Leaf Trichomes Morphology of *Hyptis suaveolens* (L.) Poit. (LAMIACEAE)

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**Abstract.** *Hyptis suaveolens* L. Poit. is one of the plants from family Lamiaceae and is an aromatic plant. The aroma contained in plants is usually secreted by certain structures in plants, such as glandular trichomes. At this plant has been carried out observations about the type and distribution of trichomes by using light microscopy and SEM (Scanning Electron Microscopy). The results showed that the leaves of this plant are non-glandular trichomes types and glandular, either on the surface abaxial and adaxial and on the veins. Non-glandular trichomes consist of the monoselula and multicellular trichomes. While the glandular trichomes consist of peltate type, capitate type I and type II.

1. Introduction

*Hyptis suaveolens* L. Poit. is a herbaceous, branched, aromatic, often woody plant at the base, height 0.4-2 m. Long-haired stems, oval leaves with a base of rounded heart shapes, irregularly serrated [1, 2], leaf surfaces have hair glands. Hair glandsular or glandular trichomes of aromatic plants common produce essential oil [3]. Glandular trichomes are one of the secretory structures found in plants [4] that can secrete secondary metabolite [5] especially in Labiatae, Verbenaceae and Geraniaceae [6] families. The scented leaves are caused by essential oils. Which are secreted by glandular trichomes. Many species of the Labiatae family have glandular trichomes [7] spread over vegetative and generative organs [8] and more prevalent in leaves and flowers [9]. The morphology, distribution and number of glandular trichomes may be as distinguishing characteristics at the subfamily level of Labiatae [10]. According to Cutler [11], when a plant has a trichome, it is usually in a form that can characterize the plant species.

Trichomes are additional cells or derivatives of the epidermis, [4, 12]. In some plants, the trichomes are persistent or may persist in their organs as long as the organ is alive or it may dry out and fall off at any one time [12]. Trichomes usually arise from asymmetric cleavage in a single protodermis of stem cells. Although in fact the cell division of the stem cell is symmetrical and more than one beginner cell is involved. In adult cells the possibility without protopasma, but the cells remain alive [13]. The cell wall of trichomes generally consists of cellulose and is covered with...
cuticles [14]. In general, trichomes can be divided into two groups, ie non glandular or glandular trichomes that have secretions [11, 15, 16].

The main function of trichomes in plants is as a defense [17]. Non-glandular trichomes in plants may, among other things, affect the physiological and ecological conditions of plants, whereas glandular trichomes may provide plant resistance to insects, herbivorous and pathogenic attacks based on the chemical compounds they contain [18]. The results of glandular trichome secretions may also be useful for humans, such as for the manufacture of pesticides, drugs, cooking spices and perfumes [19].

2. Methods

Plant material

*H. suaveolens* leaves are obtained from natural populations in the area of Air Tawar, Padang, Indonesia. Leaves taken are young, mature and old leaves to be observed anatomically by using light microscopes and electron microscopes.

Light microscope

Young, adult and old *H. suaveolens* leaves are taken in the field, then taken to the laboratory and then fed into the FAA solution (formalin, acetic acid and alcohol). The leaves are made of transverse incision and stained with safranin, then placed on a glass object and covered with a cover glass, then observed trichome form and trichome types contained on the leaf by light microscope model Primo Star iLED Miroscopes from Carl Zeiss Microlmaging GmbH P. OB.4041.37030, Gottingen, Germany.

Scanning Electron Microscopy (SEM).

Approximately 0.5 cm fresh leaves from *H. suaveolens* are placed on the top of the sample holder of the electron microscope, then immediately observed by Scanning Electron Microscopy Phenom Prox model. The observed leaf surface is the adaxial (base and leaf end) and abaxial (base and leaf end).

3. Results And Discussions

The glandular trichomes of *H. suaveolens* leaf was investigated by light microscope and Scanning Electron Microscopy (SEM) and was summarized in Figure 1 and Figure 2.
Figure 1. The distribution of trichomes in *H. suaveolens* leaves present in the adaxial and abaxial portions observed by light microscopy (A and B), unicellular non-glandular trichomes (C), multicellular non-glandular trichomes (D), glandular tricks of peltate type (E), Glandular trichomes capitate type I and capitate II (F), head cells consisting of secretory cells with subcutaneous cavities in glandular trichomes (G) and glandular trichomes that have secreted secretions (H).
Figure 2. Trichomes observation of *H. suaveolens* leaf with SEM, visible type of non-glandular and glandular trichomes (A), non-glandular and glandular trichomes are also present in leaf bone (B), glandular capitate type I (C) trichomes, cell Head in a glandular trichome consisting of four cells (D), a glandular trichome that releases its secretory (E-F).

Trichoma capitate type II has a stalk with a size longer than the capitate type I. The capitate-type mice are commonly found in the Lamiaceae family [10], but with varying head length and head size. Commonly composed of one or two stalk cells with one or two round cells forming a secret cell. Cell secretion in glandular trichomes is assumed to be a volatile oil-producing cell in the familia Lamiaceae. Cell secretion is related to the stem and cell base and is also associated with the secretion-subcutaneous oil subcutaneous cavity (Fig.).

The glandular trichomes observed by SEM, visible non-glandular and glandular trichomes (Fig. 2A). Werker, et al. [18], explains that almost all plant body surfaces that emit the scent of the Lamiaceae family are covered by non-glandular trichomes and glandular trichomes or secretory trichomes. In Figure 2B, the spread of non-glandular trichomes and glandular trichomes is also present in the leaf bone. Glandular trichomial head cells are round with smooth surfaces. In the head cell there is a secretion cell consisting of one to several cells. The secretion results will be collected in the subcutaneous cavity, if this cavity is broken, the secretion results will come out and the glandular trichom cell head will contract (Fig. 2E-F). Malecci and Servettaz [20] explains, in adult trichomes,
the results of secretions accumulate in the large subcutaneous space and form above the secretion cells. The release of this secretion results in a certain aroma. The leaves are scented because of the glandular trichomes that secrete essential oils.

4. Conclusion
From the results of the study, it can be concluded that in *H. suaveolens* L. leaf there are five types of trichomes, ie unicellular non-glandular and monocellular, glandular peltate, type I capitate and type II capitate. Both non-glandular trichomes and glandular trichomes are dispersed in abaxial and adaxial portion of the leaf and are present in the leaf vein.

References
[1]. Henderson.1959. Malayan Wild Flowers (Dicotyledons). Tien Wah Press ltd., Singapore.
[2]. Backer, C.A and R.C.B Van de Brink. 1965. Flora of Java. Vol. II. N.V.P Noordhoff-Graningen. Netherlands.
[3]. Simpson .G.2006.Plant Systematics.Elsevier Academic Press. USA.
[4]. Fahn, A. 1990. *Plant Anatomy*.4st Ed. New York. Pergamon Press
[5]. Schilmiller, A.L., R.L Last and E Pichersky. 2008. Harnessing Plant Trichome Biochemistry for the Production of Useful Compounds. The Plant Journal 54: 702-711.
[6]. Handa, S.S. 2008. An Overview of Extraction Techniques for Medicinal and Aromatic Plants. In Extraction Technologies for Medicinal and Aromatic Plants. International Centre for Science and High Technology: 21-54.
[7]. Singh G. 2010. Plant Systematics. An Intregated Approach. Third Edition. Science Publisher. USA.
[8]. Werker, E. 1993. Fuction of Essential Oil-Secreting Glandular Hairs in Aromatic Plants of Lamiaceae-a Review. Flavour and Fragrance Journal. Vol.8 (5): 249-255.
[9]. Baran P., C Ozdemir and K Aktas. 2010. Structural Investigation of the Glandular Trichomes of *Salvia argentea*. Biologia 65/1 : 33-38.
[10]. Ascensao L., N Marques and M.S Pais. 1995. Glandular Trichomes on Vegetatif and Reproductive Organs of *Leonotis leonurus* (Lamiaceae). Annals of Botany 75: 619-626.
[11]. Cutler D.F. 1978. *Applied Plant Anatomy*. Longman Inc. New York.
[12]. Varghese T.M. 1987. An Introduction to The Anatomy of Angiospermae. Allied Publisher Limited. New Delhi.
[13]. Dickison W.C. 2000. *Integrative Plant Anatomy*. Academic Press. USA
[14]. Mishra S.R. 2009. *Understanding Plant Anatomy*. Discovery Publishing House PVT. Ltd. New Delhi. India.
[15]. Mauseth J.D. 1988. *Plant Anatomy*. Pulishing Company Inc.Menlo Park, California.
[16]. Werker E. 2005. Trichome Diversity and Development. In Plant Trichomes (Hallahan D.L and J.C Gray, eds.). Advances in Botanical Research. Vol 31. New York. Academic Press.: 1-35.
[17]. Levin, D.A. 1973. *The Role of Trichomes in Plant Defense*. The University of Chicago Press.
[18]. Werker, E., U. Ravid and E. Putievsky. 1985. Struktur of Glandular Hairs and Identification of Main Component of Their Secreted Material in Some Species of Labiatae. Israel J Bot. 34:31-35.
[19]. Duke, S.O. 1994. Commentary Glandular Trichomes; A Focal Point of chemical and Structural Interaction. International Journal of Plant Science 155: 617-620.
[20]. Malecci, L.B and O. Servettaz. 1991. Morphology and Distribution of Trichomes in Italian species of *Teucrium* sect. *Chamaedrys* (Labiatae) - a Taxonomical Evaluation. Pl.Syst.Evol.174 : 83 – 91.