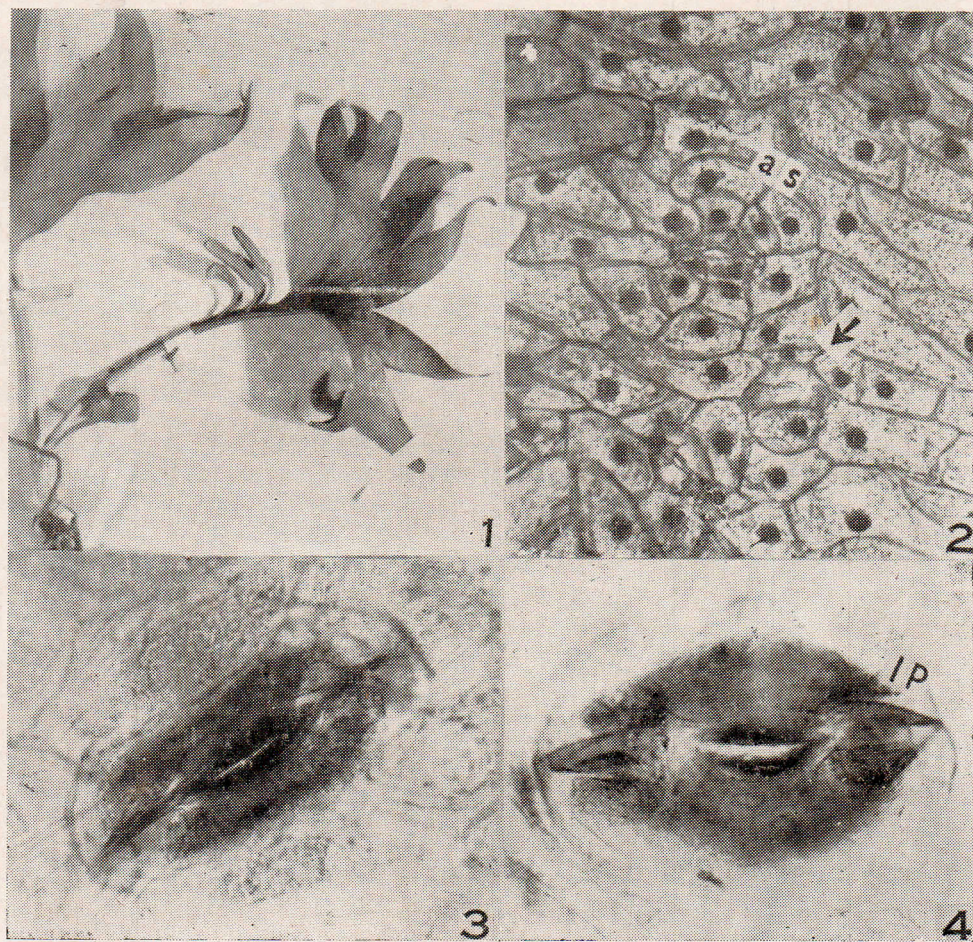


## STOMATA IN *OPHIOGLOSSUM PALMATUM* L.

THE epidermal structure of the Indian species of *Ophioglossum* was briefly described by Mahabale<sup>1</sup>. Pant and Khare<sup>2</sup> have studied the mode of development of stomata in four species of *Ophioglossum* and also in *Botrychium* and *Helminthostachys*. But as far as known, the epidermal features, which are

species of *Ophioglossum* described in this paper were collected from several localities from Central India : viz., Gwalior, Shivpuri, Narsingharh, Rewa, Ambikapur, Jagdalpur, Varanasi and Nainital. Excursions to these places have yielded eight species of the genus, viz., *O. costatum* R. Br., *O. nudicaule* L.,



FIGS. 1-4. Fig. 1. A plant of *O. palmatum* ( $\times 4$ ). Fig. 2. Lower epidermal feature in *O. palmatum*. Note the anucleate guard cell mother cell (arrowed) and accessory subsidiary cells (as) ( $\times 175$ ). Fig. 3. Normal stomatal apparatus in *O. palmatum* ( $\times 600$ ). Fig. 4. Another stoma "showing flipped" projections (1p) in between the guard cells ( $\times 600$ ).

being described hereunder, of *O. palmatum* are completely unknown. Statistical data on stomatal index and other aspects are given for the first time.

The plants of *O. palmatum* (epiphytic gaint species) were obtained from U.S.A. (Fig. 1). Other

*O. petiolatum* Hook., *O. lusitanicum* L., *O. gramineum* Willd., *O. polyphyllum*. A Braun apud Seubert, *O. vulgatum* L. and *Ophioglossum* sp. The plants of *Botrychium* Swartz and *Helminthostachys* Kaulfuss were collected from Nainital and Gorakhpur respectively.

TABLE I  
Epidermal features of the family Ophioglossaceae

Sl. No.	Name of species	Stomatal Index		Average size of epidermal cells in microns						Average size of stomata in microns					
		Upper		Lower		Upper		Lower		Upper		Lower			
		Length	Width	Length	Width	Length	Width	Length	Width	Length	Width	Length	Width		
1.	<i>Ophioglossum costatum</i>	9.3	12.5	63 ± 9.9	33 ± 7.8	57 ± 19.18	31 ± 8.16	48 ± 5.05	32 ± 3.87	50 ± 3.74	38 ± 6.48				
2.	<i>O. nudicaule</i>	18.7	21.4	105 ± 30.98	28 ± 7.80	94 ± 39.28	29 ± 11.18	54 ± 4.47	36 ± 3.09	57 ± 4.84	36 ± 5.05				
3.	<i>O. gramineum</i>	10.8	12.5	108 ± 22.80	45 ± 19.02	115 ± 33.78	25 ± 8.77	57 ± 4.12	33 ± 3.13	67 ± 6.83	31 ± 4.3				
4.	<i>O. polyphyllum</i>	20.5	23.0	92 ± 27.18	46 ± 12.03	114 ± 26.94	31 ± 8.31	63 ± 3.49	43 ± 5.19	68 ± 7.60	41 ± 5.39				
5.	<i>O. petiolatum</i>	8.8	12.5	110 ± 33.37	43 ± 17.67	110 ± 39.52	26 ± 8.81	54 ± 5.14	31 ± 3.38	66 ± 8.31	34 ± 4.09				
6.	<i>O. lusitanicum</i>	13.6	18.1	129 ± 35.60	30 ± 22.67	156 ± 26.95	43 ± 25.08	64 ± 7.27	48 ± 3.35	70 ± 3.69	40 ± 5.51				
7.	<i>O. vulgatum</i>	9.0	14.0	115 ± 17.46	54 ± 20.65	99 ± 55.26	52 ± 30.20	75 ± 6.39	55 ± 3.49	76 ± 9.79	58 ± 4.09				
8.	<i>Opeioglossum</i> sp.	9.6	12.5	66 ± 23.89	34 ± 12.16	84 ± 29.15	28 ± 6.45	47 ± 7.34	36 ± 5.8	56 ± 8.09	37 ± 3.60				
9.	<i>O. plamaurti</i>	..	6.6	273 ± 57.01	77 ± 20.81	190 ± 121.506	64 ± 15.39	..	..	110 ± 11.73	69 ± 6.81				
10.	<i>Helminthostachys zeylanica</i>	..	8.7	87 ± 39.97	29 ± 6.94	86 ± 36.73	18 ± 4.94	..	..	57 ± 7.17	31 ± 3.49				
11.	<i>Botrychium ternatum</i>	..	7.6	117 ± 40.81	37 ± 9.39	97 ± 42.26	26 ± 7.21	..	..	78 ± 6.51	36 ± 5.19				

Mean of 10 values, ± = standard deviation.

Epidermal features from mature leaves were studied from peels of the central portion. The peels were obtained by heating the material at 60° C for 15 to 30 minutes in the mixture of hydrogen peroxide, acetic acid and water (4 : 4 : 2 parts respectively). These were then stained with hematoxylin and mounted in glycerine.

Cells of epidermis are straight. They do not possess stomata on their upper surface. Both features are unlike other species of *Ophioglossum* (sinuous epidermal cells) but similar to *Helminthostachys* and *Botrychium*. The size of epidermal cells ( $273 \times 77 \mu$ ) and the stomata ( $110 \times 69 \mu$ ) are the largest among the Ophioglossaceae (Table I). But as expected, the numbers of stomata and epidermal cells on the lower surface are the lowest (Table I).

The mode of development of stomata in the present study essentially conforms to the pattern described by Pant and Khare<sup>2</sup>. Basically piper type, the stomatal development is perigenous in Ophioglossaceae. Frequently the neighbouring cells of perigene are divided by radial walls before or after the formation of guard cells and increase in their number. The meristemoid divides by two successive walls formed at right angles to each other cutting off two mesogene cells before the meristemoid functions as the guard cell mother cell. The guard cells of a mature stoma are surrounded by

complete rings of subsidiary and encircling cells, each ring consisting of several cells (Fig. 2). The marginal cells of lower epidermis forming dome-like papillae such as noted in *H. zeylanica*<sup>2</sup> has not been observed in the present study.

In *O. palmatum* the stomata were seen to possess uniform guard cells (Fig. 3) or some of them had the "lipped" guard cells (Fig. 4). These extensions from guard cells overlapped each other and gave a peculiar shape to the stomata. Such a state has not been reported in any member of Ophioglossaceae. It is very interesting to note that its stomata resemble more closely with that of *H. zeylanica* than with other species of *Ophioglossum*.

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