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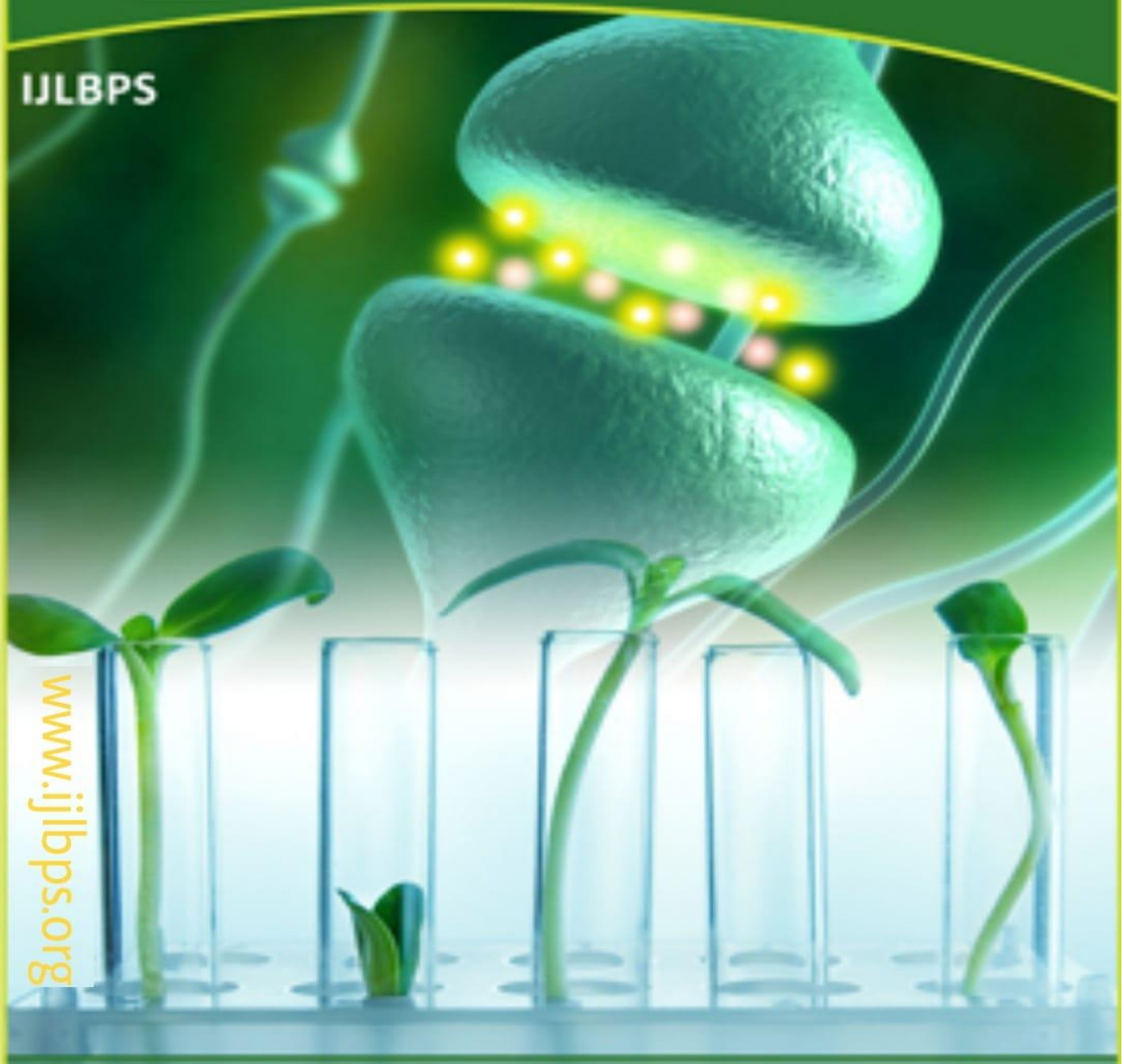

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Chemical constituents of wild onion *Urginea indica* KunthLiliaceae

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Abstract

In summary, the wild onion, Urginea indica, is a good source of nutrients and beneficial compounds. The raphides in onion bulbs give them their characteristic bitter flavor and serve as a defense mechanism. The nutrients in wild onions include vitamins E, C, and K as well as potassium, fiber, and folate. In addition to the usual suspects like calcium, iron, and protein, they also include a number of useful and marketable chemicals including bufadienolides, quercetin, alose, methyl tert-butyl ether, tartaric acid, and para-aminobenzoic acid. Anticancer and antibacterial actions are only two of the many health benefits associated with these chemicals. Each has been found to protect cell membranes from harm and aid the body's natural defenses combat free radicals.

Key-Words: *Urginea india,* Wild onion, Chemical constituents

Introduction

The oxidative damage to cells and tissues in the body is slowed or delayed by the presence of the powerful antioxidant quercetin. Quercetin has been shown in studies to preserve and regenerate vitamin E, a potent antioxidant, and to remove free radicals in the body, which is vital for preventing artherosclerosis and cardiovascular disease. Quercetin is stable in low-temperature cooking environments.In the "Garuda Puran," wild onions, or palandu in Sanskrit, are referenced, and they are discussed in depth by renowned sages like Maharshi Atreya and Lord Dhanvantri. Kandarpa Varishya Vati is also described; it is an excellent toner for the whole body and consists of onions, nutmeg, mace, cinnamon, clove, and cardamom, as well as the seeds of Mucuna Pruriens (Kauncha beeja).Desiccation mellows the sharp, vesicating flavor of the fresh bulb's juice. Mechanical action, namely the presence of hard crystals of calcium oxalate, sharp pointed at each end, causes the juice to irritate the skin when rubbed into it. One millimeter in length is attained by the crystals. Currently, around twenty five species have been described. Pharmacists have distinguished between two types of squill, which they call "white" and "red" squill.Pliny the Elder and other ancient authors mention both the white squill (from the Middle Ages) and the red squill (from the Salerno Medical School) in their works. While fresh usage is common in its native land, pharmacopoeias in other nations recommend drying the herb before consuming it.

Due to Raphides' action, fresh bulbs exude a thick, bitter liquid that irritates the skin and has strong therapeutic properties. The therapeutic properties of dried herbs somewhat diminish.

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Squill keeps well when stored dry, but it loses its medicinal properties when ground into a powder and must be dried over fast lime to maintain its potency.

Squill's chemical components are only partially understood. In 1879, Merck isolated the three glucosidal compounds responsible for bitterness. There are a few different types of scillin, including scillitoxin, scillipcrin, and scillin. Scillin is crystalline and induces numbness and vomiting, whereas the first two are amorphous and act on the heart. Other components include a mucilaginous and saccharine component, a carbohydrate called Sinistrin, and an Inulin-like molecule that, when cooked with diluted acid, produces laevulose. In 1834, Macguart suggested Sinstrin for Inulin.

If a piece of fresh squill is rubbed on the skin, it may produce extreme discomfort and, in rare cases, an eruption because of the calcium oxalate found in bundles of long, acicular crystals that readily enter the skin when the bulbs are touched.

Squill chemistry is still being investigated. There is a lot of uncertainty about the chemical identification of the glucosides mentioned since they have only been synthesized in their amorphous state.

Benefits to Health

In the early classic period, Indian squill was widely used as a medicine and was included in all official pharmacopoeias. Pythagoras, who lived in the sixth century B.C.E., is credited with developing the cough remedy oxymell of squill. In the third century, Theophrastus reported Indian squill; the Greeks epimenides and others used it extensively.

Homer called it sea onion, pling and dioscorides were familiar with it and provided the process for manufacturing vinegar of squills, and Arabian physicians of the Middle Ages gave compounds of squill with honey. Today, the substance is still widely used in European medicine. It has been used as an emetic in cases of whooping cough, but its primary uses are as a stimulant expectorant, diuretic, and heart tonic.

It forms a powerful stimulant of the urinary organs. (A pill containing 1 grain each of squill, digitalis & calomel is popularly known as iriemeyer's pill) The extract of bulb also shows hypoglycaemic & anti cancer activity.

It also contains various flavonoids including Quercetin & kaempferol polyglycosides, sinistrin, mucilage & calcium oxalate (Ghami, 2003) Fresh squill yields two glycosides Scillaren-A Scillaren-B. Squill also contains dextrose, starch, albuminous bodies, volatile oil, mineral salts.

The peculiar active principles of squill have been investigated by many chemists E. Merck by an unpublished process; obtained amorphous, brown Scillitoxin insoluble in water & ether soluble in alcohol, and crystalline yellow scillin, not easily soluble in water.

It is a glucosid, yielding upon hydrolysis dextrose butyric acid & iso-propyl-alcohol. A glutinous carbohydrate ($C_6H_{10}O_5$) resembling dextrin-exists in squill in large quantity. It was called sinistrin by schmiedeberg (1879). It differes from dextrin in being laevo rotatory & upon hydrolysis yielding chiefly laevulose & other sugars.

In large doses, squill is dangerous, it can not be safely used in any doses, unless combined with opium.

In small doses it stimulates all of the secretory organs, relieve irritation of the Mucous surfaces & check excessive secretions. It acts better in general & passive dropsies than in local dropsies & in those of asthemic character. Dropsies of cardiac origin are relieved by it. it may be used in all cases where no inflammation is present, & there is over action of the kidneys.

It acts favourably where there is a dry harsh skin, parched tongue, fevered lips & contraction of features. In cardiac dropsy, when the hearts action is feeble &the pulse is weak & rapid, 2 grains of squill may begiven in a fluid drachm of infusion of digitalis 3 timesa day. As an expectorant it will be found useful inchronic catarrh, humid asthma, pheumonia pthisis,winter cough & other chronic bronchial ailments.

Dose of the powder as a diuretic & expectorant from 1 to 3 grains as an Emetic, 6 to 12 grains of the syrup 1 or 2 fluid drachms tincture 1 to 20 drops.

Wild onion *Urginea indica* are carminative, melt the phlegm & oil extracted from them is volatile. Onions has several medicinal uses described by various authors as remedy or cure for different ailments.

In rheumatism, asthma, as a deobustrbent, prescribed for dropsy, skin diseases, bronchitis, renal calculi, leprosy, scabies, headaches & disease of the nose (bulb) aids in removing any obstructions to secretion or excretion & expectorant, cardiac stimulant emmenagogue (bulb) & cyanogentic (plant) anthelmitic, alexiteric.

Wild Onion compound Quercetin linked to lower bloodpressure by an average of five millimeters of mercury, indicates new research led to significant reductions in the blood pressure high intake of Quercetin & other flavonoids from onion & other food has been shown to decrease risk of artherosclerosis in an epidemiologic study in the united states.

The chemistry of the squill & its constituents have beenreviewed by Stoll (1937) & by Fieser & Fieser (1959). Earlier pharmacologists divided the components of squill into scillaren A & Scillaren B. Scillaren A is composed of an aglycone rhamnose & glucose. Scillaren has a double bond in the glycone. Removal of the rhamnose & glucose from scillaren A produces the aglycones. Scillaren B is a mixture of cardiac glycosides was more effective in its diuretic & natriuretic action than digoxin.

The sap of leaves & bulbs of *Urginea* species are irritating to the skin ; some species produce such marked topical stinging & itching effects that they are used by young xhosa boys during pain – Eudurance games, indicating the presence of bufadienolides.

Bufadienolides containing plants are used as *anthelmintics*, for bronchial asthma, heart conditions, fevers & during pregnancy (Hutchings & Terblanche, 1989).

Ethnomedicinal plant traders in *nelspruit sell U. lydenburgenesis* under the name masi xabane & isiklenama. Glycosides are usually compounds of plant origin, they are made up of one or more sugars combined with an alcohol, or a complex molecule such as a steroid nucleus.

Since these compounds occur in nature combined with various sugars they have been given the general term of cardiac glycosides. Lyon & Degraff (1967) estimate that more than 400 cardiac glycosides have been found in nature. It is of interest to speculate that in these many cardiac glycosides there may be one or more that are superior to digitalis.

It is the purpose of the present review to focus attention on one of these cardiac glycosides – squill & its chemical constituents.

There is very little clinical use of squill & its constituents in this country, although these preparationsare used abroad. The last description of the drug in the

U.S. Pharmacopiea appeared in 1972 ; in the National Formulary in 1960. New & Non official remedies 1952contains description of Scillaren, Scillaren A & B_1 and Urginin for internal use in treating asthma & itching of skin. A swazi traditional medical practitioner from nelspruit reportedly alleviated “body pains’ (possibly anthelmintic (the bulb), alexiteric (the plant), and emmenagogue (the bulb).

High intake of Quercetin and other flavonoids from onion and other food has been shown to decrease risk of artherosclerosis in an epidemiologic study in the United States. This was found to be the case by measuring blood pressure in people who ate a lot of wild onions, which reduced their blood pressure by an average of five millimeters of mercury.

Stoll (1937) and Fieser & Fieser (1959) both provided comprehensive reviews of the chemistry of the squill and its compounds. Squill was originally broken down by pharmacologists into two separate compounds, scillaren A and scillaren B. Scillaren A is a rhamnose- and glucose-containing aglycone. The glycone in scillaren is double-bonded. Scillaren A aglycones are made by cleaving off rhamnose and glucose. Scillaren B, a combination of cardiac glycosides, outperformed digoxin in studies comparing its diuretic and natriuretic effects.

Some Urginea species generate such pronounced topical stinging and itching effects that they are employed by young xhosa males during pain - Eudurance games, showing the presence of bufadienolides in the plant's sap of leaves and bulbs.

Asthma, heart problems, fevers, and pregnancy are only some of the disorders treated using plants

containing bufadienolides (Hutchings & Terblanche, 1989).

Nelspruit's ethnomedicinal plant vendors market U. lydenburgenesis as masi xabane & isiklenama. Typically found in plants, glycosides consist of one or more sugars joined to an alcohol or other complicated structure, such a steroid nucleus.

The name "cardiac glycosides" was used to describe this class of chemicals since they are found in nature usually bound to one or more sugars. According to Lyon & Degraff (1967), scientists have discovered over 400 cardiac glycosides in nature. It's intriguing to consider the possibility that among all these cardiac glycosides, one or more may be more effective than digitalis.

In this review, we will look at one of these cardiac glycosides, squill, and the chemicals that make it up.

Although squill and its components are utilized in therapeutic settings in other countries, its use in the United States is minimal. The drug's final characterization in the

U.S. Pharmacopiea published in 1972 ; in the National Formulary in 1960. Scillaren, Scillaren A & B1, and Urginin are all described in New & Non Official Remedies, 1952 for internal use against asthma and skin irritation. There were reports of "body aches" being relieved by a swazi traditional medicinal practitioner in Nelspruit.

Scillarenin-3-o-a-L-2^1-3^1-diacetyl rhamnosido-4^1-β-D-glucosido-4^{11}-β-D- glucoside.
Scillarenin-3-o-a-L-2^1, 3^1-diacetyl rhamnosido-4^1-β-D-glucosido-4^{11}-β-D- glucoside.
Scilliphaeosidin-3-o-a-L-rhamnosido-4^1-β-D-glucosido-3^{11}-β-D-glucoside.
Scilliphaeosidin-3-o-d-L-rhamnosido-4^1-β-D-glucosido-4^{11}-$β^1$-D-glucoside
Quantification of Bufadienolides in different cytotypes of *U. indica* in both roots & bulbs were made by Sumitha Jha & Sen (1983).
Kopp et al 1996 isolated forty one bufadienolides from the bulbs of *U. maritima* from Egypt.

Phytosterols identified in roots, bulbs & leaves of diploid, triploid, tetraploid and hexaploid cytotypes of
U. indica by gas liquid chromatography, such as stigmasterol, campesterol & sitosterol, Sumitha Jha and Sumitha Sen (1981).
Isolation and Characterization of a 29KDa glycoproteinwith antifungal activitiy from bulbs of *urginea indica* (Sandhya Shenoy et al 2006) and also anti-angiogenic and proapoptotic activitiy a novel glycoprotein from *u.indica* is mediated by NF-KB and caspase activated Dorase in ascites tumos model by Deepak et al 2003.

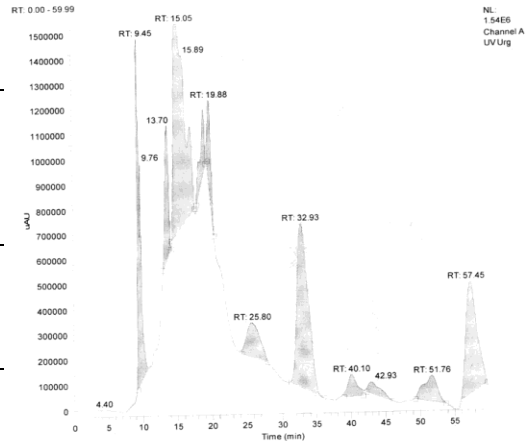
Therapeutic uses

Skin disorders.
Anti-inflammatory
Worm infestation
Diaorrhea
Ascites
Cardiac disorders
Reduce inflammation, in cardiac disorders.
Chronic rhinitis
Chronic cough (Dried slices)
Chronic pulmonary disorders
Respiratory diseases
Makes heart stronger
Renal failure
Chronic renal failure
Amenorrhea
Dysmenorrhoea
Itching
Useful in cancer
Formulations
Used as syrup & tincture.
Dosage Choorna (powder) 100 to 200 Milligrams
Panak – 30 to 60 drops
Surasatav – 5 to 30 drops
Ayurvedic Properties
Guna (Properties) – Tikshan, Laghu
Rasa (Taste) – Katu, Tikt
Vipak (Metabolisum) – Katu
Virya (Potency) ushan
Prabhav (Impact) Hridya
GC MS analysis in *Urginea indica*: [Petroleum Ether Extract]

	furfurss ole	

Roots acid hydrolysed	Pentanoic acid, 4- oxomethyl ester ormethyl levulinate	62.76%
Volatile oil of bulbs	2-Butanone, 3-Hydroxy or Acetoin 2.3-Butanediol (R – (R,R)) - & Butane -2.3-diol or 2.3 –Dihydroxy butane	20.5% 25.4%
Volatile oil ofroots	Ammonium acetate ss Acetic acid, ammonium salts mindereru's spirits Acetic acid Ethylic Acid Methane Carboxylic acid, Vinegar acid	47.23%
Acid hydrolysed leaves (Gorur)	Pentanoic acid, 4-oxy methyl ester or Levulinic acid, Methyl Ester D-Allose & Beta-D Allose or Hexose	32.01% 34.09%
Acid Hydrolysed leaves (shimoga)	Pentanoic acid, 4-oxy methyl ester or Levulinate, Levulinic acid	33.83%

Name of the compound	Formula
Sitosterol	$C_{29}H_{50}O$
Stigmasterol	$C_{29}H_{48}O$
Campeterol	$C_{28}H_{48}O$
Octacosanoic acid	$C_{28}H_{56}O_2$
Scillarenin	$C_{24}H_{32}O_4$
5-6-dimethyoxy – 3-4-	$C_{30}H_{36}O_{17}$



Pharmacology

It suppresses vatta, Kapha & pitta
Used in worm infestation
Cardiac tonic
Anti inflammatory
Cough expectorant
Diuretic
Seductive
Anti-carcinogenic

Toxicology

The toxicity of squills has recently been ascribed to a single, bitter, non-nitrogenous glucoside, to which the name scillitinis given causes vomiting & diaorrhea when taken orally.

Active ingredients & its chemistry

Parts used in Plant	Compound with highest peak	% Area
Bulbs Acid hydrolysed	2 – Furancarboxaldehyde, 5-hydroxymethyl –ss 2-Furaldehyde, 5-Hydroxyethyl –ss 5-Hydroxy methyl furfural, ss hydroxyl methyl	28.88%

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A detailed review on bio-systematics studies of Medicinal plant *urginea indica* has been made by Shiva Kameshwari Et al (2012).

The Chemical composition of onion (Edible) is compared with wild onion & given as under

Nutritive value per 100 gm of onion