OBSERVATIONS ON ANATOMICAL FEATURES OF ETHNO-MEDICINAL PLANT GYMNEMA SYLVESTRE R. BR. EX. SCHULT

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ABSTRACT

Gymnema sylvestre R Br. Ex. Schult belonging to fam. Asclepiadaceae is used medicinally as astringent, stomachic, diuretic, tonic and refrigerent properties. It is also used in eye complaints , heart diseases, piles, leucorrhoea and biliousness. Extract of leaves is stimulant, hypoglycemic and are used in diabetes to reduce glycosuria. The internal structure of root, stem, petiole and leaves were studied. Root shows the ring of vascular tissue and starch grains in cortical region. Stem also shows the ring of secondary vascular tissue and starch grains in the pith region. Petiole shows three vascular bundles with central one large and arranged in semicircular fashion. Leaf shows presence of calcium oxalate crystals in spongy parenchyma.The genus is characterized by well developed, multicellular, unbranched trichomes present on stem petiole and leaf. The medicinal properties of Gymnema sylvestre can be attributed to the specific structural features and chemical constituents such as antisaccharin, gymnemic acid in addition to glucose, carbohydrate, cellulose, manganese and saponins. Leaf material stimulates insulin secretion. Due to insulin excess of sugar is neutralized in body of diabetic person, therefore leaves are used as destroyer of glycosuria and in other urinary disorders. This plant can be utilized as potential drug resources for the treatment of diabetic patients.

Keywords: *Diabetes, Gymnemic acid, Insulin, Starch-grains.*

Introduction

Ethno botanical knowledge is very ancient in India. The knowledge of herbal drugs was mostly concentrated with ancient Rishis and seers who loved and maintained ecofriendly relations with the nature. The use of different parts of several medicinal plants to cure specific ailments has been in vogue from ancient times . Our knowledge of medicinal plants has mostly been inherited traditionally.

The research and development in the field of medicinal and aromatic plants has acquired considerable importance in India, since large number of drugs from medicinal plants were discovered and introduced in modern pharmacopoeia during 1850– 1950. Some of the important crude plant drugs are belladonna (Atropa belladonna), cascara (Rhamnus purshina), digitalis (Digitails purpurea), ipecae (Cepliaelis ipecacuanha), Opium (Papaver somniferum), rouwolfia (Rauwolfia serpentina) and veratrum (Veratrum viride) (Singh and Dey 2005).

The term ‘crude drug’ applies to the products from plant origin found in a raw form. It is either made up of cell or it is obtained from natural sources by extraction. Microscopic characters such as stomata, trichomes, calcium oxalate crystals, starch grains, stone cell, fibres vessels etc. are important anatomical characteristics of drug. Excretory products of the plant are named as tannins, resins, latex, volatile oils and chemicals like alkaloids, glycosides and mineral crystals such as calcium oxalate, calcium carbonate are stored inside the cell. Alkaloids, glycosides and tannins have medicinal properties and hence used as drugs. Resin, latex and volatile oils are carminative, stimulant and antiseptic (Kokate, Purohit and Gokhale, 2003).

The present investigation reports the detail anatomical features of a medicinal plant Gymnema sylvestre .

Gymnema sylvestre R. Br.Ex. Schult belonging to fam. Asclepiadaceae which is used for diabetes is common in central and southren India, Westren Ghat , Konkan and Maharashtra. It is cultivated and wild. It is a shrubby climbing plant with opposite decussate leaves and small yellow flowers.

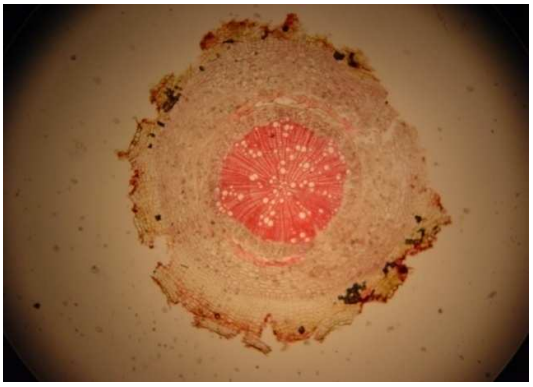
A number of chemical constituents have been isolated from this plant. Yoshikawa et al. (1997) isolated gymnemosides – a, -b, -c, d, -e and – f from the leaves of this plant. Siddiqui et al. (2000) studied the chemistry and pharmacology of the saponins isolated from the leaves. Leaves contain an antisaccharin principle gymnemic acid, Gymnamine, Nonacosome and Hentriacotance (Joshi, 2000). Leaves also contain tartaric acid, resin glucose and chlorophyll colouring matters (Sanyal, 1984) Gymnema sylvestre is used as destroyer of glycosuria and in other urinary disorders. Because of its property of abolishing the taste of sugar, it has been given the name of gur-mar (sugar – destroying) and it is believed to neutralize the excess of sugar present in the body of diabetes mellitus (Kapoor, 1990) Plant is astringent, stomachic, ant periodic, diuretic, tonic and refrigerant, and used in eye complaints to cure corneal opacity, heart diseases, piles, leucorrhoea and biliousness (Dhiman, 2004). Root is expectorant, emetic and acts as a remedy for snake bite (Narayanrao, 2003). Extract of leaves is stimulant, diuretic, cardiovascular, hypoglycemic and used in diabetes, chewed to reduce glycosuria (Joshi, 2000).

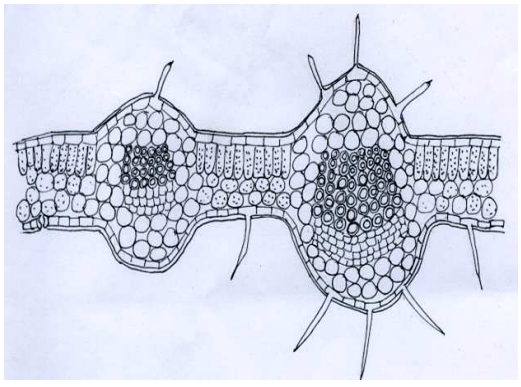
All the plant parts separated and preserved in 4% Formalin, followed by thin section staining in proposed by Johnson (1940).The prominent features like hairs, trichomes, stomata were studied through epidermal peeling from leaves.

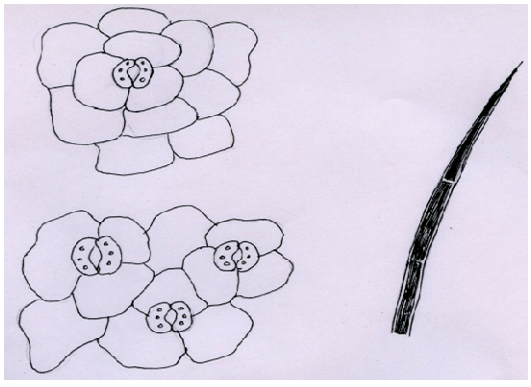
Observations and Results

Root - Periderm is 3 to 4 layered, cells parenchymatous, rectangular, compactly arranged without intercellular spaces, measuring about 41 x 33 µm in size. Lenticels present. ; Cortex multilayered, cells parenchymatous, oval, thin walled with small intercellular spaces, measuring about 57 x 34 µm in size. Cortical cells contain starch grain. Endodermis is single layered, parenchymatous, cells barrel shaped, compactly arranged. ; Pericycle is single layered, parenchymatous, cells compactly arranged. ; Vascular cylinder consists of secondary phloem and secondary xylem. Secondary phloem is in outer continuous ring, multilayered, thin walled, compactly arranged without intercellular spaces, measuring about 14 x 12 µm in size. Cambium is present in between secondary xylem and phloem. Secondary xylem is continuous cylinder traversed by narrow rays. Vessels are in radial rows, circular and angular in outline, measuring about 36 x 34 µm in size. Vascular cylinder is traversed by parenchymatous medullary rays. Stem - Trichomes many, multicellular, unbranched, conical, much longer than broad, pointed at apex, wall thick, measuring about 249 x 15 µm in size. ; Epidermis single layered, cells oval and parenchymatous, compactly arranged without intercellular spaces, measuring about 11 x 13 µm in size. Cuticle present, Cortex multilayered, cells parenchymatous, oval, thin walled, enclosing small intercellular spaces, measuring about 32 x 31 µm in size. ; Endodermis single layered, cells barrel shaped, compactly arranged, Pericycle single layered, parenchymatous, Vascular cylinder consists of secondary phloem and secondary xylem. Secondary phloem in outer continuous ring, multilayered, phloem elements rectangular in outline, compactly arranged, measuring about 10 x 10 µm in size. Cambium is present in between secondary xylem and secondary phloem. Vessels are in radial rows, circular and angular in outline, measuring about 29 x 19 µm in size. ; Pith wide, homogeneous, cells parenchymatous, thin walled, isodiametric, oval, enclosing small intercellular spaces, measuring about 38 x 35 µm in size. Cells contain some starch grain Secondary growth normal. Petiole - Trichomes many, multicellular, unbranched, conical much longer than broad pointed at apex wall thick, measuring about 379 x 17 µm in size.; Epidermis single layered, cells oval, parenchymatous, compactly arranged

without intercellular spaces, measuring about 12 x 12 µm in size.







And xylem with 3 patches. Central patch is semicircular, large, consists of radial rows of xylem. On lateral side two small patches with phloem. Xylem vessels arranged in radial rows, circular in outline.

Leaf, surface- Epidermal cells polygonal, parenchymatous, thin walled, compactly arranged without intercellular spaces, measuring about 34 x 22 µm in size. End walls and lateral walls straight. ; Leaf amphistomatic. In lower epidermis stomata are more than the upper epidermis. Stomata are distributed uniformly. Pore is oval measuring about 8 x 4 µm in size. Guard cells measuring about 16 x 8 µm in size. Guard cells surrounded by three unequal cells therefore stomata is of cruciferous or anisocytic type.

Leaf - Trichomes arise from epidermis. In midrib region hairs are many. Trichomes are multicellular, unbranched, conical more long than broad. ; Both epidermis are single layered, cells rectangular, parenchymatous, compactly arranged without intercellular spaces, measuring about 21 x 16 µm in size. Cuticle present on both epidermis. ; In between upper and lower epidermis mesophyll cells are present. Below upper epidermis mesophyll is differentiated into palisade and spongy parenchyma . Palisade is single layered, cells are close together with long axes of the cells perpendicular to the epidermis. Cells are columner elongated, parenchymatous, compactly arranged without intercellular spaces, containing large amount of chloroplasts, measuring about 46 x 10 µm in size. Above lower epidermis mesophyll is differentiated as spongy parenchyma. Spongy tissue 2 to 3 layered, cells are parenchymatous, oval, thin walled enclosing small intercellular spaces, measuring about 28 x 20 µm in size. Cells contain chloroplasts. In spongy parenchyma in lamina rosette crystals of calcium oxalate are present in idioblasts. In between palisade and spongy tissue 1 to 2 layers of elongated parenchyma cells are present containing chloroplasts, cells are compactly arranged without intercellular spaces. ; In midrib region mesophyll is not differentiated into palisade and spongy mesophyll. Mesophyll consists of only parenchyma cells. Parenchyma cell are isodiametric, oval, thin walled, enclosing small intercellular spaces, measuring about 16 x 12 µm in size. ; Large vascular bundle present in midrib. Vascular bundles of lateral veins run parallel to each other in laminar portion. Vascular bundle is of conjoint and collateral type. In midrib, vascular bundle is semicircular. In the centre parenchyma is present. Xylem elements show radial arrangement. Xylem is present on upper side of vascular bundle and phloem is present on lower side of vascular bundle. Xylem elements circular in outline, measuring about 16 x 16 µm in size.

In medicinal plant Gymnema sylvestre drug shows presence of stomata, trichomes, calcium oxalate crystals, vessels, resins, tannins and glycosides as microscopic characters. Secondary metabolites such as resins, tannins, and glycosides present in cell attributes it a pharmacognostic importance

Discussion

The genus Gymnema sylvestre R. Br. Ex. Schult. is characterised by well developed trichomes present on stem, petiole and leaf. They are multicelluar, unbranched, conical, thick walled, pointed at apex. In addition to this cortical cells of root and pith cells of stem contain starch grains. Further xylem is furrowed, xylem becoming broken up by dilation of the ground tissue. The spongy parenchyma in lamina is infested with raphides composed of rosette crystals of calcium oxalate in idioblasts. Leaves contain an antisaccharin principle gymnemic acid therefore used in diabetes, and chewed to reduce glycosuria (Joshi 2000).

The microscopic attributes significance in properties of the specimen apart from this the chemical constituents and secretory products like calcium oxalate crystals (raphides) have therapeutic effect on the body.

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