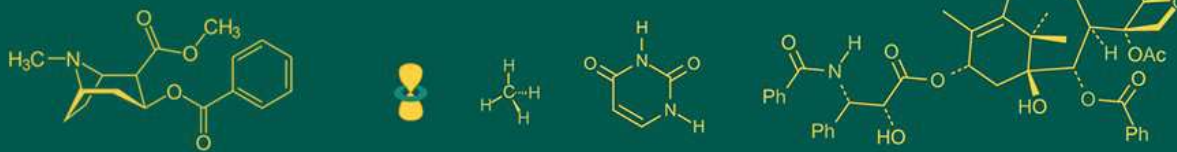


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Ethnopharmacology, phytochemistry, and pharmacology of *Uvaria acuminata* Oliv.

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Abstract

According to medicinal scientists, 67% of plant species have therapeutic potential. Medicinal plants have a great deal of positive effects and are able to fight against various diseases. People have employed many plants for their initial treatments over the years. Numerous phytochemicals found in plants have positive effects on a variety of detrimental disorders. *Uvaria acuminata* is a multi-branched plant that grows as a small tree, liane, or shrub between 1.8 and 9 meters tall. This study aims to review the ethnopharmacology, phytochemistry, and pharmacology of *U. acuminata* on the basis of literature reports. The main chemical constituents of this plant are acuminin, benzyl benzoate, desacetylvaricin, diuvaretin, isochamuvaritin, isouvaretin, uvangoletin, uvaricin and uvaretin. This plant's pharmacological activities include anti-microbial, cytotoxic, anti-cancer, anti-malarial, and anti-anemic properties, among others. *U. acuminata* might be one of the hopeful phytotherapeutic tools to fight against various diseases and disorders in humans.

Keywords: *Uvaria acuminata*, ethnopharmacology, phytochemicals, pharmacological activities

Introduction

The usage of medicinal plants is widespread across the world, and they are growing in popularity in modern civilization as organic substitutes for synthetic medicines (Verma *et al.*, 2011) [25]. For most of the world's population, it is the most significant source of life-saving medications. Secondary metabolites from plants are useful as pesticides, medicines, fragrances, and pigments (Khan *et al.*, 2009) [10]. According to estimates, 70% to 80% of the world's population relies mostly on traditional remedies, many of which are herbal (Fransworth and Soejarto, 1991) [4]. Since it is easily accessible and less expensive than contemporary medicines, they are widely used for non-industrialized societies. Although traditional medicine is not heavily regulated in many nations, the World Health Organization manages a network to support its safe and responsible use. Threats to medicinal plants include both general concerns like climate change and habitat degradation as well as a more specialized risk like overharvesting to satisfy commercial demand (Ahn, 2017) [1].

Uvaria acuminata Oliv. (Family: Annonaceae) (Figure 1) varies in habit. It is an aromatic shrub widely distributed in East Africa. It can be a shrub, a tree, or a climbing plant, depending on its environment, with multi-branched stems 2 to 9 meters long. The plant is gathered in the wild and utilized locally for food, medicine, and timber. It is occasionally cultivated as an ornamental. Although habitat loss is anticipated across its range due to increased agriculture, urbanization, and other factors, these are not considered severe threats to this species.

The IUCN Red List of Threatened Species classifies the plant as 'Least Concern' (2011). It may be found near the coasts of Somalia, Kenya, Tanzania, and Mozambique in east-Tropical Africa. Thickets, bush land, and dry scrubby forest, as well as wetter evergreen forest or woodland, with altitudes ranging from sea level to 800 meters. The luscious pulp of ripe fruits is consumed by sucking it out and discarding the seeds. A delightful juice is made by pressing ripe fruits in water and adding sugar, then filtering and drinking before or after cooling. The round to ovoid, golden or orange fruits range in size from 8 to 16 mm in diameter.

They grow in clusters of 5 to 15 fruits. This paper aims to review the traditional uses, phytochemicals, and pharmacological reports of *U. acuminata* on the basis of existing literature.

Plant taxonomy

Domain : Eukaryota
 Kingdom : Plantae
 Phylum : Spermatophyta
 Subphylum : Angiospermae
 Class : Dicotyledonae
 Order : Annonales
 Family : Annonaceae
 Genus : Uvaria
 Species : *Uvaria acuminata* Oliv.



Leaves

Fruits

Fig 1: Parts of *Uvaria acuminata* Oliv.

Traditional uses

The roots are boiled and the decoction is used for the treatment of dysentery, snakebite, painful menstruation, stomach-ache and breast and chest disorders (Kokwaro, 1976) [11]. The wood is used for withies, bows, tool handles, walking sticks, as well as fuel. In Kenya it is locally recognized as Mundagoni and Murori (Pokomo) and is used in post-partum hemorrhage, menorrhagia, dysmenorrhea, excessive bleeding and painful menses. For this purpose, roots of the plant are boiled in water and concoction taken orally. One glass daily for five days. Usually mixed with *Markhamia zanzibarica* (Kaingu *et al.*, 2013a) [12]. The same formulation is also used for the management of male reproductive disorders (Kaingu *et al.*, 2013b) [13]. The root of this plant is used for dysentery and painful menstruation (Kamuhabwa *et al.*, 2000) [14].

Phytochemical groups and phytoconstituents

The plant appears to contain alkaloids. Three new alkaloids, namely (-)-anolobine, (-)-anonaine, and (+)-reticuline were isolated from *U. acuminata* by Ichimaru *et al.* (1997). It also contains acetogenins such as uvaricin (Rupprecht *et al.*, 1990) [22] and 3'-benzylhydrochalcones (Hufford and Lasswell, 1976) [6] such as isochamuvaritin, acumitin, benzylbenzoate, uvangoletin (Ichimaru *et al.*, 2004) [7], uvaretin, diuvaretin (Munissi, 2019) [18], isouvaretin (Nakatani *et al.*, 2005) [20], uvaricin (Jolad *et al.*, 1982) [9] and desacetyluvaricin (Jolad *et al.*, 1985) [8]. Some important phytochemicals isolated from the plant have been shown in Figure 2.

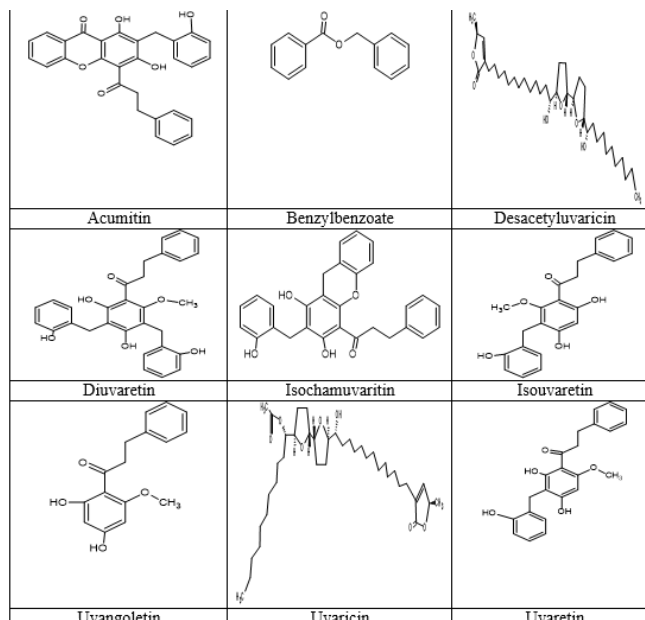


Fig 2: Important phyto constituents isolated from the *Uvaria acuminata* Oliv.

Pharmacological activities

Anti-microbial effects

Fractions and pure compounds from *U. acuminata* were tested for their cytotoxicity and antimicrobial activities against *Candida albicans*, *Bacillus anthracis*, *Escherichia coli*, *Klebsiella pneumoniae*, *Proteus sp.*, *Pseudomonas aeruginosa*, *Salmonella typhimurium*, *Shigella boydii*, *Staphylococcus aureus*, and *Vibrio cholerae*. The mixture of uvaretin and diuvaretin isolated from the plant showed the highest cytotoxicity (LC₅₀ = 3.59 µg/mL). Moreover, this mixture was also active against the gram-positive bacteria *S. aureus* and *B. anthracis* in comparison to the standard antibacterial drug, gentamycin (Munissi, 2019) [18].

Cytotoxic effects

Among 28 plant extracts, *U. acuminata* root extract gave an LC₅₀ <20 µg/mL when compared with controls treated with 10% dimethylsulphoxide (DMSO) in water as solvent. It was found to be the most active plant extract among the tested extracts in brine shrimp (Massele *et al.*, 1995) [16]. The plant is known to exert cytotoxic effects on HeLa, HT29 and A431 at 10 and 100 µg/mL (Kamuhabwa *et al.*, 2000) [14]. Moreover, uvaretin, isouvaretin, and diuvaretin, cytotoxic C-benzylated dihydrochalcones isolated from it, also displayed growth inhibitory effects (10-50 µM) against human promyelocytic leukemia HL-60 cells (Nakatani *et al.*, 2005) [20]. Dihydrochalcones namely isochamuvaritin, acumitin, uvaretin, isouvaretin, diuvaretin, and uvangoletin isolated from the plant exerted cytotoxic effects on the HL-60 cell line (IC₅₀ values: 4.1 to >50 µM) (Ichimaru *et al.*, 2004) [7].

Anti-cancer effects

The first acetogenin, uvaricin, in the plant possesses an anti-tumoral effect (Jolad *et al.*, 1982) [9]. *U. acuminata* contains 3-benzylhydrochalcones which has inhibitory activity against the P-388 lymphocytic leukemia (Hufford and Lasswell, 1976) [6].

Anti-malarial effects

Acetogenins were previously described as having antimalarial activities (Rupprecht *et al.*, 1990) [22]. *U. acuminata* is known to contain acetogenin, uvaricin (Cole *et*

al., 1976; Jolad *et al.*, 1982) ^[9]. *U. acuminata* methanolic extract clearly acts against both chloroquine sensitive and resistant *Plasmodium falciparum* clones (IC₅₀: 10g/mL) (Gathirwa *et al.*, 2011) ^[5].

Anti-anemic effect

Anemia is a major public health issue that is linked to a higher risk of morbidity and mortality, particularly in emerging African nations. It is characterized by a lack of RBC or Hb in the blood, which affects the transport of oxygen (WHO, 2006) ^[26]. *U. acuminata* has the ability to show an anti-anemic effect in Tanzania (Peter *et al.*, 2014) ^[21].

Mitogenic effects

The process of inducing mitosis in cells is known as mitogenesis. As will be seen later, mitogenesis is linked to both hyperplasia and regeneration. The word "mitogenesis" has been used to refer exclusively to hyperplasia in some studies (Cattley, 2010) ^[2]. The root extract of *U. acuminata* exerted a mitogenesis effect on human peripheral blood lymphocytes and mouse spleen cells (Tachibana *et al.*, 1996) ^[23].

Anti-epileptic effects

A brain illness called epilepsy is associated with persistent seizures. People who have epilepsy experience prejudice, misperception, social stigma, and stress from having a persistent, unexpected illness, which can result in losing their mobility for daily activities (Moshé *et al.*, 2015) ^[19]. Leboeuf *et al.* (1982) ^[15] suggest that the uvaretin found from *U. acuminata* roots and leaves given anti-epilepsy effects.

Conclusion

In comparison to synthetic drugs, medicinal plants are much more important for human use in treating various ailments. People frequently use medicinal plants on their own after learning about their therapeutic properties. *U. acuminata* is used to treat a variety of diseases and disorders in humans, including cancer, tumors, epilepsy, dysentery, snakebites, painful menstruation, stomachaches, and breast disorders. Uvaretin, the primary chemical component of this plant, has a strong anticancer effect. Diuvaretin, isouvaretin, isochamuvaritin, acumitin, benzylbenzoate, uvangoletin, uvaricin, and desacetylurvaricin are a number of important chemical components of this plant that have various pharmacological activities.

Conflict of interest

None declared.

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