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ON BIFURCATION RATIO IN *SCHIMA* SPECIES

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THE bifurcation or branching ratio (*Rb*) which was first used by geomorphologists to quantify the drainage patterns of stream basins is based on Horton's¹ suggestion that in a drainage network the number of segments (streams) of each order forms an inverse geometric series with order number, which is constant throughout a river system. More recently the concept has been used to characterize the branching networks of biological systems, such as trees²⁻⁷. This paper attempts to relate this concept to *Schima*

khasiana and *S. wallichii* two closely related tree species. These trees have a monopodial trunk which grows rhythmically and develops tiers of branches (Rauh's model).⁸ The leader axis as well as branches are sylleptically borne. Flowers are axillary with no direct impact on the geometry of the tree crown.

For the present study 10 replicates of 'open' grown and 'forest' grown trees of *S. wallichii* from lower (Burnihat, 100 m) and higher (Shillong, 1,600 m) altitude; and *S. khasiana* from Upper Shillong (1,900 m) in Meghalaya (89° 45' - 92° 50' E and 25° - 26° 10' N) were randomly chosen. The branch systems of the trees were ordered according to the centripetal ordering system using Horton's¹ method as modified by Strahler⁹. The bifurcation ratio was calculated by Motomura's^{10,6} formula: $N - N_{max} / N - N_1$, where *N* is the total number of the branches of all orders, *N_{max}* is the number of branches of the highest order; and *N₁* is the number of the branches of first order.

The bifurcation ratio values (table 1) were not significantly different (at 5% level) between the open and forest grown trees of *S. wallichii* but in *S. khasiana* significant differences (at 1% level) occurred. The altitude did not affect *Rb* values significantly for the two species/populations.

Oohata and Shidei³ and Whitney⁴ analysed bifurcation ratio and considered it to be a measure of morphological adaptation of the crown structure to a particular niche. Further, that may be a species-specific constant, suggesting that a given species has limited ability to modify the crown structure under different environments. On the other hand, Steingraeber *et al.*⁶ and Pickett and Kempf⁷ suggested that this is variable under different light environments. We tend to support the latter viewpoint only partially as the open and forest grown trees of *S. khasiana* alone differ significantly with respect to *Rb* values. The branch ordering system⁹ and the subsequent calculation of *Rb* values completely ignores the information pertaining to architectural development of trees⁸, according to which the main axis would represent the lowest order followed by increase in

TABLE 1
Bifurcation ratio (*Rb*) values (\pm S.E.) for *Schima Reinw. ex Blume*, species

	Open grown		t-value	Forest grown	
	Mean \pm S.E.	Range		Mean \pm S.E.	Range
<i>S. wallichii</i> (DC) Korth (Lower altitude)	3.99 \pm 0.49	3.31 - 4.76	0.76 N.S.	3.44 \pm 0.19	3.00 - 4.14
<i>S. wallichii</i> (DC) Korth (Higher altitude)	3.85 \pm 0.20	3.00 - 4.20	1.81 N.S.	3.40 \pm 0.14	3.00 - 3.95
<i>S. khasiana</i> Dyer	3.91 \pm 0.14	3.38 - 4.75	4.06*	3.24 \pm 0.09	3.00 - 3.59

*Significant at 1% level; N.S. = not significant.

order number with each bifurcation in a branch system. For similar reasons, it was concluded¹¹ that any ordering system which does not keep track of the actual physical dimensions of a tree cannot be used to investigate the principle of its mechanical design. Recently on the basis of mathematical modelling on *Tabebuia rosea*, Borchert and Slade¹² have questioned the usefulness of bifurcation ratio in trees as an adaptive strategy. However, our results on *Schima* species prove that bifurcation ratio could be a highly variable feature depending upon the species and the environment in which it grows; therefore, it cannot be used for obtaining ecological generalizations on tree growth and adaptation.

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A NEW POWDERY MILDEW FROM MADHYA PRADESH

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DURING an extensive survey of plant parasitic fungi of Madhya Pradesh, the authors collected a powdery mildew on *Jasminum officinale* var. *grandiflorum* Bailey¹(=*J. grandiflorum* L.)², family-Oleaceae. This

appears to be the first report of powdery mildew on this host genus, hence the present fungus has been accommodated in a new species.

Oidium jasminii: Saxena and Saksena sp. nov.

Mycelium external, hyaline, septate 3.2–6.0 μm (4.2 μm) wide; haustoria simple; conidial apparatus non-chain forming, *Oidium* type; conidiophores erect, simple, cylindrical, septate, 78.0–110.0 \times 5.5–6.5 μm (95 \times 6.0 μm); conidia unicellular, hyaline, highly vacuolated, ellipsoid to cylindrical, borne singly on conidiophores, germinating immediately after getting released by simple germ tube, 26.0–34.0 \times 15.6–18.0 μm (30.0 \times 16.5 μm). Perithecial stage absent.

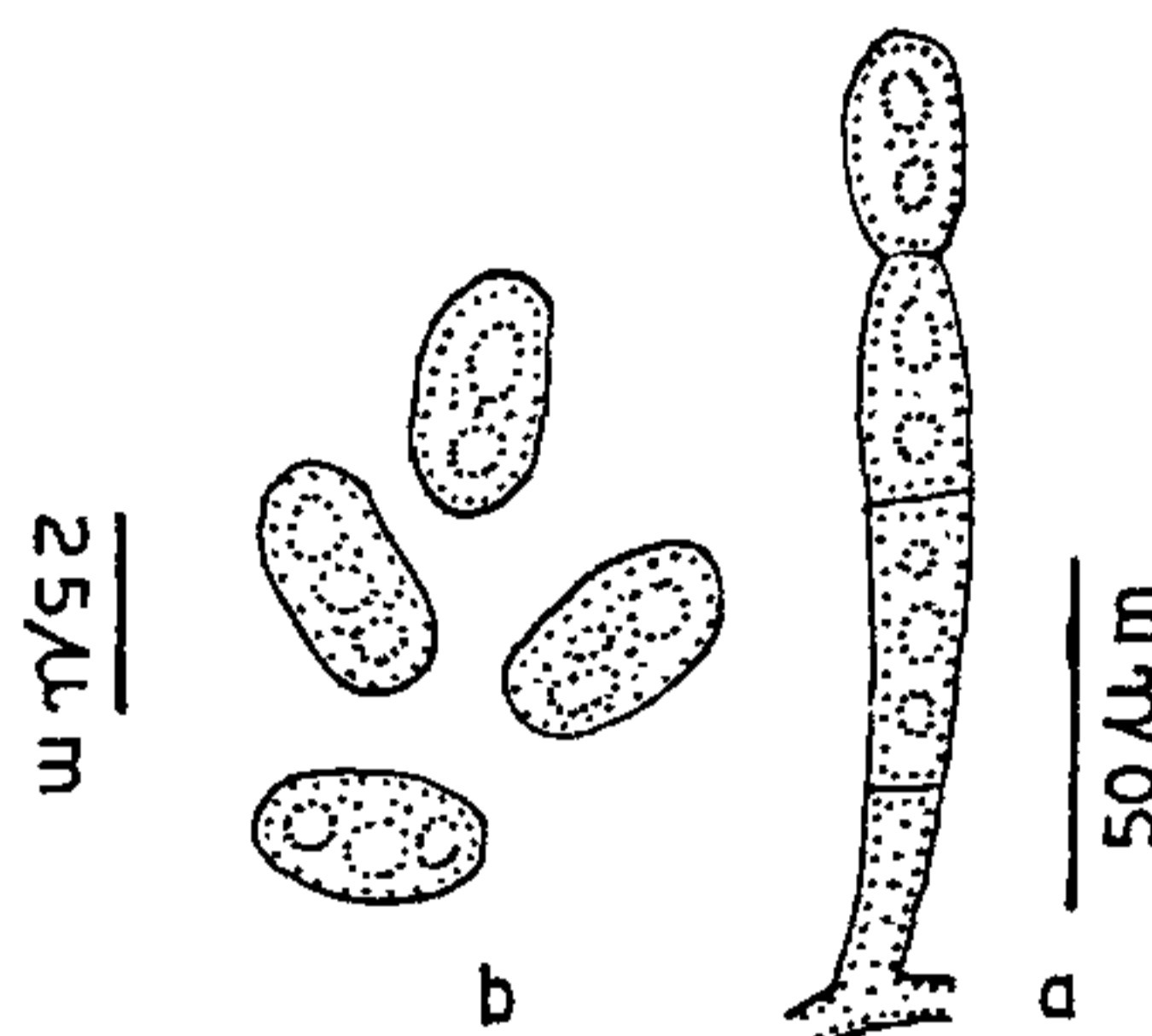


Figure 1. *Oidium jasminii*; a. Conidiophore and b. Conidia.

Habitat : On living leaves of *Jasminium officinale* var. *grandiflorum* Bailey (Family-Oleaceae), Motijheel, Gwalior, March 1981, leg. S. B. Saksena and A. K. Saxena

Type specimen has been deposited in Herbarium Cryptogamiae Indiae Orientalis (HCIO 33574).

Oidium jasminii : Saxena et Saksena sp. nov.

Mycelium superficiale, hyalinum, septatum. 3.2–6.0 μm (4.2 μm) latum; haustoria simplicia; conidiophora erecta, cylindrica, septata, 78.0–110.0 \times 5.5–6.5 μm (95 \times 5.0 μm); conidia unicellularia, hyalinum, ellipsoidea vel cylindrica, solitaria in conidiophora, 26.0–34.0 \times 15.6–18.0 μm (30.0 \times 16.5 μm); status perithecialis ignotus.

Habitatio : In foliis vivis *Jasminum officinale* var. *grandiflorum* Bailey (Family-Oleaceae), Motijheel, Gwalior, India, March, 1981, leg. S. B. Saksena et A. K. Saxena.

Typus positus in Herbarium Cryptogamiae Indiae Orientalis (HCIO 33574).

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