

Stomatal frequency and pollen analysis in *Allium hookeri* Thwaites

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ABSTRACT

Allium hookeri Thwaites belongs to amryllidaceae family. The research deals with shape, size and stomatal frequency as well as pollen grain size and percentage of sterility and fertility were also carried out. The maximum stomatal number was observed on the adaxial surface of the middle portion of the leaf. The longest stomata was observed at the base portion of adaxial surface of the leaf. High fertility rate was recorded.

Keywords: - Frequency, Pollen grain, Stomata, Sterility, Fertility, *Allium hookeri*.

INTRODUCTION

Allium hookeri Thwaites is a perennial herb widely grown in dampy soil which belongs to amryllidaceae family. It is commonly called as hooker's chive or winter leek and locally it is called as Van Lahsun. It is native to India, China, Myanmar, Bhutan, Sri Lanka etc. The plant is not bulbous. Flowers are in cluster and are of white in colour. The flowering season begins in the month of August and seeds ripen in the month of October and pollination by bees. It has many medicinal properties such as it helps in lowering cholestrol level, reduces platelets aggregation and lowers the risk of heart attack. It exhibits anti- carcinogenic activities and anti-inflammatory effects.

The present investigation on *Allium hookeri* was carried out to determine the size and frequency of stomata shape, size of pollen and its fertility and sterility rate.

Material and Method

The plant of *Allium hookeri* Thwaites was collected from Lalkhatanga-locality, Ranchi, Jharkhand. The locality is 20 kms away from the Ranchi main town. Following studies has been carried out on the selected plant.

Stomatal Studies

Fresh leaves were collected for stomatal studies. The leaves were scratched with sharp razor, stained with

1% safranin and mounted with 5% glycerin. It was observed under microscope and its shape and number were recorded. Stomatal index, Length and Width of the stomata from both abaxial and adaxial surfaces of the leaves in apex, middle and base portion were recorded. The statistical data performed using ocular micrometer.

Stomatal index = Number of stomata per unit area
x100
Number of stomata per unit area
+Number of Epidermal cell

Pollen studies:-

Fresh flowers were used for the pollen studies. The anthers were excised from flower and warmed in 2% acetocarmine. The anthers were teased in slide and observed under microscope. Pollen fertility and sterility rate were calculated by using following formula-

Percentage pollen fertility = Total number of
fertile pollens x100
Total number of pollen
studied

Percentage pollen sterility = Total number of
sterile pollens x100
Total number of pollen
studied

Shape of the pollen grains of flowers were determined by using the technique of Erdman

(1952). The size of pollen was determined by dividing polar diameter of pollen with equatorial diameter of pollens.

Results

Stomatal studies

In the present investigation, stomata observed were anomocytic type. Stomatal index was calculated which showed highest number of stomata on the middle portion of adaxial surface. It was recorded

with 12.63 ± 0.59 . Less number of stomata was observed in the base portion of abaxial surface i.e, 6.13 ± 0 (Table-1). In adaxial surface, the longest stomata were recorded in the base portion with $53.6 \pm 2.06 \mu\text{m}$ and the broadest stomata were recorded in base portion with $24.8 \pm 1.11 \mu\text{m}$ where as in abaxial surface, base portion had the longest stomata i.e $48.4 \pm 1.44 \mu\text{m}$ and the broadest stomata $20.0 \pm 0.98 \mu\text{m}$ (Table-1)

Table 1: Data related to stomatal index, Length and Width in (μm)

	S. I.	Length (μm)	Width (μm)	S. I.	Length (μm)	Width (μm)	S. I.	Length (μm)	Width (μm)
Abaxial Surface	11.49	45.6	19.6	11.05	45.2	18.8	6.13	48.4	20.0
	\pm	\pm	\pm	\pm	\pm	\pm	\pm	\pm	\pm
	0.68	1.72	0.89	0.76	1.40	1.14	0.40	1.44	0.98
Adaxial Surface	9.34	47.6	20.8	12.63	47.6	22.0	9.16	53.6	24.8
	\pm	\pm	\pm	\pm	\pm	\pm	\pm	\pm	\pm
	0.48	2.01	0.95	0.59	2.31	1.30	0.65	2.06	1.11

Pollen Studies

pollen fertility and sterility rate of *Allium hookeri* Thwaites herb was examined and a slightly high percentage of pollen fertility was recorded with

60.27% (Table-2) shape of the pollen was observed to be mono- anasulcate and heteropolar structure (Fig-3). Equatorial diameter was longer than its polar diameter (Table-3).

Table-2 Percentage pollen sterility and percentage pollen fertility in *Allium hookeri* Thwaites

1	715	284	39.72	431	60.27

Table-3 Pollen morphology of *Allium hookeri* Thwaites

1	8.2±0.16	9.2±0.1	1±0.28	Monoanasulcate

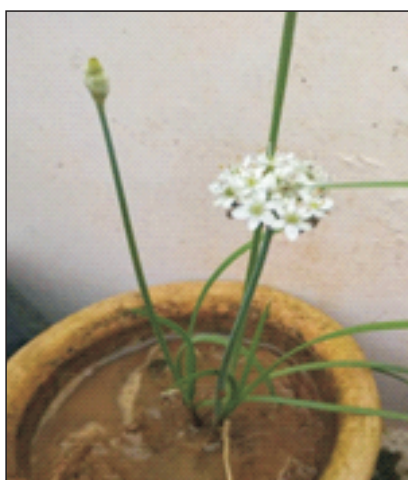
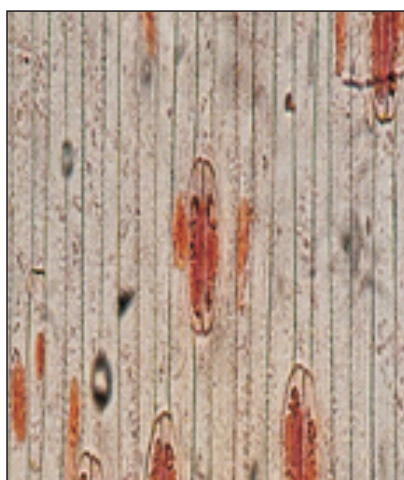
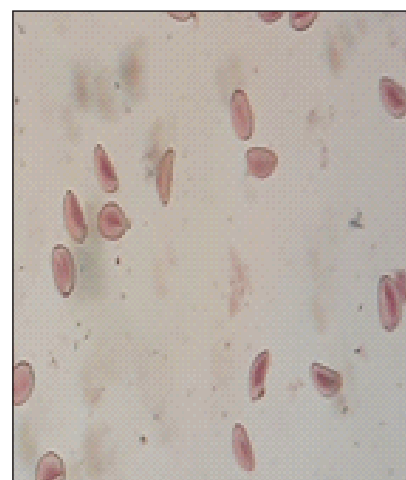
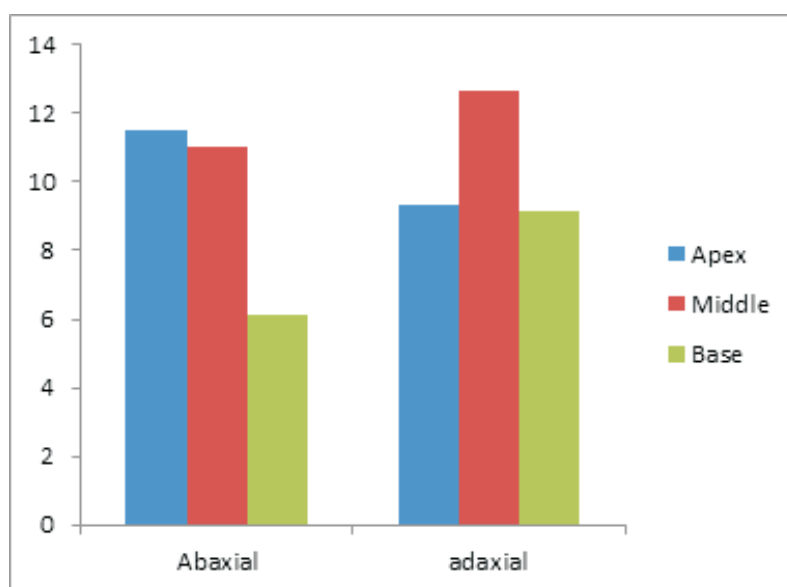
Photograph of *Allium hookeri* Thwaites Plant (Fig. 1) and Photomicrograph Stomata (fig .2) and Pollen (Fig.3).**(Fig. 1)****(Fig. 2)****(Fig. 3)****Fig. 4: Column graph showing stomatal index of both abaxial and adaxial leaf surface of *Allium hookeri* Thwaites.**

Fig. 5: Column graph showing the stomatal length and width (in μm) of both Abaxial and Adaxial leaf surface of *Allium hookeri* Thwaites

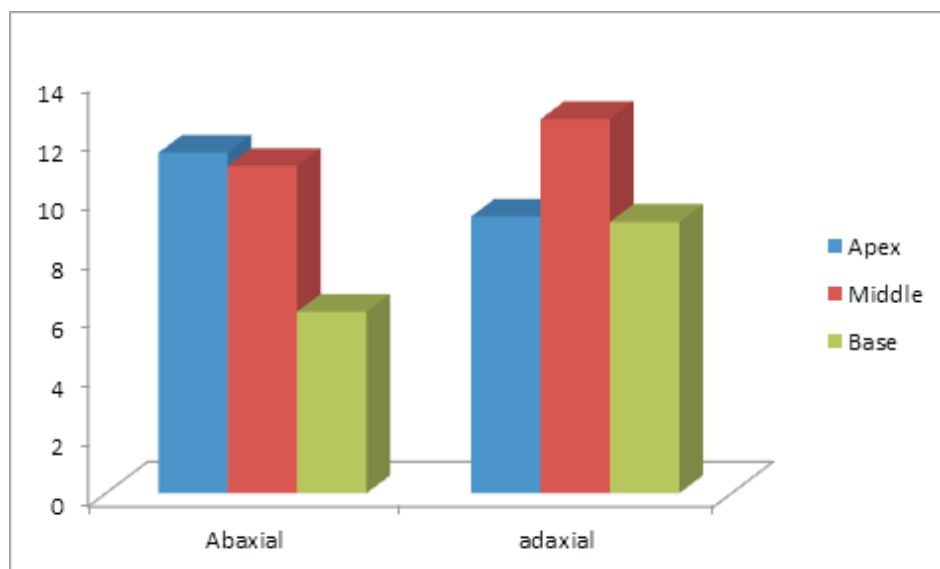
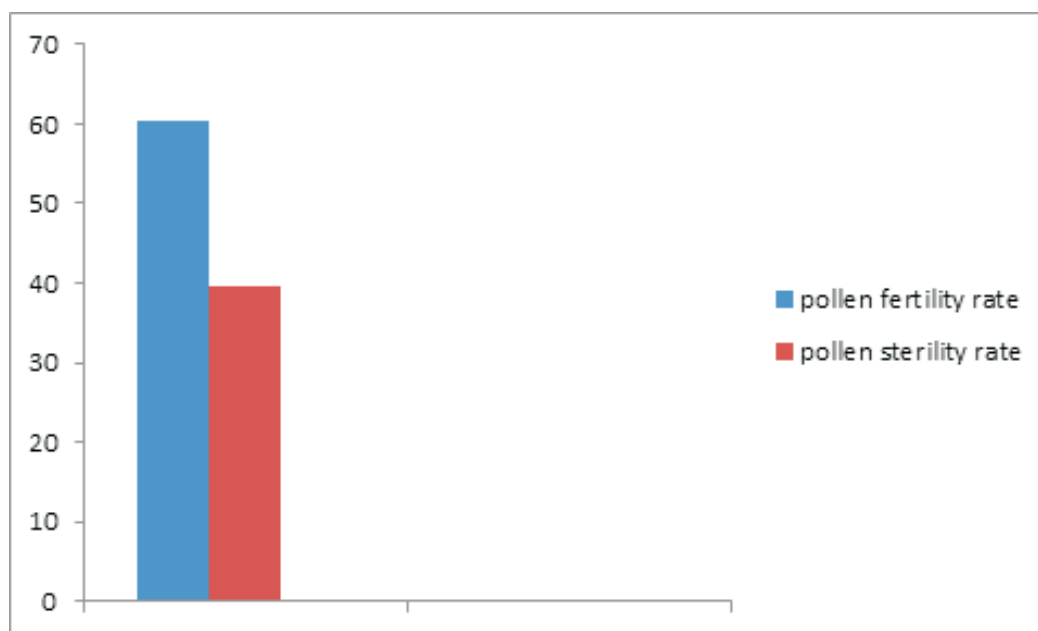


Fig 6 pollen sterility of *Allium hookeri*: Column graph showing percentage Thwaites.



Discussion

The stomata play an important role in controlling physiological process such as transpiration and photosynthesis. Stomatal size, density, frequency and distribution are quite helpful in selecting drought resistance genotypes.

Pollen studies also plays a major role in determining the shape and size in the present day taxonomic work (Edeoga et al 1996). Pollens were of medium size which shows high fertility rate. High fertility rate showed the stability of the studied plant. Though it is highly fertile but shows sexual incompatibility.

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