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MICROSCOPIC STUDY OF TRICHOME NUMBER AS TAXONOMIC CHARACTER OF SELECTED *SOLANUM* SPECIES IN THAILAND

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Abstract: The study is aimed to examine structural characteristics of leaf for identification of selected *Solanum* species (*Solanum* spp.) in terms of trichome number. Eight species in the Genus *Solanum*, which include *Solanum aculeatissimum* Jacq., *S. indicum* L., *S. melongena* L., *S. melongena* L. var. *esculentum*, *S. stramonifolium* Jacq., *S. torvum* Sw., *S. trilobatum* L., and *S. xanthocarpum* Schrad. & H. Wendl. were selected. Fresh and mature leaves collected from various locations across Thailand and number of dorsal and ventral trichomes in one millimeter squared area were examined under a photomicroscope. Six out of eight species had stellate trichome, while *S. stramonifolium* had both stellate and multicellular, uniseriate trichome and *S. trilobatum* had no trichome. Mean, minimum, maximum, and standard deviations were calculated and analyzed. For each species, the average ventral trichome number was higher than average dorsal trichome number. In addition, results showed a comparative data of trichome number among selected *Solanum* spp.

Keywords: Solanum, Solanaceae, Trichome number

บทคัดย่อ: การศึกษานี้มีวัตถุประสงค์เพื่อศึกษาลักษณะโครงสร้างของใบในกลุ่มต่างๆของสายพันธุ์มะเขือ (*Solanum* spp.) ในแง่ของจำนวนขนใบ (trichome) ในพืชสกุลมะเขือจำนวนแปดชนิด ซึ่งรวมถึง *Solanum aculeatissimum* Jacq., *S. indicum* L., *S. melongena* L., *S. melongena* L. var. *esculentum*, *S. stramonifolium* Jacq., *S. torvum* Sw., *S. trilobatum* L. และ *S. xanthocarpum* Schrad & H. Wendl โดยเก็บเฉพาะใบสด และโตเต็มที่ ซึ่งเก็บจากสถานที่ต่างๆ ทั่วประเทศ มาศึกษาจำนวนขนใบ บริเวณหลังใบและท้องใบในพื้นที่หนึ่งตารางมิลลิเมตรภายใต้กล้องจุลทรรศน์ (photomicroscope) โดยพบว่ามะเขือหกชนิดจากแปดชนิด มี stellate trichome ในขณะที่ *S. stramonifolium* มีทั้ง stellate และ multicellular, uniseriate trichome และ *S. trilobatum* ไม่มี trichome เลย ค่าเฉลี่ย ต่ำสุด สูงสุด และค่าเบี่ยงเบนมาตรฐาน ของจำนวนขนใบสำหรับแต่ละสายพันธุ์ พบว่าค่าเฉลี่ยของขนใบบริเวณท้องใบ สูงกว่าค่าเฉลี่ยของขนใบบริเวณหลังใบ โดยผลการศึกษานี้แสดงข้อมูลเปรียบเทียบของจำนวนขนใบในกลุ่มต่างๆของสายพันธุ์มะเขือที่ถูกคัดเลือกมาทำการศึกษา

คำสำคัญ : พืชสกุลมะเขือ, พืชวงศ์มะเขือ, จำนวนขนใบ

INTRODUCTION

Solanum, a genus belonging to Family Solanaceae, constitutes one of the largest genera of angiosperms. There are approximately 2000 species in the world and are mainly concentrated in tropical and sub-tropical areas (Yousaf *et al*., 2013). They are mostly founded in South America, Australia, and Africa, while grows relatively less in Europe and Asia (Hayati *et al*., 2005). *Solanum* spp. are not only economically important crops, but they are also medicinally and ornamentally valuable (Thongpukdee *et al*., 2013). In Asia, *S. aculeatissimum* are used as rootstock for tomato and eggplant (Nicholson, 2008). Likewise, fruits of *S. xanthocarpum* can treat skin complaints while its roots can cure toothache (Blomgvist and Nguyen, 1999). *S. melongena* or "eggplant" help lower blood cholesterol levels and blood pressure. Its leaves are narcotic and toxic, but its poultice can treat burns and cold sores (Japan International Research Center for Agricultural Sciences, 2014). *S. trilobatum* L. is beneficial in treating cough and diabetes (Thongpukdee and Chockpisit, 2010). Fruits of *S. melongena* or "golden egg" is eaten when ripe (Porcher, 2009). *S. stramonifolium* is used to enhance flavor in Thai cuisine (Porcher, 2009). Medicinal properties of *S. torvum* include anti-tussive, anti-diabetic, and pain reliever (Encyclopedia of Life, 2014). Among a variety of *Solanum* spp. in Thailand, they show differing quantitative traits from inherent traits and geographic distribution (Taridno, 2008). For that reason, it is important to authenticate these medicinal plants. Therefore, the study of trichome number may contribute to providing taxonomic significance data for revision of selected *Solanum* spp. in Thailand.

MATERIALS AND METHODS

The following materials were obtained from commercial sources. Ethanol (Lot. No. 30655783223) was obtained from Merck Ltd., Thailand. Hydrochloric acid (Lot. No. 857035021553) was obtained from RCI Labscan Ltd., Thailand. Sodium hypochlorite (Lot. No.76815294855) was obtained from Alax Finechem Pty., Ltd. Chloral hydrate (Lot. No. 13067139791) was obtained from Alax Finechem Pty., Ltd.

Materials for plant authentication

Fresh leaves of eight *Solanum* spp. were collected from various locations across Thailand. All samples were authenticated by Assoc. Prof. Dr. Nijsiri Ruangrungsi, College of Public Health Sciences, Chulalongkorn University and deposited at College of Public Health Sciences, Chulalongkorn University.

Method for microscopic analysis

The leaf of all samples had been soaked in 70 % (v/v) ethanol for at least 2 weeks prior before used. Transverse sections of midrib and main veins of leaves were cut into small pieces. Calcium oxalates of leaves were removed by boiling specimens in 50% (v/v) hydrochloric acid under low heat for ten minutes. Then, specimens were bleached with 50% (v/v) sodium hypochlorite solution, and cleared with chloral hydrate solution under low heat. Then, the samples were rinsed with distilled water until the samples were cleaned and

mounted the samples on slide and covered with cover glass. A 20X magnification of objective lens of compound microscope, with an attached digital camera was used and recorded the images. The images were scaled for the area of 0.5 millimeter squared using program AxioVision version 4.6.3.0 prior counting the dorsal and ventral trichomes in one-millimeter squared area of each *Solanum* spp. Leaves were examined and counted under a photomicroscope as shown by Figure 1.

Figure 1: Photomicroscope AxioVision 40 attached to computer with AxioVision software version 4.6.3.0

RESULTS AND DISCUSSION

The constant number of dorsal and ventral trichomes in one millimeter squared area of each *Solanum* spp. were examined and counted under a photomicroscope as shown by Figure 1. The mean, minimum, maximum and standard deviation (SD) of trichome numbers were then analyzed as shown by Table 1.

Table 1: Trichome number of eight *Solanum* spp. in one millimeter squared area*

Solanum spp.	Mean		Minimum		Maximum		Standard Deviation	
	Dorsal	Ventral	Dorsal	Ventral	Dorsal	Ventral	Dorsal	Ventral
S. aculeatissimum	5.89	11.61	4.33	6.83	8.00	15.17	0.79	1.79
S. indicum	24.29	27.05	16.00	21.00	33.00	33.50	3.55	3.33
S. melongena	4.62	10.45	5.00	7.50	10.00	14.33	0.83	1.67
S. melongena var. *esculentum*	4.76	9.22	3.00	5.83	8.00	13.50	1.15	1.87
S. stramonifolium	6.57	12.28	3.67	7.83	9.83	17.00	1.56	2.10
S. torvum	17.76	21.87	13.00	1517	23.67	28.83	2.44	3.17
S. trilobatum	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
S. xanthocarpum	7.13	13.16	4.33	9.00	9.33	9.33	1.23	2.01

* n = 3, each sample were done in triplicate

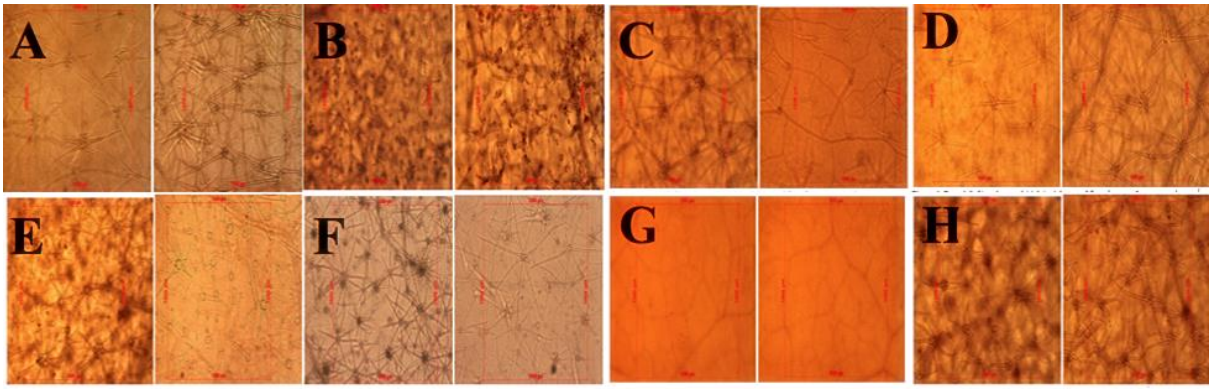

Figure 2: Dorsal (left) and ventral (right) trichome of (A) *S. aculeatissimum*, (B) *S. indicum* , (C) *S. melongena*, (D) *S. melongena* L. var. *esculentum*, (E) *S. stramonifolium*, (F) *S. torvum*, (G) *S. trilobatum*, and (H) *S. xanthocarpum*

According to Table 1, *S. indicum* had the highest averages for dorsal trichome of 24.29 with SD of 3.55 and ventral trichome of 27.05 with SD of 3.33. On the other hand, *S. trilobatum* L. had no trichome present. For the rest of the species, the trichome numbers are specified in the table. The relationship, however, between the dorsal and ventral trichome for eight *Solanum* spp. is a higher number of ventral trichome than those of dorsal trichome.

Due to the small area scaled to count trichome, it was believed to increase systematic error because of the limited number of trichome present in a one-millimeter squared area. It is suggested to increase the area of photograph. In addition, the inaccurate selection of mature leaf may have contributed to an inaccurate count of trichome number. It is recommended to collect more specimens.

CONCLUSION

Microscopic analysis of medicinal plants, such as trichome number, is an important, first-step identification technique. However, it is recommended to study other analytical methods to give further support for useful information, such as DNA fingerprinting assay.

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