International Journal of Trend in Scientific Research and Development (IJTSRD)
International Open Access Journal
ISSN No: 2456 - 6470 | www.ijtsrd.com | Volume - 1 | Issue – 6

Counting of Stomata from Different Types of Leaves

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ABSTRACT

Stomata play a vital role in a plant's life. It helps in the process of Photosynthesis and Respiration. The exchange of gases also occurs through stomata. Thus Stomata is very important part of the plant. Few plants belonging to class Dicot and Monocot were collected to study the number of stomata present in their leaves. Leaves from Herbs, Shrubs, Trees and Climbers were collected for the study. These leaves were collected from wide areas from Ahmedabad city. As the stomata are located on the dorsal surface of leaf, the chlorophyll was scrapped from the dorsal surface. The chlorophyll content should be removed to see the stomata clearly. This chlorophyll content was removed using blade/scalpel and water. The number of stomata was calculated using 'Micrometer slide'. The scale on 'Micrometer scale' was 0.01 micrometer. This 'Micrometer slide' was kept under the microscope and the scale was fixed. After that only the number of stomata was calculated. It was found that 'Tulsi' had the maximum number of stomata among the dicotyledons whereas 'Pancreatium sp' had the maximum number of stomata among the Monocotyledons. The stomata were calculated in fresh leaves of collected plants. The number stomata were carried out under 'Compound Microscope'. The number of stomata is directly related to the enhancement of Physiological process.

Keywords: *Stomata, Guard cell, Epidermis*

INTRODUCTION

Stomata are small apertures on the leaf surface that regulate loss of water via transpiration and Carbon dioxide uptake during photosynthesis, and thereby water relation and plant biomass accumulation is influenced by stomatal movement. On the leaf surface, stomata may occur on both sides are known as Amphistomatous leaves or on either surface alone, usually the lower surface are known as Hypostomatous leaves. Amphistomatous leaves are most commonly found in arid environments, whereas leaves with stomata only on the underside seem to be more common in plants of Mesophytic habitats**.** On the other hand, although less common in nature, leaves with stomata only on the adaxial (upper) surface are known as Epistomatous or Hyperstomatous leaves can be found in some floating plants, such as water lilies[1]

Stomata are crucial in land plant productivity and survival. In general, with lower irradiance, stomatal and epidermal cell frequency per unit leaf area decreases, whereas guard-cell length or width increases. Anatomically, sun leaves have a more developed palisade tissue and a larger mesophyll surface area per unit leaf area (SLA), besides being thicker than shade leaves. Among the various stomatal characters, stomatal density (SD) is an important eco-physiological parameter that affects gas exchange and photosynthesis[2].

Stomata are small pores on the surfaces of leaves and generally comprised of two guard cells. Stomata control the exchange of gasses between the interior of the leaf and the atmosphere. They also make a significant contribution to global water and carbon cycles. Stomata play an important role in plant innate immunity. In addition, leaf epidermis stomatal morphology has significance in taxonomy[3].

Stomata sense a myriad of factors. Stomatal opening signals photosynthetic demand and closing is associated with water stress and decreased photosynthetic demand. Pore changes occur in a few minutes of stimulus application and guard cell volume doubles. Stomata respond to environmental signals such as light, carbon dioxide, temperature, humidity and pollutants and to endogenous signals such as the hormones abscisic acid (ABA) and auxin. Turgor changes in guard cells provide the driving force for stomatal movements[4].

Stomatogenesis has long been studied by morphologists, physiologists and taxonomist .The morphology and ontogenies of taxa are important in intrageneric systematics[5]. The plant Environment is continuously changing, and stomatal apertures adjust accordingly[6].

AIMS AND OBJECTIVES

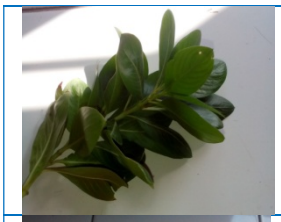
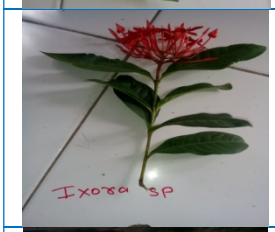
1. To select leaves of Dicot and Monocot plants.
2. To count the number of stomata using 'Stage Micrometer'.

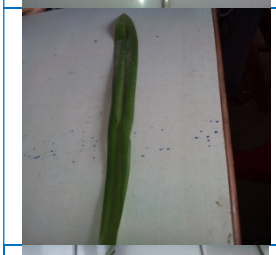
METHODOLOGY

1. Collection of leaves.
2. Cleaning of collected leaves.
3. Clearing of Chlorophyll from dorsal surface of leaves.
4. Counting stomata under compound microscope.

OBSERVATIONS[7]

Image of Plants	Name of Plants	Family	Class	No. of stomata (under 10x)
	*Nerium indicum*, Mill	Apocynaceae	Dicot	40
	*Gliricidia sepium*, Stend	Fabaceae	Dicot	15
	*Tecoma stans*,H.B.K	Bignoniaceae	Dicot	35

	*Vinca rosea*,L	Apocynaceae	Dicot	17
	*Alstonia scholaris*, R.Br	Apocynaceae	Dicot	42
	*Ixora coccinea*,L	Rubiaceae	Dicot	28
	*Hamelia patens*, Jacq	Rubiaceae	Dicot	32
	*Ocimum sanctum*, L	Lamiaceae	Dicot	62
	*Bougainvillea spectabilis*, Willid	Nyctaginaceae	Dicot	37
	*Thevetia peruviana*, Schun	Apocynaceae	Dicot	43
	*Euphorbia sp*	Euphorbiaceae	Dicot	52
	*Ficus sp.*	Urticaceae	Dicot	52

	*Bambusa vulgaris var.striata* Gamble	Poaceae	Monocot	29
	*Clerodendron inerme,* Gaertn	Verbenaceae	Dicot	36
	*Zizyphus jujube*, Lamk	Rhamnaceae	Dicot	42
	*Pongamia pinnata,* Pierre	Fabaceae	Dicot	55
	*Tecomeria capensis,* Thunb	Bignoniaceae	Dicot	38
	*Ficus religiosa*, L	Urticaceae	Dicot	58
	*Pancratium caribaeum,* Roxb	Amaryllidaceae	Monocot	42
	*Zea mays*, L	Poaceae	Monocot	23

	*Phoenix sylvestris*, Roxb	Arecaceae	Monocot	35
	*Cassia fistula,* L	Caesalpinaceae	Dicot	43
	*Azadirachta indica*, A. Juss	Meliaceae	Dicot	55
	*Tabernamontana coronaria,*R. Br	Apocynaceae	Dicot	45
	*Verbena venosa,* Gill and H	Verbenaceae	Dicot	12
	*Hibiscus rosa sinensis*, L	Malvaceae	Dicot	48
	*Jasminum sambad,* Aiton	Oleaceae	Dicot	36
	*Quisqualis indica*	Combretaceae	Dicot	41

	*Adhatoda vasica,* Nees	Acanthaceae	Dicot	42
	*Musa paradisiaca,* L	Musaceae	Monocot	49
	*Annona squamosal,*L	Annonaceae	Dicot	34
	*Plumeria acutifolia,*L	Apocynaceae	Dicot	28
	*Polyalthia longifolia,* B & H-False	Annonaceae	Dicot	20
	*Manihot utilissima,* Pohl	Euphorbiaceae	Dicot	42
	*Pothos scandens,*L	Araceae	Monocot	30
	*Ficus racemosa*	Urticaceae	Dicot	18

	*Ficus reticuleta*	Urticaceae	Dicot	41
	*Ipomoea palmate,* Forsk	Convolvulaceae	Dicot	25
	*Ocimum basilicum*, L	Lamiaceae	Dicot	15

DISCUSSION

In *Nerium* sp and *Alstonia* sp of Family Apocynaceae has high number of stomata. Both these plants are examples of Xerophytes. In *Azadirachta* sp of Family Meliaceae has highest number of stomata which is 55/mm. In *Ficus religiosa* of Family Urticaceae has 58/mm number of stomata, indicating planting of these species in "Vedas". In case of Monocots, *Musa* sp of Family Musaceae has the highest number of stomata which is 49/mm.

CONCLUSION

The function of stomata is associated with various physiological processes and with the success of plant individuals[8]. The rate of transpiration is regulated mainly by stomatal movement but is also affected by stomatal size and density. Stomatal movement is regulated by the circadian clock and changes in light conditions, CO2 level, temperature, humidity, water availability, and ABA[9].

Plants with higher transpiration rate have the potential to humidify the atmosphere and thereby have direct relevance to cloud formation and rainfall. Hence, the effect of low transpiration rate may, in some extent, account for the reason of drought. This means transpiring plants having higher number of subsidiary cells per stoma have more potential of humidifying the atmosphere than plants with lower number of subsidiary cells[10]. Stomatal density (SD) is a function of both the number of stomata plus the size of the epidermal cells. Thus, SD is affected both by the initiation of stomata and the expansion of epidermal cells[11].

Correlations between leaf morphological and stomatal characteristics revealed that populations with larger leaf area, specific leaf area and higher hair density had low stomatal density[12]. The number of stomata per unit area varies not only between species but also within anyone species owing to the influence of environmental factors during growth[13]. Stomatal density can vary within leaves, plants, and individuals of a single species. It can also vary due to environmental factors such as light, air humidity, water availability and atmospheric CO_2 concentration[14].

ACKNOWLEDGEMENT

1) The authors are obliged and thankful to the Principal and faculty members of K.K Shah Jarodwala Maninagar Science college, Ahmedabad for giving us an opportunity to undertake this research work.
2) The authors would also like to thank student members for helping in the research work.

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