurga four-horned antelope sanctuary; neuroprotective agents.

INTRODUCTION

The tropical regions of India have biodiversity and comprise rich vegetation. Since herbal medicine is now used by more than 50% of the world’s population to maintain health, plant products have emerged as the primary source of novel medicines. The resurgence of local health traditions as an essential component of local culture reflections among the people has been compelled by changing circumstances, particularly in the Post-COVID arena. In recent years, it has become more usual for people to eat more plant-based natural products (PBNPs), which has increased market demand. In particular, the post-COVID era has seen changes in food consumption patterns with regard to local fruits and vegetables to increase immunity (1). Wild plants make up a significant portion of the human diet. Further research into agricultural topics, folklore, and plant diversity is expected to advance bio-conservation strategies and sustainable food production. Biochemical data is crucial for determining the physiological effects and health advantages of Wild edible plants (WEPs) in order to perform clinical investigations about their mechanisms of action, safety, and efficacy (2). Current research mainly targets plant secondary metabolites as medicinal agents to get protection and treatment against various degenerative diseases. Fruits, being a significant component of our diet, play an important role as essential nutrients and impart protection against many diseases. To prevent non-communicable diseases related to food, the WHO advises that each person consume more than 400 g of fruit per day (WHO World Health Organization, 2003). Poor consumption is caused by accessibility issues, high costs, ignorance, and neglect (3). Wild edible fruits (WEFs) are the most widely used non-timber forest products. WEFs are native species that develop and reproduce unaided by human intervention in their natural habitats (2). These fruits are excellent suppliers of nutrients and minerals that are lacking in the majority of diets (4). Indian traditional practitioners use wild edible fruits as folk medicine. Although WEFs are not particularly savoury, their abundance in antioxidants and bioactive compounds makes them important for the treatment and prevention of disease. According to research, several edible wild fruits contain beneficial phytochemicals, including those from some medicinal plants that are

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important in the treatment of diseases and may be helpful in the development of new pharmaceuticals. Some scientific studies highlight the importance of eating wild fruits because they are packed with nutrients. WEFs have become increasingly significant in recent years as a dietary supplement for people of all ages. In Indian folk medicine, they are frequently incorporated into the various "Ayurveda" formulations. In the current situation the researchers focus on wild edible fruits, because it provides food dietary components (fibre, proteins and minerals) for prevention of constipation, along with some essential phytochemicals (alkaloids, steroids, flavones, tannins, saponins, and triterpenoids), having anti-malnutrition properties and addresses global health problems such as cardiovascular disorders, obesity, inflammation, diabetes, neurodegenerative diseases and cancer, that causes death of millions of people across the world (5).

The Rangayyanadurga is the only sanctuary which is home to Four-Horned Antelopes (FHA) in Jagalur taluk of Davangere, Karnataka, India (6). Most of the forest blocks of the sanctuary, harbour large extents of scrub forests which tend to be thorny bushes in the driest localities (https://aranya.gov.in). This survey was carried out in this sanctuary, to document the indigenous, unexploited, edible and unfamiliar fruits for the first time, since there were no previous reports. In this sanctuary, still many wild edible fruits are left unexploited which are still unfamiliar to a large population. WEFs are important sources of income and also food to the rural communities. Scientific research on WEFs have shown and proved their potential sources of better nutritional value. Many WEFs are used as therapeutic agents to treat various human ailments including chronic diseases. The unexploited wild edible fruits, their phytochemicals, and health applications are prioritised in this review of the Rangayyanadurga sanctuary. The current level of knowledge about WEFs, the gaps in the field of information, applications and the current accessible data on exploited and unexploited wild edible fruits of Rangayyanadurga sanctuary are the concerns expressed in this review.

More reports on WEFs, their biological applications, their use as functional foods, and their nutraceutical benefits for human health are now accessible. When we rely on only a few types of crops as food sources, our food security is jeopardised. Exploiting the wild and unexploited sources will thereby add to our food basket's diminishing resource base, which is instantly required. For rural residents and malnourished children in particular, WEFs can be a crucial source of food and cash. Based on a survey of the literature, the list of a few WEFs and their biological activity is provided below. For example, Chrysophyllum caimito fruits contain medicinal benefits such as anti-diabetic, anti-cancer and anti-inflammatory properties (7). Jujube fruit, Ziziphus jujuba, contains both a peel and pulp that are consumed and used as food additives to improve health. Folk medicine for colds and coughs also makes use of jujube (8). Limonia acidissima fruits are used for treating insect sting, tumours, cardiac debility, asthma and wound healing (9). Fruits of Coccinia grandis (L.) are commonly used to treat diabetes, oxidative stress and exhibit antioxidant activity (10). Coccinia indica raw fruit is used as a vegetable and dried fruit is used to treat eczema. Furthermore, common fruits such as oranges, apples, berries, blueberries, grapes, and cherries contain antioxidant phytoconstituents such as catechins, polyphenols, lignans, anthocyanins, tannins, flavonoids, and isoflavones.

Fruits that are regularly consumed are good for human health. These delicious fruits contain bioactive substances that assist to lower inflammation, slow down the ageing process, prevent oxidative damage to cells, and lower the risk of several age-related chronic diseases like diabetes, cancer, and neurological diseases (11). Millions of people's lives and health are in danger as a result of the growing prevalence of neurodegenerative illnesses, which also poses a threat to global economic and social advancement. In the twenty-first century, it represents a serious health risk to global development. Edible fruits have always played an important part in augmenting the nutrition of the people of the Indian Subcontinent. Aside from their traditional usage as food, wild edible fruits have a variety of health benefits, including the potential to provide immunity to a variety of diseases (12). WEFs are rich in phytoconstituents, however few of them are neuroprotective. Neuroprotective agents can protect the central nervous system from acute and chronic neuronal damage. Even with the improvements made over the previous decades, most of the medications recommended for the management of neurodegenerative diseases can only diminish their symptoms and slow down their progression. Recent clinical research has demonstrated that several fruits can enhance motor and cognitive abilities while preventing age-related neurodegenerative illnesses. The neuroprotective effects of these fruits on neurodegenerative disorders are attributed to phytochemicals. Therapeutic components of WEFs have the ability to change brain functions and protect against neurodegeneration (13).

The primary goal of this review is to identify the wild edible fruits found in the Rangayyanadurga Four-Horned Antelope Sanctuary region, as well as to discuss the potential neuroprotective properties of the numerous WEFs that can be found there.

**Study Area**

The objective of this study is to find a current database on traditional knowledge of WEFs present in Rangayyanadurga Four-Horned Antelope Sanctuary in Jagalur taluk of Davangere, Karnataoka, India. It is
covered by 77.23 square kilometres and is located at 30° 75' north latitude and 45° 13' east longitude (https://aranya.gov.in) (Fig. 1). It has an average elevation of 633 meters above sea level. Major parts of Jagalur are covered by red soil, black soil and sandy loam soil (14). Online literature was retrieved using well-known scientific search engines such as PubMed, Google Scholar, EMBASE, Science Direct, and a few standard e-books. The findings are cross-referenced from a total of 44 references listed in this review (2012 to 2023).

Fig. 1: Location map of the Rangayyanadurga Four-Horned Antelope Sanctuary

### DISCUSSION

Knowledge of the nutritional content of wild fruits is essential to offer them as a supplement to a healthier diet. In order to address health and nutrition issues, a food composition database is critical (5). A total of 15 species of WEFs belonging to 11 families have been discovered in the Rangayyanadurga Four-Horned Antelope Sanctuary, according to this literature review. The fruit plants belonging to these different families and among them, three plants from Rubiaceae, two plants from Rutaceae, two plants from Boraginaceae, and one plant each from Moraceae, Apocynaceae, Cucurbitaceae, Fabaceae, Arecaceae, Myrtaceae, Cactaceae, and Rhamnaceae. The list of various WEFs are arranged in alphabetical order in Table 1. The current review summarises the name of the wild edible fruit, plant family, vernacular name, parts used, phytoconstituents, and biological effects in a methodical manner (Table 1 and Fig. 2).

Further assessment of availability status of these 15 fruit species showed, they are seasonal as the fruit varies from species to species. Many of the fruits have both nutritive and pharmaceutical use. *Gardenia gummifera* L.f. and *Gardenia latifolia*, on the other hand, have fewer findings on phytoconstituents and biological effects. But there is evidence saying *Gardenia gummifera* Lf used in formulation in the Indian system of medicine (29).

### Table 1: Wild edible fruits, phytoconstituents and their biological effects

<table>
<thead>
<tr>
<th>Wild edible fruits</th>
<th>Family</th>
<th>Vernacular name &amp; English name</th>
<th>Parts used</th>
<th>Phytoconstituents</th>
<th>Biological effects</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Aegle marmelos</em> (L.) Correa</td>
<td>Rutaceae</td>
<td><em>Bilvapatre Bael</em></td>
<td>Fruits eaten raw</td>
<td>Alkaloids, coumarins, steroids, polysaccharides, tannins, carotenoids</td>
<td>Bael fruit has antidiabetic effect. Neuroprotective (15)</td>
</tr>
<tr>
<td><em>Cordia dichotoma</em></td>
<td>Boraginaceae</td>
<td><em>Challekai</em></td>
<td>Fruits eaten raw</td>
<td>α-amyrians, betulin, octacosanol, lupeol-rhamnoside, β-sitosterol, taxifolin-3-5-rhamnoside. Fatty acids like arachidic acid, palmitic acid, oleic acid, stearic acid, behenic acid, and linoleic acid. Flavonoid glycosides</td>
<td>Analgesic and cytotoxic activity, degenerative disorder and antidiabetic activity (19).</td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>Common Name</th>
<th>Family</th>
<th>Scientific Name</th>
<th>Habitat</th>
<th>Fruits eaten raw</th>
<th>Medicinal Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coccinia grandis</td>
<td>Cucurbitaceae</td>
<td>Mekki kai</td>
<td>Fruits eaten raw</td>
<td>Phenolics and flavonoids (10).</td>
<td>Bronchitis, jaundice, infections, allergy, syphilis, eye gonorrhoea, and insect bites (10).</td>
</tr>
<tr>
<td>Ficus racemosa L.</td>
<td>Moraceae</td>
<td>Atti hannu</td>
<td>Fruits eaten raw</td>
<td>In addition to flavonoids and polyphenols, some bioactive substances include β-amymins, arabinose, glycosides, xanthotoxol, β-sitosterols and β-carotenes (20).</td>
<td>Diabetes, leukoderma, aphrodisiac, menorrhagia, treating skin inflammation as well as lymphadenitis, wounds, sprains, and fibrositis. Prevents neurological illness (20).</td>
</tr>
<tr>
<td>Gardenia latifolia</td>
<td>Rubiaceae</td>
<td>Aare Bikke hannu</td>
<td>Fruits eaten raw</td>
<td>Not reported</td>
<td>Not reported</td>
</tr>
<tr>
<td>Gardenia gummifera L.f</td>
<td>Rubiaceae</td>
<td>Adavi bikke Hannu</td>
<td>Fruits eaten raw</td>
<td>Not reported</td>
<td>Not reported</td>
</tr>
<tr>
<td>Momordica cymbalaria</td>
<td>Cucurbitaceae</td>
<td>Karchikai</td>
<td>Fruits eaten raw</td>
<td>Saponins, flavonoids, terpenes, quinones, steroids and alkaloids (22).</td>
<td>Hypoglycaemic, cardioprotective, hepatoprotective, nephroprotective and antioxidant properties (22).</td>
</tr>
<tr>
<td>Phoenix sylvestris (L.) Roxb.</td>
<td>Arecaceae</td>
<td>Echalu Hannu</td>
<td>Fruits eaten raw</td>
<td>Tannins, flavonoids and saponins.</td>
<td>Arthritis, used in ethnomedicine as a nerveine tonic, restorative, and sedative purposes as well as for the treatment of nervous debility. (25).</td>
</tr>
<tr>
<td>Syzigium cumini</td>
<td>Myrtaceae</td>
<td>Nerale Hannu</td>
<td>Fruits eaten raw</td>
<td>Cynidin glycoside, flavonoids, tannins, oxalic acid, gallic acid, mallic acid (26), oleocnolic acid.</td>
<td>Anticancer, anti-diabetic, anti-noiceptive, antifertility, anticlastogenic, antiiallerge, anti-hyperlipidemic, antiinamesic, radical scavenging (ROS), properties (26).</td>
</tr>
<tr>
<td>Opuntia ficus-indica</td>
<td>Cactaceae</td>
<td>Paapasukalli</td>
<td>Fruits eaten raw</td>
<td>Fibers, carotenoids, ascorbic acid, vitamin E, and antioxidant compounds (phenols, flavonoids, betaxanthin and betacyanin) (27).</td>
<td>This fruit is an excellent food source as well as anti-ulcrerogenic, antioxidant, anticancer, hepatoprotective, and antiploriferative. Neuroprotective (27).</td>
</tr>
<tr>
<td>Ziziphus mauritiana</td>
<td>Rhamnaceae</td>
<td>Baare hannu</td>
<td>Fruits eaten raw</td>
<td>Flavonoids, triterpenes and saponins, alkaloids, indole derivatives, and fatty acids (28).</td>
<td>Antioxidant and antibacterial activities (28).</td>
</tr>
</tbody>
</table>

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Neurodegenerative disorders and wild edible fruits

The term "neurodegenerative disease" refers to a group of neurological conditions in which the central nervous system's neurons die or suffer damage, leading to serious deficiencies and, in the worst case, death. The elderly are the ones who are most likely to encounter them. The onset of the sickness, on the other hand, could happen sooner. Their prevalence has risen considerably in recent years, and as the world's population ages, this tendency is expected to continue. Due to the lack of a known cause and the lack of a treatment, neurodegenerative diseases can be unpleasant and burdensome. Nowadays, the emphasis of treatments is on reducing symptoms. Neurodegenerative disorders include Parkinson's disease (PD), Alzheimer's disease (AD), Huntington's disease (HD), Spino cerebellar degeneration (SCD), Frontotemporal lobar degeneration (FTLD), and Amyotrophic lateral sclerosis (ALS). The degeneration of certain neurons is a feature of neurodegenerative diseases. The hippocampus, a region of the brain that is vital for memory and learning, is first affected in AD, and the disease then spreads to other regions of the brain. Patients with PD, FTLD, HD, SCD, or ALS have compromised dopaminergic neurons in the midbrain, frontal and temporal lobes of the cerebral cortex, basal ganglia neurons, cerebellar neurons, or motor neurons, respectively.

Physiological, biochemical, dietary, behavioural, mental, and social aspects all have a role in maintaining a healthy ageing process. Increased production of reactive oxygen species is assumed to play a significant role in the development of neurodegenerative disorders. Aging can induce stress inside the system in the form of ROS or other stressors, impair general health, and cause age-related neurological ailments. Additionally, a lot of neurotransmitters undergo auto-oxidation, which creates reactive oxygen species (ROS). The aetiology of neurodegenerative diseases and ageing appears to be influenced by increased oxidative stress. Numerous
Polyphenols have neuroprotective properties because they can cross the blood-brain barrier, directly remove abnormal amounts of reactive oxygen and nitrogen species, and chelate transition metal ions. Numerous plant phytochemicals have been proven to increase memory and learning, lower Aβ load from the blood-brain barrier, and minimise plaque development, all of which are beneficial for neurological diseases (31). Wild species provide a wealth of phytochemicals that can be used for nutritional, nutraceutical, and medicinal applications. The current emphasis is on WEFs and their derivatives, which offer anti-aging potential through several pathways, including antioxidant, immune-enhancing, and neuroprotective potential, with few adverse reactions.

Berry fruits can enhance motor and cognitive abilities while preventing age-related neurological issues, according to clinical trials. The phytochemicals anthocyanin, caffeic acid, catechin, quercetin, kaempferol, and tannin are linked to the neuroprotective properties of berry fruits against neurological diseases. Numerous polyphenolic compounds have been shown to possess scavenging abilities as well as the capacity to trigger significant antioxidant enzymes in the brain, breaking the vicious cycle of oxidative stress and tissue damage. Berries include natural polyphenols, which have been demonstrated to boost memory, learning, and overall cognitive capacities. Researchers believe that boosting antioxidant consumption can help prevent or reduce these changes because oxidative stress and inflammation appear to have a role in brain ageing and neurodegenerative diseases. Brazilian berries present great nutritional, and functional characteristics (32). Cleistocalyx nervosum is a Thailand berry plant with powerful antioxidant, antimitagenic, anticarcinogenic, and anti-aging effects (31). Rubus brigantinus and R. vagabundus are two Rubus sp. endemic from the North of Iberia Peninsula were shown to be promising sources of neuroprotective chemicals that protected brain cells from oxidative stress, one of the most common characteristics of neurodegeneration (33). Wild blueberries are high in antioxidants and include many polyphenols. Blueberry fruits may help to protect against neurodegenerative diseases and the fruit extracts protect microglia and reduce indications of neuroinflammation. Polyphenols found in Vaccinium berry species may help to minimise oxidative stress and inflammation, which are thought to play a role in illnesses like Parkinson's disease (34). Rosa laevigata Michx., a third-generation wild fruit food, is a useful and healthy food native to Asia. Natural plant-based polysaccharides are crucial in the prevention of chronic diseases like diabetes, cardiovascular disease, neurodegenerative disease, and inflammatory disorders with significant tissue damage. When ingested in human diets, selenium (Se)-enriched natural products, such as selenium-polysaccharides derived from plants or their synthetic equivalents, are well known for reducing the risk of a number of disorders. The Rosa laevigata fruit polysaccharides reduced H2O2-induced oxidative stress and death in SH-SY5Y cells, indicating that they might be an effective therapeutic agent for preventing or treating neurological diseases (35). Phenolic compounds, such as anthocyanins, are abundant in Prunus spinosa, Arbutus unedo, Rosa canina and Rosa micrantha. The flavonoid family member anthocyanins, which are primarily found in berries, have strong antioxidant properties that protect against neurological disorders (36). Few among the WEFs of Rangayyanadurga sanctuary have been studied for the presence of neuroprotective activity. The paralysis was significantly delayed when Aegle marmelos extract was used (15). In HT22 cells, ethanol fruit extracts of A. marmelos were found to be neuroprotective against glutamate-induced damage (37). By reducing lipid peroxidation and raising endogenous antioxidant enzyme levels, Coccinia grandis decreased oxidative stress in the brain. Memory and learning are aided by C. grandis. This could be because the flavonoids, tannins, and polyphenols present in it have antioxidant qualities (38). Fruits from Ficus racemosa have polyphenolic chemicals that have anti-free radical capabilities and can prevent and treat neurological disorders (20). On ischemia reperfusion-induced brain injury in rats, The neuroprotective effect of methanolic fruit extract of wood apple (Limonia acidissima) was examined (39) (21). Steroidal saponin of M. cymbalaria has substantial preventive and therapeutic effects on diabetic neuropathy, including improved myelination and neuronal integrity, delaying the course of neuropathy (40). Fruit extracts of Opuntia ficus-indica exhibited considerable neuroprotective effects by lowering oxidative stress, and could be a promising therapeutic alternative for a number of neurological diseases (27). Nervous debility, and sedation are treated using the fruits of Phoenix sylvestris Roxb. The fruit’s methanol extract has central and peripheral antinociceptive properties as well as CNS depressant, sedative, and anxiolytic effects (25). D-allose, a carbohydrate found in the methanolic extract of Ziziphus mauritiana fruit, has been shown to have neuroprotective properties against retinal ischemia, and anti-epileptic drugs such as molinate and levitiracetam have also been detected in the fruit. Z. mauritiana fruits contain the compound 2-propyl octanoic acid, which has been found as a potential treatment for neurological disorders such as Parkinson disease, Alzheimer's disease, and Amyotrophic Lateral Sclerosis (ALS) (41).
Molecular docking studies

Computational stimulation of drug-target interactions using in silico molecular docking and molecular dynamics techniques are widely used for rational drug design and screening. Molecular docking has emerged as a valuable computational approach for predicting ligand-receptor interactions. The exploitation of wildlife sanctuaries would become more prominent in pharmacology. In silico neuroprotective qualities relevant to the Rangayyanadurga sanctuary have not been studied. Three varieties of wild fruit plants found in the Rangayyanadurga sanctuary have been examined in silico for their neuroprotective properties (Table 2).

Gas chromatography-MS/MS analysis was used to identify the significant bioactive phytoconstituents in Carissa carandas L chloroform leaf extract, and in silico molecular docking studies were used to assess their potential for treating Alzheimer's disease (AD) targeting Aβ and AChE (42). To determine whether the main constituents of Opuntia ficus-indica (OFI) extracts may interact with the AChE and serotonin transporter (SERT), a molecular docking research was conducted. Study revealed that isorhamnetin glucoside and 7-glucosyl-oxy-5-methylflavone glucoside from OFI extract inhibit AChE activity with scoring function -27.49 Kcal/mol and 32.39 Kcal/mol (27). The Myrtaceae family’s aromatic evergreen Syzygium cumini (L.), which contains essential oil with (E)-b-caryophyllene as one of its major compounds, received the best docking scores of 6.75 Kcal/mol for AChE (43).

The status of wild edible fruits in India

There are numerous kinds of WEFs in India, and Jeeva (2009) did extensive research into the possibilities of edible fruits used by the Khasi tribes of Meghalaya. In the Coimbatore area of Tamil Nadu, India, the Irula tribes exploit a variety of wild edible fruit species. In Kokrajhar, Assam, the wild fruits used by the Bodo people were also listed. Reports identify a dozen indigenous species that the boys and girls of Maria consumed as well as the wild fruit trees of the Chanda forest in the Dindori district (44). Many reports on WEFs from various parts of Karnataka are available. There are no reports of WEFs in the Rangayyanadurga sanctuary, though.

Nature, wildlife, and traditional culture are all preserved in the Rangayyanadurga sanctuary. Forestry is vital to the lives and livelihoods of the people who live here. Wild edible fruits are crucial in the dietary and economic elements of poor villagers' lives, as well as in terms of health; wild fruits contain an abundance of key nutrients and, most importantly, are free from the harmful chemicals (44).

This review aimed to develop an outline about various wild edible fruits, their nutraceutical properties and bioactive compounds present and their health benefits. The wild edible fruits have to greet potential sources of crucial nutrients majorly of children and old age people suffering from malnutrition. These fruits play a crucial role in health care. Thus, wild fruits have a great potential not only in bridging the hunger gap but also in supplying essential nutrients and providing various health benefits. Primary collectors of WEFs need to be trained for producing quality products out of the wild fruits while simultaneously studying the nutritional aspect is important to design better foods for the future (44).

CONCLUSION

Wild edible fruits are often exotic, underutilised, or less known. In rural areas, several wild fruits have been used as remedies and are safe to consume. Wild edible fruit might promote the development of alternative therapeutic compounds to prevent and treat neurological disorders. For the first time, the presence of phytoconstituents and medicines in the WEFs of Rangayyanadurga sanctuary is reported in this review. Furthermore, these WEFs would contribute to food security while also benefiting local communities due to their therapeutic value. The wild edible fruits mentioned in this review were cross-checked against the literature review that was accessible. Some of these edible fruits have already been recognised for various applications. The information in this study on phytoconstituents and biological aspects of WEFs from the Rangayyanadurga sanctuary, suggests that these forest fruits, though available currently lack public patronage and consumption, hence can be used to combat hunger, nutrient deficiencies, and a variety of lifestyle disorders especially neurodegenerative diseases.

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CONFLICT OF INTEREST

Authors declare that they have no conflicts of interest.

Table 2: Molecular docking analysis of three plant species found in Rangayyanadurga sanctuary

<table>
<thead>
<tr>
<th>Species</th>
<th>Part of plant</th>
<th>Target</th>
<th>Binding energy</th>
<th>PDB ID</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carissa carandas L</td>
<td>Leaves</td>
<td>Aβ(1-40) AChE</td>
<td>-135.38 Kcal/mol -92.38 Kcal/mol</td>
<td>2LMN</td>
<td>(42)</td>
</tr>
<tr>
<td>Opuntia ficus-indica</td>
<td>Leaves</td>
<td>AChE</td>
<td>-32.39 Kcal/mol SERT</td>
<td>4EY7</td>
<td>(27)</td>
</tr>
<tr>
<td>Syzygium cumini (L.)</td>
<td>Leaves</td>
<td>AChE</td>
<td>-6.75 Kcal/mol</td>
<td>1DX6</td>
<td>(43)</td>
</tr>
</tbody>
</table>

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