An anatomical study on genus *Goodyera* in Jeju Do

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濟州道 Goodyera屬의 解部學的 硏究

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Summary

The aim of this study is to describe the anatomical features of genus *Goodyera* in Jeju Do and 4 species colledted from Hanla Mt. were treated with paraffin method and stained with Sass's hemalum.

There is no anatomical differences between species but in *G. velutina*, leaf has protruding enidermal cells toward outward on adaxial surface and it is remarkable that all 4 species have medullary bundles.

Introduction

The anatomical features of plant body offer the knowledges on the shape, position and cell composition of tissues which comprise plant organs. From these knowledges, we can get the valuable information to the plant taxonomy and systematics (Met calfe, C. R., and L. Chalk) as well as relationship between morphological structure and physiological function.

It has been done for several decades to describe the anatomical features of plants (Met calfe, C. R., and L. Chalk) and nowadays such study is considered a classical field of plant science. But in Korea there is few report on the anatomical description of Korean plants as well as comparative anatomical studies.

That is why we design the study to describe the anatomical features of Korean plants and as a part of this study, we described the anatomical features of vegetative organs of genus *Goodyera* in Jeju Do.

Materials and Methods

Materials

4 species of genus Goodyera were collected from Hanla Mt. The species names are as follows; *Goodyera macrantha* MAX., *G. maxinowicziana* MAKINO, *G. schlechtendaliana* PEICH, *G. velulina* MAX. The classification of them is based on Lee (1980).

Methods

Vegetative organs, leaf, root, stem, of each species were cut in 5mm—1cm long using surgical knife and fixed in FAA. According to the Berlyn & Miksche method (1976), all of them were dehydrated and embeded in paraffin. After sectioned with rotary microtome in 15 μm thickness, these sections were stained with Sass's hemalum and mounted in Canada balsam. Using this preparates, observation and microphotography making were taken place.

Results and Discussion

There is no difference between species at anatomical level, but in *G. velutina* the epidermal cells of adaxial surface of leaves have protruding shape toward outward. Each vegetative organs is described as follows.

Leaf

Generally, the leaves of orchids can be divided into two types, plicate type and leathery type (Withner, et al. 1963). *Goodyera* spp. in Jeju Do have membranous plicate type.

Epidermis : Both side of leaf have a surface covered with thin cutinous layers (Plate 3.). The thickness of the cutinous covering is determined by the degree of exposure to the sun(Cyge 1930). Thus it can be regarded that their shady habitat is responsible for having thin cuticular layer. The epidermis consists of only one layer of cells which are tabular in shape and show compact arrangement. There is no chloroplast in epidermal cells. There are smaller cells than other parts on both sides of midrib and beneath lower epidermis, one or two layers of collenchyma cells were found(Plate 1. 3.). The shape and position on these cells indicate that the function of them is to support the central part of leaf.

As mentioned above, upper epidermal cells of *G. velutina* have protruding shape toward outward and a cone shape trichomes. Protruding cell shape and trichome are responsible for the velvet-like appearance of adaxial surface of the leaf.

Mesophyll : Mesophyll cells in plicate type leaves are direct below the epideris and are mostly isodiametric. There is no clear differentiation into palisade cells and sponge tissue (Withner. et al. 1963.). In genus Goodyera, the same appearance was found (plate 1.). Intercellular spaces are well developed and as the result of this, whole mesophyll consist of sponge tissue.

Vascular tissue : The bundles in the leaves are always oriented with the xylem uppermost and the phloem below (plate 3. 4.). This arrangement is consistent with the arrangement of the bundles in the stem. Thus underside of the leaf would be abaxial and the upperside would be adaxial.

The bundles are enclosed within one or two layer of compactly arranged parenchyma. The function of the bundle sheath is to protect the bundles.

Stem

The stem may be devided into two kinds, procumbent stem and upright stem. The upright stem with leaves and roots are developed from the node of the procumbent stem.

The epidermis of the stem consists of one layered small cells which are tabular in shape (Plate 5. 6.). Outer walls of epidermal cells are covered with cuticular layer and beneath the epidermis there are one or two layered collenchyma cells which are hypodermis (plate 5.).

The cortex consist of large cells which are round in shape and have thin cell wall. There are well developed intercellular spaces in cortex which can be identified schzogenous intercellular space as judged by the shape (plate 5). Leaf traces appear in cortex of upright stem (plate 8.).

The vascular bundles are collateral bundle and scattered within a well-difined pith surrounded by pericycle (plate 8). This kind of bundle is regared as medullary bundle which rarely appear in monocotyledons (Esau, 1965.). The pericycle consists of one layered cells which are round in shape (plate 7.). Usually, pericycle is regarded as a part of stele (Esau, 1955.). In genus *Goodyera*, however, special

type of stele appear in stem and root. Thus to ascertain the origin of pericycle needs for on togenetic study.

In the central part of the stem there are several cells which are similar to cortical cells. Thus this part can be regarded as the pith.

The origin of root which is developed from the node of the procumbent stem arise endogenously, while upright stem arise exogenously (plate 9.).

Root

Velamen forms the epidermis, which consist of cells with various shape and size.

The cortex is the same as the cortex in the stem. In the central part of the root, there is a stele which consists of pericycle, vascular bundles and pith. The stele in the root is more primitive than in the stem, that is, in contrast with collateral bundles in stem, xylem and phloem appear alternatively in root. (plate 10.).

Literatures Cited

Berlyn P. G., and J. P. Miksche. 1976. Botanical Microtechinique and Cytochemistry. The Iowa State University Press.

Cyge T. 1930. Etudes anatemiques et ecologiques sur les feuilles des Orchidees indigenes. Extr. Mem. Acad. Polon. Sci. Lett., Ser. B, Sci. Nat.

Esau K. 1965. Plant Anatomy. Willey & Sons.

Lee C. B. 1980. Illustrated Flora of Korea. Hyang Moon Sa.

Metcalfe, C. R., and L. Chalk, 1972. Anatomy of the Dicotyledons. Vol. 1. Oxford University Press, London.

Withner C. L., P. K. Nelson, and P. J. Wejksnora. 1963. The Anatomy of Orchids. Orchid : Scientific study.

國 文 抄 錄

濟州道에 自生하는 四種의 사철난을 採集하여 이들의 營養器官을 組織學的으로 檢討하고 그 특성들을 記載하였다.

組織水準에서는 種間差異를 發見할 수 없었으나 털사철난(*G. velutina*)의 경우 잎의 上部表皮細胞가 外部로 돌출된 형태를 가지고 있었으며 四種 모두의 줄기에는 維管束이 內鞘內에만 산재해 있는 ***medullary bundle***을 가진 것이 특이하였다.

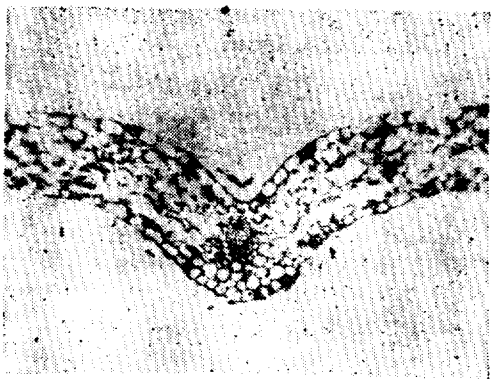

Plate 1. Cross section of *G. maximowiczіana* leaf (X100).

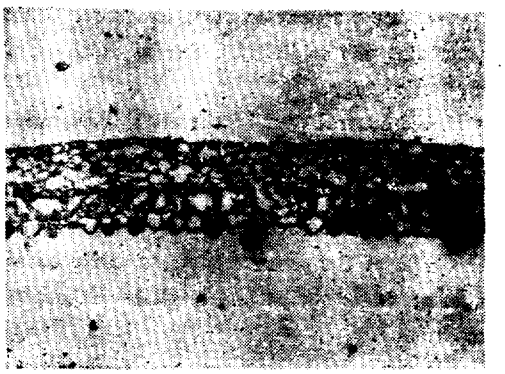

Plate 2. Cross section of ***G. velutina*** leaf (X100).

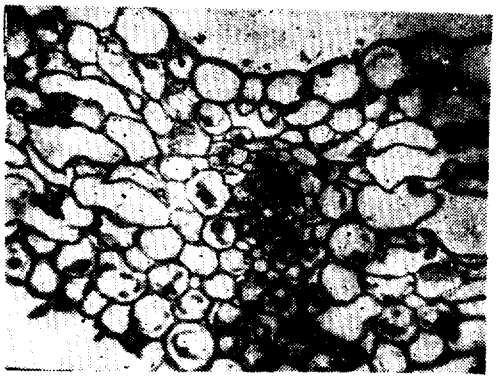

Plate 3. Cross section of *G. velutina* leaf illustrating vascular bundle and bundle sheath (X400).

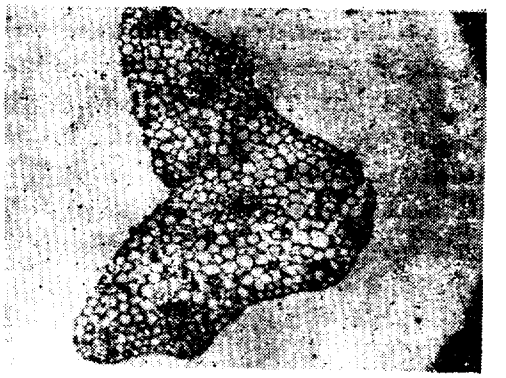

Plate 4. Cross section of ***G. velutina*** petiole (X100).

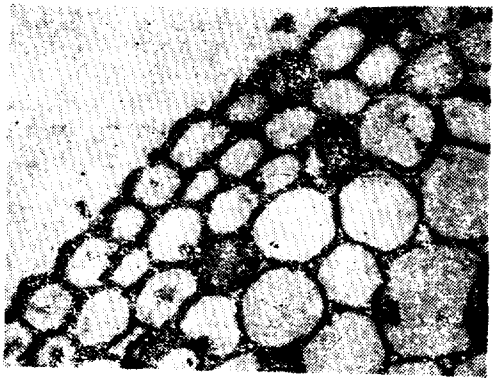

Plate 5. Cross section of *G. velutina* procumbent stem illustrating epidermis, hypodermis and intercellular space (X400).

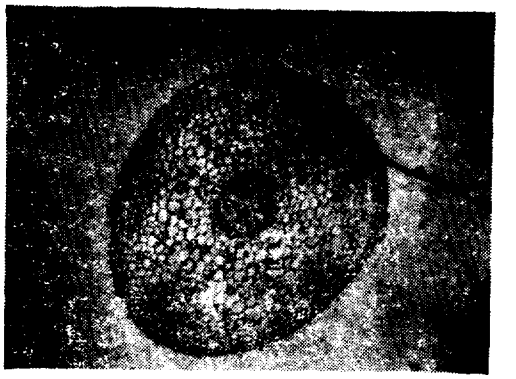

Plate 6. Cross section of ***G. velutina*** procumbent stem (X40).

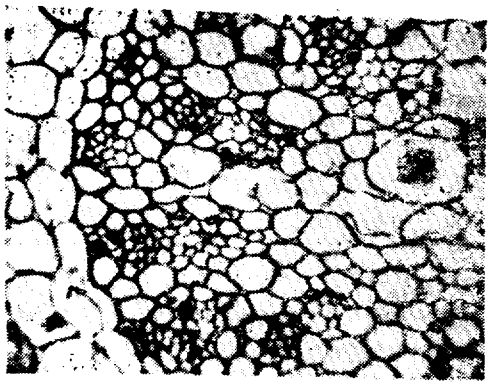

Plate 7. Cross section pf *G. velutina* procumbent stem illustrating vascular bundle and pericycle (X400).

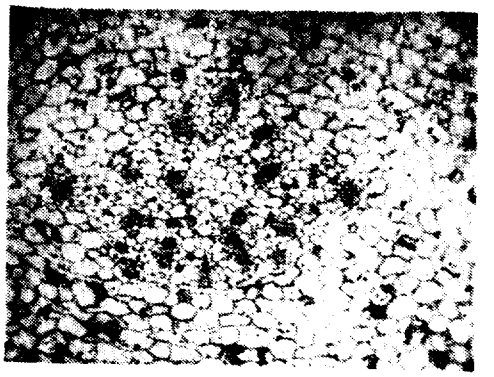

Plate 8. Cross section of *G. macrantha* upright stem illustrating stele and leaf traces (X100).

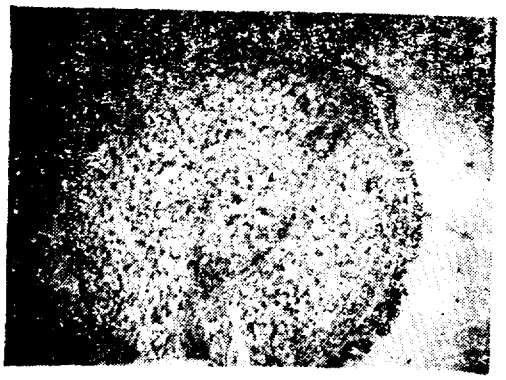

Plate 9. Cross section of node of *G. velutina* (X100).

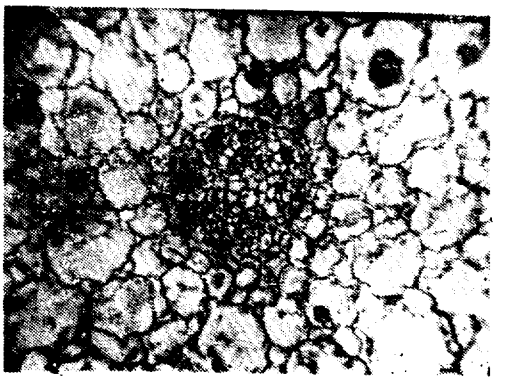

Plate 10. Cross section of *G. velutina* root (X400).