

# Anatomy and Structure Secretary *Hodgsonia Macrocarpa* (Blume Cogn.) as Plant Traditional Medicine of the Tribe Besemah for Anti-infective and Degenerative in district Lahat, South Sumatra

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**Abstract:** *Hodgsonia macrocarpa* (Blume) Cogn. is one of the type rare cucurbita found in Sumatra. Plants This is a woody liana Cucurbitaceae which is abundant utilized by the tribe Besemah in Lahat Regency, South Sumatra with Name local Still kadam, as plant drug traditional for treat disease infection including hepatitis, pneumonia, tuberculosis and other diseases degenerative namely liver. This research aims to know structure anatomy and structure secretary as well as its distribution. Study done in the month January until April 2024, located in Sukaraja Hamlet Subdistrict Longing for Lahat Regency, South Sumatra. Research This use method descriptive and creation preparation with Paraffin and whole mount methods. Based on observation anatomy and structure secretary in *H. macrocarpa* namely, leaves composed of upper and lower epidermis which are covered cuticle, parenchyma palisade and sponge, network vessels, sieve cells, and non-glandular trichomes in the form of trichome single end pointed and trichome star, while trichome glandular consists of from trichome conoidal and trichome headed stalk short, cell idioblast shaped round and shaped pentagon. Stem arranged by network epidermis, collenchyma, parenchyma, network vessels, found existence glandular trichomes terminal blunt, glandular trichomes terminal pointed, trichomes uniseriate, cell idioblast shaped round, crystal prisms and druse crystals. Roots arranged by epidermis, tissue cork cortex, tissue vessels, sclereids, cells idioblast shaped round, druse crystals and crystals systolic. Type structure secretary *H macrocarpha* in the form of glandular trichomes, cells idioblasts and crystals. While distribution structure secretary can found in leaves, stems and roots. in *H. macrocarpa*. Structure secretary mentioned play a role as place storage metabolite secondary.

**Keywords:** Anatomy; Anti-infective; Degenerative; Hodgsonian macrocarpa

## Introduction

Diversity biological in Indonesia Enough abundant. Wrong One form its diversity is diversity forest, including forest primary and secondary. The height diversity flora and fauna give opportunity to public local in utilize various source Power in life daily. According to Margarethy et al. (2019), utilization plant

for treatment traditional has become the practice that in progress since long in various ethnic group in Indonesia. Every ethnic group own knowledge unique local about use plant drug in treatment traditional, Good to disease infection and also degenerative.

Disease infection is disease Which due to by various agent infections including: viruses, bacteria, parasites, and also mold. Agent infection usually There is

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in natural and will enter to in body so that cause disease on the body, with symptom like fever, vomiting, diarrhea, loss of lust eating, pain all over body and others. Death can happen consequence Handling who does not adequate, whereas disease degenerative is disease No infectious Which in progress chronic Because decline body organ functions due to the aging process, such as disease heart, hypertension, diabetes, obesity and other (Handajani et al., 2010).

In the research Rizal et al. (2021), there are 7 plant drug typical ethnic group the besemah used for treat disease infection and degenerative one of them is *Hodgsonian macrocarpa* (Bloom) Cogn. (Still kadam) According to Kandowangko et al. (2024) plants drug can it is said typical through a number of categories, first plants used No used in other areas. Second, the usefulness from One the same plant, but its use different from area other. Third, peculiarity a plant drug can see from method its use and method the treatment which different with other areas.

*Hodgsonian macrocarpa* (Bloom) Cogn. is one of plant drug typical ethnic group Besemah who has long used by healers' traditional ethnic group Besemah For treat disease infection such as hepatitis, tuberculosis, pneumonia and degenerative such as liver. How to process and use that is with cut part stem and water stem Which produced accommodated Then drunk. Whereas For usage outside, seed refined and affixed for drug warts (Tanzerina et al., 2023).

Plant drug contain Lots compound chemistry beneficial nature in field health. Compounds chemistry the in the form of compound metabolite secondary that produced by cell secretory. Cell secretory is structure secretion special secreting compound - compound certain. Group compound metabolite secondary Which can utilize that is alkaloids, flavonoids, tannin, steroids, triterpenoids, saponins, coumarin, glycosides, And other and so on. Knowledge about structure secretory a plant important for development herbal medicines. Plants as medicine in general produce compound stored drugs in structure special so-called structure secretory which can in the form of cavity secretory, gland trichomes, glands oil, resin channels. Metabolites secondary like alkaloid compounds, flavonoids, terpenoids and compounds other can found in all plant organs like roots, stems, leaves, flowers or fruit (Anulika et al., 2016; Kandar, 2020). Content compound metabolite found throughout parts of plant organs, therefore That study scientific about structure anatomy plant drug need done for help in tracking structure special potential keep compound metabolites used as material medicine (Tanzerina et al., 2024).

Structure secretory found in all plant organs both on roots, stems, leaves, flowers and also fruit. Scientific

study about anatomy and structure structure secretory which is structure special producer compound metabolite secondary important for carried out, especially on plants *Hodgsonia macrocarpa* (Bloom) Potential cognition as plant drug typical ethnic group Besemah. Plants This grow natural in the forest with very limited population. In connection with local wisdom from ethnic group besemah said, then need done study about *Hodgsonian macrocarpa* (Bloom) Cogn. which includes observation about anatomy and structure secretory and its distribution Because part big metabolite secondary accumulated in network secretory.

## Method

### Pickup location Samples and Research

Study This implemented in the month January until by April 2024. Withdrawal sample plant *Hodgsonian macrocarpa* (Bloom) Cogn by convenience sampling located in Sukaraja Hamlet Subdistrict Sukamerindu, Lahat Regency, South Sumatra. Making preparation anatomy of vegetative organs conducted in the Laboratory Microtechnics and Laboratory Physiology and development, Department Biology, Faculty Mathematics and Science Knowledge Nature, Sriwijaya University .

### Making Preparation Anatomy

Making preparation anatomy done with method Paraffin with Safranin- fast green and whole mount staining. For leaf organs, stems and roots. made incision transverse and paradermal. For incision transverse root used Whole mount method with Safranin staining. Solution fixation using FAA and solution dehydration use Johansen's solution, sliced with microtome turn (Sass, 1958).

Study This use method descriptive, namely method that describes results observation qualitative to vegetative organ structure Good from aspect morphology, anatomy and also structure secretion. Observation morphology done in a way directly in the field. namely with Observe the organs of leaves, stems and roots.

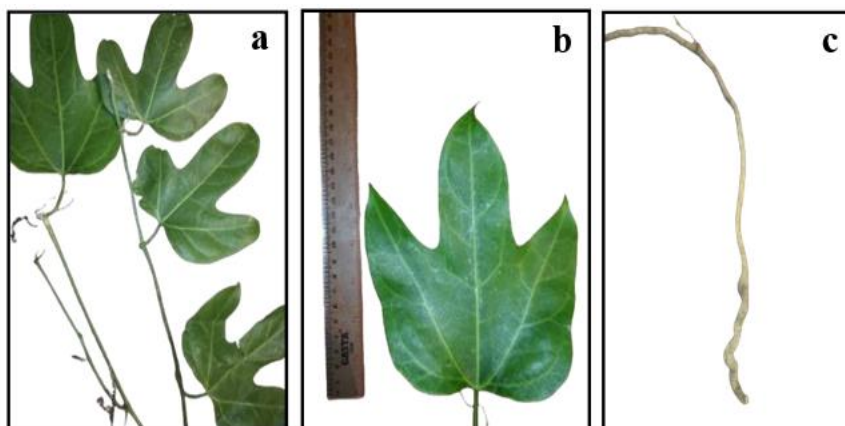
## Results and Discussion

### Morphology *Hodgsonia macrocarpa* (Blume) Cogn. (Tetap Kadam)

Based on observation morphology to organ vegetative *H macrocarpa* has characteristics leaf single, composed alternating, form round egg, lobed three, end leaf tapered (*Acuminate*) at each its lobes, arrangement bone leaf finger (*palminervis*), surface on leaf colored green old and somewhat slippery whereas part surface lower leaf rough colored green young, edge leaf chat to

finger (*palmativedus*). Leaf length 18.8 cm, width 15.8 cm and stalk leaf 5.5 cm (Figure 1b). According to

Cucurbitaceae generally leafy single, curved, share, And fingering.



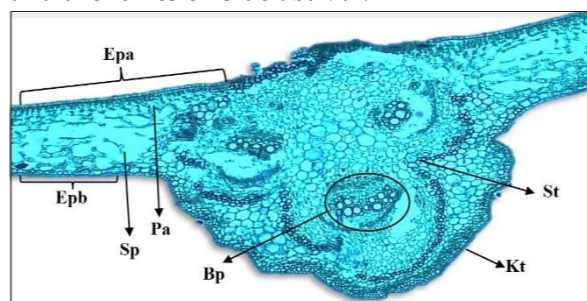
**Figure 1.** Morphology *H. macrocarpa*; (a) stem; (b) leaves; and (c) Root

Stem *H. macrocarpa* mature woody colored pale yellowish, while the young colored green (Figure 1.a), shape stem curved, and direction grow to on with climb to tree in the host, there are additional organs in the form of tendrils. Root ride colored chocolate pale.

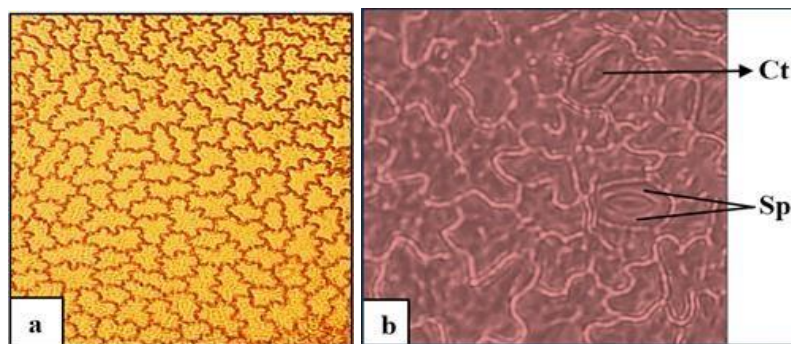
*Structure Anatomy Hodgsonia macrocarpa* (Bloom) Cogn. (Tetap Kadam)

Observation result to structure anatomy leaf *H. macrocarpa* through cross section transverse with thickness 12  $\mu$  m that is leaf composed by network, upper epidermis and lower epidermis are coated cuticle, tissue mesophyll in the form of palisade parenchyma and parenchyma sponge, tissue vessels type collateral

open, and cell but s Which seen clear (Figure 2). Stomata and trichomes on side abaxial.



**Figure 2.** Cross section transverse leaf *H. macrocarpa* with method paraffin (magnification 4x10): Epa (Upper epidermis); Pa (Palisade); Sp (Sponge); Epb (Lower epidermis); Sir (File vessels); St (Sieve cell); and Kt (Cuticle).



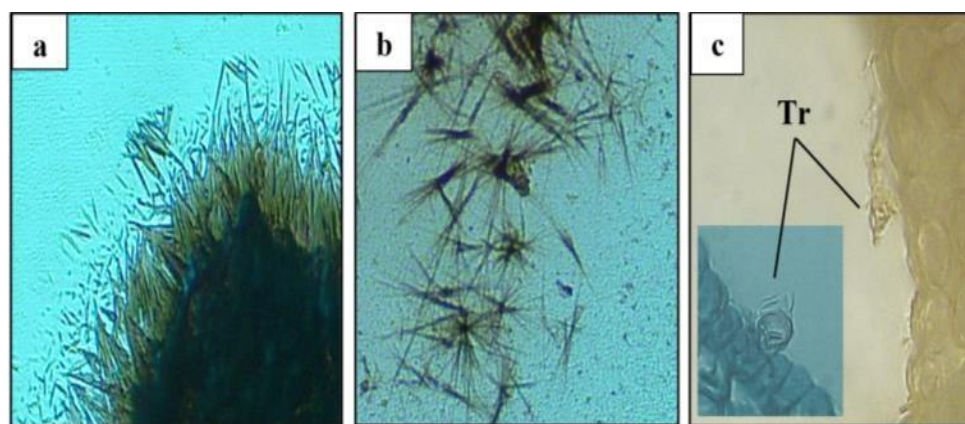
**Figure 3.** Cross section paradermal leaf *H. macrocarpa* with method *wholemout*; Ct: Gap stomata, Sp: Cell closing: (a) Epidermis on cross section paradermal leaf (enlargement 4x10); and (b) Stomata on paradermal leaves (enlargement 40x10)

According to Zuraida (2019) cucurbitaceae stems is plant herbs yearly. Based on Figure 3.a shows the epidermis leaf *H. macrocarpa* has form wall the cell that squiggly with amount curve 5-10 and there are spots smooth. Different forms of epidermis with other types of Cucurbita, according to Maryani et al. (2010) form cell epidermis of leaf *Cucumber Melon* L. is isodiametric –

hexagonal flat edged or grooved with derivative epidermis in the form of stomata and trichomes.

Stomata on leaves *H. macrocarpa* own type parasitic, cell closing parallel with neighbors. Stomata on *H. macrocarpa* only found on part abaxial epidermis. According to Suradinata (1998) type stomata Which only found on surface lower leaves (abaxial) are called hypostomatic stoma.





**Figure 4.** Cross section paradermal surface lower leaf with method *whole mount*: (a) Trichomes single end pointed (Enlargement 4x10); (b) Trichomes star (Enlargement 4x10); and (c) Conoidal glandular trichomes and trichomes headed stalk short (Enlargement 4x10)

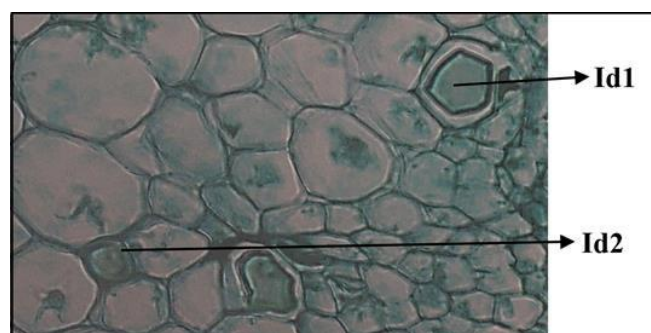
Trichomes on leaves *H. macrocarpa* has type non-glandular trichomes single-celled the only one there is on surface lower just (abaxial) with 2 type different, namely trichome single end pointed and trichome star. According to Purnomo et al. (2015) surface leaf *Cucurbita moschata* (Cucurbitaceae) equipped by trichome shaped single end sharp. According to Mulyani (2006) found that form trichome between species in Cucurbitaceae do not own difference typical. Because most own form resemble stars and there are also some shaped needle and hair single. *Cucurbita sativus* own form like needle cellular. Maryani et al. (2010) adds that on *Cucurbita Melo* own trichome single end sharp. Trichomes on *H. macrocarpa* found 2 types that is type trichome glandular conoidal and type stalk short headed pointed (Figure 4c). According to Saputri et al. (2023) *Citrullus colocynthis*, *Cucurbita Melo* and *Cucurbita pepo* there is two type trichome namely trichome glandular and non-glandular.

Structure secretory in the form of trichome the glands that there is on *H. macrocarpa* allegedly own ability biosynthesis and storage product metabolites. Kumar et al. (2020) state that trichome gland Lots there is on plant Cucurbitaceae, Wrong the only one *Cucurbita Melo*, Saputri et al. (2023) added trichome gland *Cucurbita Melo* spread on epidermis lower leaf.

Network base in the form of mesophyll Which differentiate become parenchyma palisade and parenchyma sponge. Parenchyma palisade is at appropriate in below the upper epidermis, shaped elongated, arranged in One layer cell and no too meeting, whereas parenchyma sponge found next to lower network palisade shaped round, arranged No meeting, And no regular. According to Suradinata (1998) that parenchyma palisade consists of from long, upright cells straight on surface leaf, whereas parenchyma sponge consists of on cells that are shaped like many kinds of,

often not regularly, with branching expand from cell to cell other.

Leaf *H. macrocarpa* is included dorsiventral type, where on parenchyma palisade there is in part epidermis on, and parenchyma sponge located on part lower (Figure 2). According to Rahman (2022) that leaves that have palisade parenchyma in one side leaves and parenchyma flower coral on the side other, it is said dorsiventral or bifacial. Badmanaban et al. (2009) reported that the *Lagenaria leaves siceraria* (Cucurbitaceae) dorsiventral type, network elongated palisade upright straight to surface and network sponge located in lower epidermis.



**Figure 5.** Cross section transverse leaf *H. macrocarpa* Id1: Idioblast shaped Pentagon; and Id2: Idioblast shaped round (4x10)

Network blood vessels in the bones leaf there is three file vessels, with One vessel the main one located in part middle, and in groups two Which the size smaller, there is file carrier namely xylem and phloem, And cell but s with clear. According to Wahyuni et al. (2019) stated that xylem consists of from trachea, tracheids, fibers wood and parenchyma wood, whereas phloem arranged from cell filter, cell companion and parenchyma phloem. Xylem play a role in channeling water, material standard raw material Eat raw give strength Mechanicon leaf, whereas phloem plays a role

in process translocation material food (results photosynthesis) from mesophyllleaves. Nuraida & Nisa (2017) stated that cell compiler cell but s has wall transverse Which functioning as partition Which have pores for strainer or filter.

Cell idioblast on leaf *H. macrocarpa* shaped round and the pentagon located on network parenchyma leaves (Figure 5). The presence of structure secretory in the form of cell idioblasts and glandular trichomes on leaves *H. macrocarpa* allegedly contain material active in the form of compound metabolites that can used as material accumulated drugs in network secretory. Leaves on *H. macrocarpa* utilized as plant drug for treat disease infection like flu with drink boiled water the leaves. Besides diseaseinfection plant This Also used for treat wounds and constipation, *H macrocarpha* used as material drug traditional Because contain compound a c t i v e processed with burn leaf, then affixed on skin (Biswas et al., 2018).

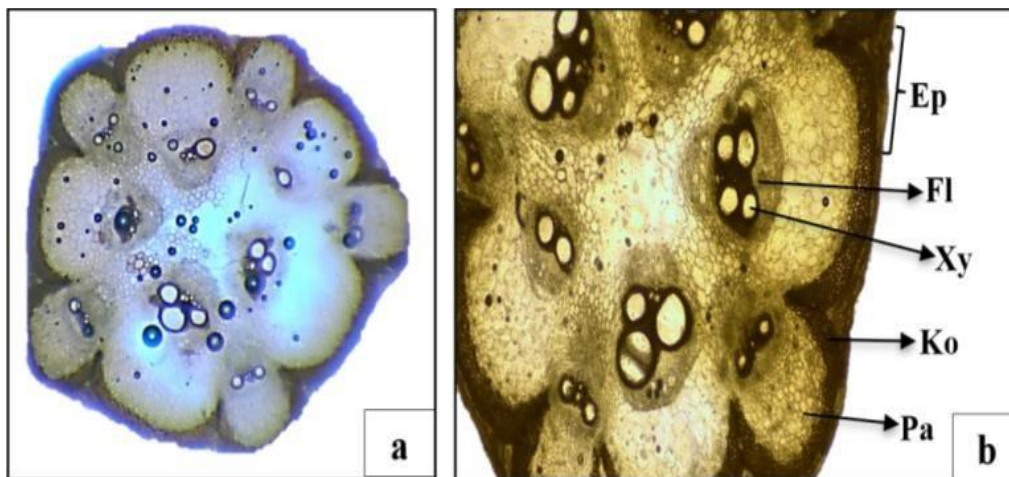
Utilization of *H. macrocarpa* in India as a medicine for ear, nose, eye And mouth as well as fever with utilise the leaves (Panda et al., 2018) and pasta the leaves used for massage painful body (Kichu et al., 2015). According to Perry & Metzger (1980), in the Malay Peninsula, boiled water from the leaves is drunk to treat fever and nasal

problems, while in Kalimantan it is used to treat chest swelling (Susiarti & Setyowati, 2005). Rizwana et al. (2010), said that leaf *H. macrocarpa* used to treat nosebleeds and to reduce body heat because it has antiviral properties

Metabolites secondary general found on part big plants. The existence of metabolite secondary certain such as alkaloids, flavonoids and terpenoids in plants efficacious for health, part big metabolite until moment This Not yet There is information Which report about content compound Which secreted by glandular trichomes and idioblasts on leaf *H. macrocarpa*, so that required study advanced related types content compound on leaf *H. macrocarpa*.

#### Structure Anatomy Stem *Hodgsonia macrocarpa* (Bloom) Cogn

On the cross-section transverse stem *H. macrocarpa* is known that structure anatomy arranged by epidermis tissue, tissue cortex among them collenchyma and parenchyma, tissue xylem and phloem vessels, trichomes, cell idioblast and crystals. Cells idioblast on leaf *H. macrocarpa* shaped round that located in network parenchyma. Tissue vessels consists of five groups size big and three group sizes small.



**Figure 6.** Cross section transverse stem *H. macrocarpa* with method *whole mount* (magnification (Magnification 10x10): Ep (Epidermis); Pa (Parenchyma); Ko (Collenchyma); Fl (Phloem); Xy (Xylem)

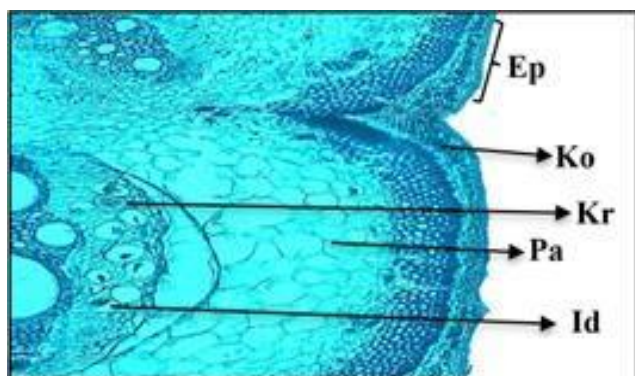
According to Hindriana & Handayani (2023) Idioblast is cell secretory single, isolated and specialized Which general in network parenchyma and contain substance typical. On the cross-section transverse stem *H. macrocarpa* own surface, No flat and wavy with 10 curves with size No The same large (Figure 6.a). The epidermis is composed of from One layer cell oval shaped parallel and even. According to Morita et al. (2021) epidermis of the stem arranged by one layer cell, keep on arranging meeting without room between cell, wall outside there is functional cuticle for

protect stem from excessive water loss big. Serrill et al. (2015) state that epidermis stem *Cucurbita moschata* And *Colocynthis vulgaris* arranged regular with thin cells. Kumar et al. (2020) added that in *Laffa acutangular* (Cucurbitaceae) has epidermis layered single Which consists of from cells shaped barrel.

Network base on stem in the form of network parenchyma and collenchyma. Network parenchyma arranged meeting, shaped oval, size small until big, whereas network collenchyma arranged in every curve and is at near epidermis. According to Hürkul (2021)



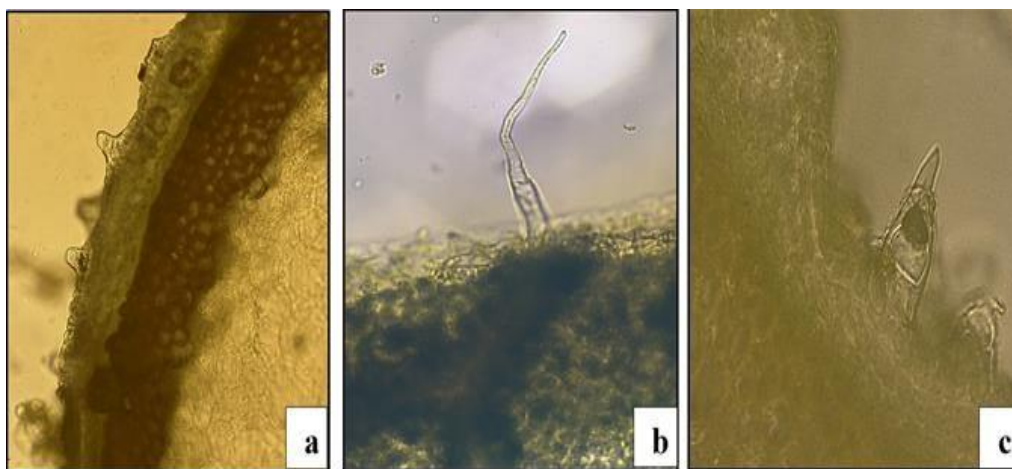
cortex arranged by a number of layer cell parenchyma Which No regular and walled thin, Lots room between cell, there is collenchyma and sclerenchyma function as supporters and amplifier body. Pereira-Dias & Santos (2015) stated on part in epidermis usually there is collenchyma Which originate from parenchyma Which experience modification with thickening. Luo et al. (2016) add that on *Momordica charantia* the trunk shaped Pentagon with epidermis one layer, there is 6–8-line collenchyma is atin the corner stem.



**Figure 7.** Cross section transverse stem *H. macrocarpa* Paraffin method (enlargement) 4x10), Cr: Crystal; Id:Idioblast

Composition bond vessels in the stem *H. macrocarpa* consists of five groups type bicollateral and side outside there is bond more vessels small. Mulyani (2006) state that file the accomplice consists of on xylem in the middle as well as One part phloem on the side outside and one part in adjacent in Network vessels in the stem *H. macrocarpa* there are five groups big and five groups small bond carrier part middle stem filled parenchyma pith. According to Drees et al. (2021) vessels consists of from a number of file vessels Which different its size. System vessels usually consists of from file Which spread as if no regular.

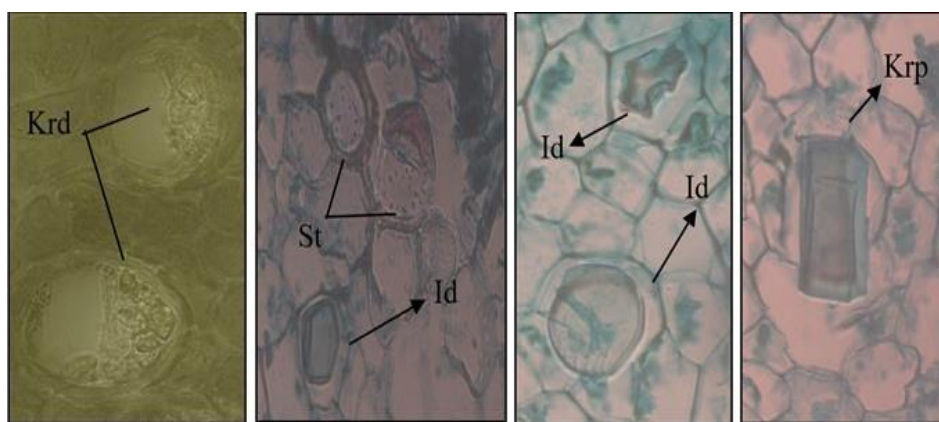
Trichomes on the stem *H. macrocarpa* has glandular and non-glandular types with form Which different that is glandular stalk trichomes short headed round (figure 8 a), trichomes uniseriate end pointed (8b) and glandular trichomes at the end sharp. According to Naspiah et al. (2024) trichome can consists of on one cell or lots cell, there is on part surface organ, trichome based on its nature there is two namely non- glandular trichomes that are not emit secretion which can consists of on one or lots cell and trichome gland which emit secretion in the form of salt, sugar (nectar), turpentine and gum.



**Figure.8.** Cross section transverse stem *H. macrocarpa* method whole mount; (a) Trichomes gland head round (Enlargement) 10x10); (b) Trichomes single cellular One (Enlargement) 10x10); and (c) Trichome a gland end pointed (Enlargement) 40x10).

Trichome glandular involved in secretion various compound, that is salt, honey, terpenes, And polysaccharides. Trichomes Which secretes salt in shape can in the form of bubbles (consists of on cell glands) and glands multicellular consisting of on a number of cell glands and basal cells, mostly glandular trichomes have layer wall in consists of on bulge with various form and complicated, functioning for transport secretion through wall surface glands. Trichomes gland covers diverse form and structure, with existence active cells in a way

metabolic and own ability for secrete or keep metabolite special in amount big. On the network parenchyma stem *H macrocarpa* is also present a number of type crystal that is druse crystals, and crystals prism. Druse crystals in the form of crystal compound. Besides crystal also obtained compound ergastic namely starch with type starch compound or *polyadelf*. According to Mulyani (2006) starch compound is grain starch Which havemore from one hilum, each surrounded by lamella.



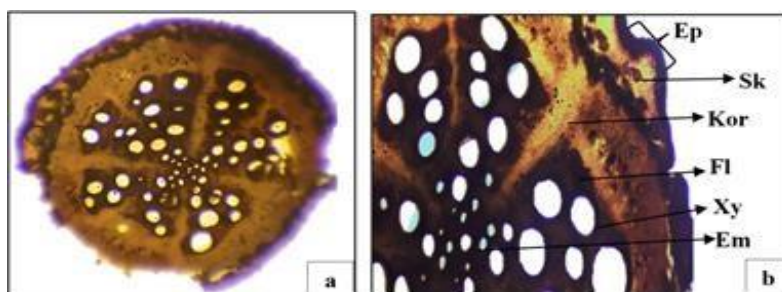
**Figure.9.** Cross section transverse *H. macrocarpa* 10X10 magnification  
Credit: druse crystal; Krp: crystal prism; St: sieve cell; Id: idioblast

Structure secretory on stem besides glandular trichomes are also found existence cell idioblast shaped round with color A little redness of the tissue parenchyma. Plant drug Which contain compound active for treatment allegedly own compound metabolite secondary stored in structure secretory. Stem from *H. macrocarpa* utilized by public ethnic group Besemah For treat disease infection like hepatitis, inflammation lungs, TB, pneumonia and degenerative like liver. With method processing and use that is cut part stem and water stem Which produced

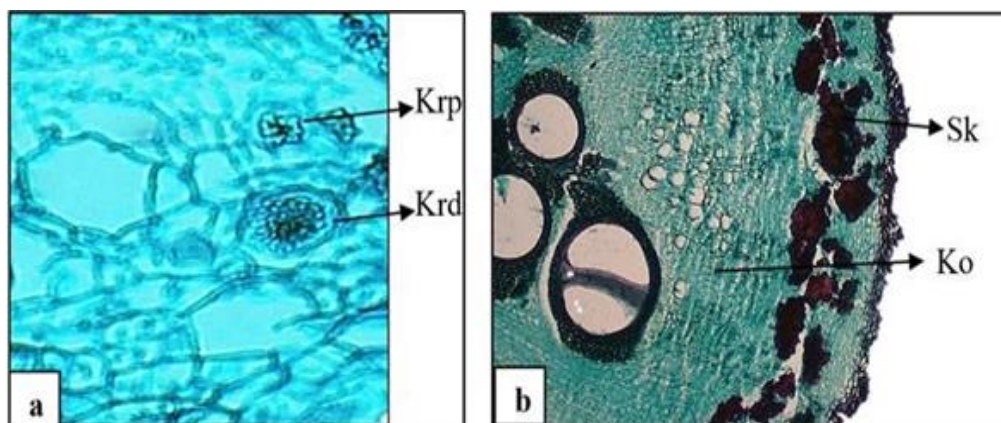
accommodated Then drunk (Tanzerina et al., 2023).

*Structure Anatomy Root Hodgson macrocarpa (Bloom) Cogn. (Fixed kadam)*

On cross section transverse root *H. macrocarpa* Already experience growth secondary below the epidermis layer is visible network cork that will replaces the epidermis as protector, network base in the form of parenchyma, collenchyma and sclereids, as well as network vessels, xylem next to in phloem, and crystals (Figure 10).



**Figure 10.** Cross section transverse root *H. macrocarpa* with method *wholemount* (magnification 4x10): Ep (Epidermis); Sc (Sclereid); Kor (Cortex); Em (Pith); Xy (Xylem); Fl (Phloem)



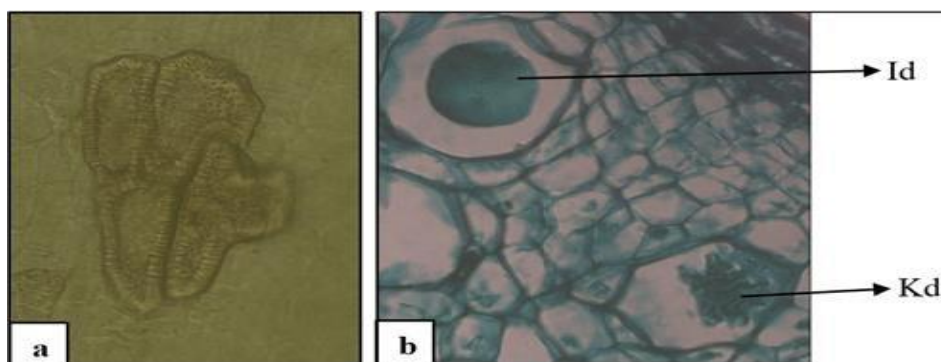
**Figure 11.** Cross section transverse root *H. macrocarpa* with method paraffin (Enlargement) 4x10): Ko (Collenchyma); Sc (Sclereid); Krd (Druse crystal); and Krp (Crystal systolic)

Type crystals on the roots *H. macrocarpa* is crystal druse and crystal systolic with form like grapes (Figure 11), besides it was also found existence cell idioblast shaped round. Presence crystal druse functioning for support structure, defense to herbivore, storage calcium, and increase photosynthesis.

According to Mulyani (2006) that stone cells develop from parenchyma with thickening wall cell secondary. Wall secondary very thick and in inside looks a number of layer centralized And dot branched. Cell tracheid on root *H. macrocarpa* A little curved and uneven, shaped rectangle, consists of from a number of layer thick (Figure 12a). The epidermis as network outermost Which compile root, arrangement cell on epidermis is very dense, cells One with other cells each other attached and not There is room intercellular. Tissue epidermis the more long will the more thicken,

thickening This functioning for give protection on the network in the section more in.

Network base in the form of network parenchyma and collenchyma. Tissue parenchyma arranged meeting. The cortex is network compiler the roots are located is at after epidermis. Function network This is for keep backup food. Compiler main network cortex is network parenchyma Which relatively looser with network amplifier which often seen close up injured tissue. Therefore, development cell rock considered as response or response to damage physiological. On the skin wood, the amount cell altered parenchyma become sclerida due to the network that aging. Based on Figure 12a, there are sclereid with type brachysclereid Which located under the epidermis.



**Figure 12.** Cross section transverse root *H. macrocarpa* (Magnification 10x10): (a) Sclereid; and (b) Cell Idioblast And crystal druse

On the network parenchyma root *H. macrocarpa* was also found cell idioblast shaped round and druse crystals found in root allegedly that root own content compound metabolite Which potential as material drug. Metabolite secondary is compound organic synthesized by plants and is source compound drug, classified on alkaloids, terpenoids, steroids, flavonoid and saponins. The benefit content compound metabolite secondary potential as antioxidants, anticancer, anti-inflammatory, antimicrobial, And antidiabetic.

## Conclusion

Based on results study anatomy and structure secretory as well as its distribution on *Hodgsonia macrocarpa* (Blume) Cogn. so can concluded Leaf *H. macrocarpa* by dermal tissue Which consists of from, epidermis on and lower epidermis, tissue parenchyma palisade and parenchyma sponge, tissue vessels, and cells, also found in leaves glandular and non-glandular thymoma, crystals druse and cells idioblasts. Stem *H. macrocarpa* is composed of tissue epidermis, tissue base parenchyma and collenchyma as well as network vessels

xylem and phloem. Glandular trichomes are in the form of glandular trichomes terminal blunt, glandular trichomes terminal pointed, and non-glandular; trichomes uniseriate, as well as cell idioblasts and crystal. Root *H. macrocarpa* arranged by network epidermis, network base, network vessels, sclereid, cell idioblast shaped round and druse crystals and systolic. Type structure secretory in a way overall on *H. macrocarpa* in the form of conoidal glandular trichomes, trichome end blunt and trichome headed stalk short, cell idioblast shaped round and pentagonal as well as druse, prism and cystolith crystals. Distribution structure secretion covering leaves, stems and roots. Based on the discoverer structure secretory that stores compound metabolite secondary in *H. macrocarpa*. So recommended For Histochemical and phytochemical tests were carried out on *H. macrocarpa* This more carry on as effort development for material standard herbal medicine.

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### Authors Contributions

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### Conflicts of Interest

The authors declare no conflict of interest.

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