



Herbal Plant Uvaria Species and Its Therapeutic Potentiality

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ABSTRACT

Herbal medication especially with employing natural plant products is gaining familiarity both in developing and developed countries. The studies of herbal drugs with antidiabetic activity are yet to be industrially prepared as the latest medicines although their therapeutic possessions in the conventional systems of medicine have been approved. Among different plant species, we have concentrated our studies on the Annonaceae family, which is a rich source and possesses a therapeutic potential for the advancement of novel pharmaceutical drugs. The Annonaceae family and its genus with several species have been thoroughly studied and revealed to provide numerous therapeutic substances which are used for the treatment of many illnesses. In this paper, we will discuss the therapeutic potential of Uvaria species which was derived from the Annonaceae genus. The present article focuses on diabetes mellitus and its treatment by using herbal remedies.

Keywords: Annonaceae, Herbal remedy, therapeutic potential, Uvaria species, Antidiabetic activity

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1. INTRODUCTION

The herbal plant with medicinal properties is acknowledged as the gifts of nature to heal several diseases in human beings (Niazi et al., 2019; Ahmad et al., 2018). The attention on herbal medicines has never ended from the Vedic period. Conventional medicine affords a tremendously enormous body of source material for the growth of the latest and novel drugs (Alduhisa and Demayo, 2019).

Topically ethnobotanical investigations have offered various valuable information about the medicinal properties of certain important medicinal plants (Munir et al., 2018; Sargia et al., 2018). An ethno-medico-botanical examination has been conducted during 2006-2008 at Kalanjimale range in D.K. District of Southern Karnataka. Nevertheless, 234 plants were well recognized for their ethnomedical potentiality in the course of this period. Uvaria Narum (Dunal) Wall belonging to the family of Annonaceae is a plant, known as Karimaderi in Kannada and Kakkepandel in Tulu (Gopalakrishna, 2003; Varier, 1993; Satyanarayana et al., 2004; Sharma et al., 1998).

By further investigating in literatures, it has been established that this plant seems to possess various medicinal properties and, hence, it is used to treat fever, jaundice, and herpes (Khare, 2007; Johansen, 1940; Subrahmanya, 2005). The family of Annonaceae has been conventionally revealed to be employed earlier for medicinal purposes such as stomach-ache, asthma, cough, fever, and wounds (Kluza et al., 2008; Breuer et al., 1982; Mahajan et al., 2010). Annonaceae is commonly known as Mempisang and has been enlisted as one of the local medicinal plants generally exploited by local healers to treat any clinical symptoms (Pinto et al., 2005).

WHO has stated that diabetes mellitus is a common and epidemic disease with metabolic disorders of the endocrine glands, which has been highlighted in more than 150 million people, and this number may increase in the coming years (Chakrabarti and Rajagopalan, 2002; Gaurav et al., 2018). In the current study, we have emphasized the medicinal potential of pharmaceutical agents derived from Annonaceae species, especially in its antidiabetic potential, which has been collected from several study reports and discussed it in detail to further foster the research purpose.

2. DISTRIBUTION OF UVARIA SPECIES BELONGING TO THE FAMILY ANNONACEAE

Uvaria species belonging to the custard apple i.e family of Annonaceae is signified to be a prosperous genus of woody climbers and scandent shrubs. The Annonaceae has known species of about 210 and is far spread in tropical and subtropical wet forests of Africa, Madagascar, continental Asia, Malaysia, Northern Australia, and Melanesia (Zhou et al., 2010; Zhou et al., 2009). The Annonaceae family belonging to the genus Uvaria possesses stellate hairs, valvate sepals, imbricate leathery flowers with petals, and many-seeded fruits (Zhou et al., 2012). Some Uvaria species are usually evergreen and known to contain biologically useful metabolites, which exhibit several medicinal properties (Tempesta et al., 1982; Nkonya et al., 1991; Lawrence et al., 2003; Okwu and Iroabuchi, 2008). [Shown in Table 1]

Medicinal properties of Uvaria species

Annona cherimola Mill, commonly named as Cherimoya, indicates cold seeded plants (Pinto et al., 2005). There is a lot of information about the plant, It actually cannot tolerate freezing temperatures at elevated altitudes but germination

still occurs in it (Alique et al., 1994). This species is originated from South America and later has been dispersed throughout Africa, India, and various parts of Asia, Australia, and New Zealand. Cherimoya fruits are consumed as it is rich in vitamin C and also has approximately 15% sugar and 60 kcal/100g (Lyon, 1992). Excessive consumption of Cherimoya fruits leads to atypical parkinsonism (Champy et al., 2005; Caparros-Lefebvre et al., 1999). In addition to side effects, the bark extracts have shown active potential against several disease conditions. Moreover, the extracts of the ripe fruit of *Annona cherimola* Mill by different concentrations of methanol, ethanol, and dimethylformamide (DMF) have shown radical scavenging activity towards DPPH radical.

Uvaria species (Mempisang) have also shown anti-cancer potential, which was identified from previous study reports. This genus was originated from Peninsular Thailand and Peninsular Malaysia. *Pseuduvaria* commonly known as "Mempisang" grows in the forests of Perak, Pahang, and Terengganu embracing the Tioman Island in Malaysia (Su et al., 2010; Hairin, 2011; Taha et al., 2015). Numerous studies have been carried out on the cytotoxicity of the plant products for the past 5 years. According to previous literature reports, some species of *Pseuduvaria* such as *P. monticola*, *macrophylla*, and *rugosa* revealed to have promising cytotoxic effects against several human cancer cell lines, which were proved by MTT assay method. The composition of several bioactive compounds leading to the anti-cancer potential was demonstrated by spectrophotometry analysis (Aziz Atiqah et al., 2016).

Antidiabetic activity of *Uvaria narum*

The earlier trend in diabetes therapeutics was oral administration or injections, which forced careful examinations on natural products especially *Uvaria Narum* by attempting at the identification of phytochemicals and chemical constituents, as well as conduction of clinical trials on natural products and their analogs in drug discovery studies (Moller, 2001; Gupta and Amartya, 2012; Rutebemberwa et al., 2013; Gessler et al., 1995; Sharma et al., 2010; Hall et al., 2011). *Uvaria Narum* belongs to the Annonaceae (custard apple) family, which is a medicinal plant broadly disseminated in the foothills of Western Ghats. The survey of the literature revealed the use of plant leaves to treat several other diseases including diabetes (Pandey Govind, 2011). The habitat of this plant is in forests of the Western Peninsula, the Central Provinces of India, as well as Ceylon. [Shown in Figure 1]

The potential use of *U. Chamae* on Diabetes mellitus

Diabetes mellitus (DM) is a life-threatening disease to mankind that causes a wide range of problemson patients (Tabish, 2007). This disease is a public health problem, which has been recognized as one of the crucial diseases among the low- and middle-income countries (WHO, 2013; Andrade, 2009). DM is a non-communicable disease that results in a metabolic disorder, described by sustained hyperglycemia with disruption in carbohydrate, fat, and protein metabolisms resulting in defects of insulin secretion, action, or both (Alberti et al., 1998). The main cause of this disease is the destruction of pancreatic β -cells, dysfunctional β -cell, as well as insulin resistance, which result in hyperglycemia (American Diabetes Association, 2010;

Cerf, 2013). As time prolonged, the diabetic patients face with poor glycemic control, which further leads to micro and macrovascular complications including nephropathy, retinopathy, neuropathy, and cardiovascular diseases (Deshpande et al., 2008; Ray et al., 2005). The reasonable solution to treat diabetes is the restoration of β -cells since β -cell deficiency is the basic cause of both types of 1&2 diabetes (Scully, 2012). Transplantation from exogenous sources helps restore deficient β -cells. Moreover, the endogenous regeneration of insulin-producing cells undoubtedly has a therapeutic value that can significantly improve diabetes and its complications (Matsumoto et al., 2009; Abdel Aziz et al., 2013).

Several scientists have found another approach for the treatment of diabetes; the application of medicinal plants, which possess various phytochemicals can cause beta-cell regeneration leading to normal blood glucose in animals and humans (Xu et al., 2014). Various medicinal plants originated from Africa, such as *Momordica charantia* (bitter melon), *Cyclopia genistoides* (honeybush), and *Catharanthus roseus* (Madagascar periwinkle), were found to be effective against diverse diseases including diabetes mellitus (Maedler et al., 2005).

Little study has been carried out on *Uvaria* species. Among the *Uvaria* species is *chamae*, which is conventionally used to treat diabetes mellitus and other conditions such as bronchitis, gastroenteritis, amenorrhea, menorrhagia, abdominal pain, and wound (Del Guerra et al., 2005; Tahrani et al., 2011; Meier, 2008; Risbud and Bhone., 2002). The *uvaria* species is relatively a climbing plant with promising medicinal activity. It is commonly called as custard apple and widely dispersed in western regions of Africa. In Africa, it is recognized with various names and is native of Nigeria, where it is known as Mmimi ohia, Kaskaifi, Oko Oja, Ogholo, and Ayiloko (Jun, 2008).

Various literature studies have confirmed bioactive compounds present in *U. chamae*. They have shown the presence of different phytochemicals such as alkaloids, flavonoids, phenols, tannins, and terpenoids with hypoglycemic, anti-inflammatory, antifungal, and antimalarial effects (Xiu et al., 2001; Mahomoodally., 2013; Okwu and Iroabuchi, 2009; Oluremi et al., 2010; Emordi et al., 2016; Emeka et al., 2015). Moreover, studies about the treatment of diabetes using the *Uvaria* species revealed that there is only limited documentation. However, among several species of *Uvaria*, we have described their potential in the treatment of diabetes mellitus which is depicted in Figure-2. Several literature have revealed that the plant extract has many potentialities with little side effects.

3. CONCLUSION

The chief enzymes for metabolism of carbohydrates, i.e. pancreatic α -amylase and α -glucosidase, which are present in the small intestine, convert consumed polysaccharides to monosaccharides. This action results in an increase in postprandial blood glucose level, which occurs especially due to the absorption of glucose formed from polysaccharides in the small intestine. Similarly, drugs also have the same reducing effect on both of these enzymes and have the ability to control the postprandial blood glucose level specifically in type

2 diabetic patients. The glucose control mechanisms vary based on the type of anti-diabetic drug employed but any long-term use of the drug has many side effects. Nevertheless, the therapeutic herbal plant usages are almost devoid of various side effects. Since Annonaceae (Custard apple) is conventionally available and has no toxicity, it is among those naturally available plants with intense anti-diabetic activity. It is a primary plant with diverse species, many of which are utilized for several medicinal and ethnobotanical purposes.

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Competing interests

The authors declare that they have no competing interests.

Consent for publication

Not applicable.

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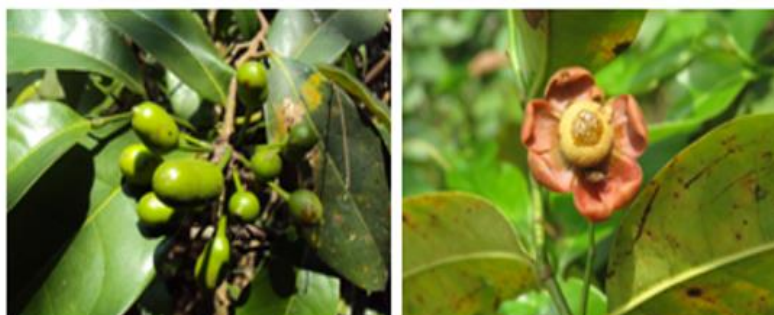


Figure 1: *Uvaria Narum*-climbing shrub

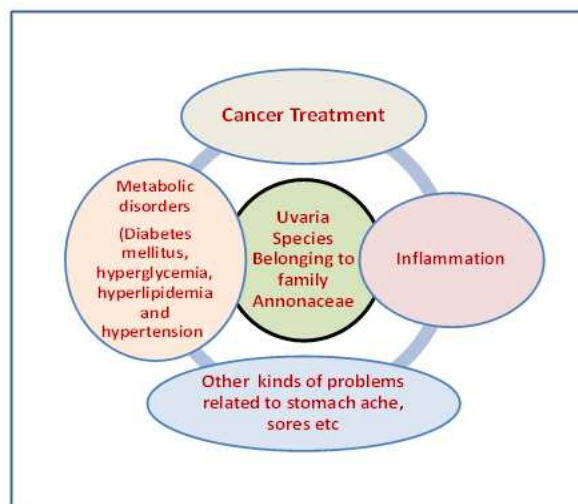


Figure 2: *Uvaria* species as a natural remedy for several diseases

Table 1: Distribution of Annonaceae family with its important uses

Scientific name	Family name	Local name	Habit	Parts used	Uses/ailments for treatment
<i>Uvaria Narum</i>	Annonaceae	Dunal	E. Asia - southern India, Sri Lanka.	Roots, Leaves, and Stems	antipyretic, antimicrobial, anti-inflammatory, antimalarial, and anti-diabetic properties
<i>Uvaria calamistrata</i> Hance	Annonaceae	Spiny-fruited <i>Uvaria</i>	E. Asia - southern China, Vietnam	root bark the sap of the leaves, stems, and seeds	antiinflammatory, treatment of dysentery; as a specific treatment for piles; epistaxis, haematuria
<i>Uvaria chamae</i> P.Beauv	Annonaceae	Finger-root or bush banana	Tropical Africa in a belt from Senegal to the Central African Republic. Caledonia.	stem bark root bark and leaves	anti-inflammatory, astringent, febrifuge, galactagogue, and styptic
<i>Uvaria kweichowensis</i> P.T.Li.	Annonaceae	-	Endemic to the southwest of china	Leaves	Antileukemic, antitumor, and antibiotic activities.
<i>Uvaria rufa</i>	Annonaceae	Dunal Blume; Susung-kalabaw	Asia - southern China, India, Thailand, Laos, Cambodia, Vietnam, Malaysia, Indonesia, Philippines	Roots and bark	Alcoholic tincture of the roots is used as an oxytocic The bark has been shown to contain alkaloids.
<i>Uvaria Grandiflora</i>	Annonaceae	kalak, Pisang akar	A native species of all South-East Asian countries. Sometimes cultivated.	Leaves, roots, and stems	Leaves and roots are applied in traditional medicine against stomachache, abdominal pains, and skin diseases. Climbing stems said to be a good substitute for rattans.