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Pollen morphology of *Strobilanthes* Blume (Acanthaceae) in China and its taxonomic implications

HONG WANG and STEPHEN BLACKMORE

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The pollen morphology of 37 Chinese species of *Strobilanthes* Blume (Acanthaceae), a large and taxonomically problematic genus, was investigated by LM and SEM. Two distinct pollen shape classes, ellipsoid and spheroidal, recognised by earlier workers were found. Eight pollen types could be distinguished on the basis of variation in ornamentation, and the number, distribution and type of apertures. Five of these fall within twenty two pollen types reported from *Strobilanthes* in southern India and Sri Lanka. Three new pollen types are also described, further extending the palynological diversity of the genus. From the results presented, the characters of palynological diversity and the related taxonomic implications are discussed.

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Established in 1826 by Blume, *Strobilanthes* is a large genus of flowering plants with the number of species in *Strobilanthes* s. l. ranging from 350 (Mabberley 1987) to more than 450 (Terao 1983). However, the generic circumscription and species delimitations remain ambiguous. Anderson (1867) enlarged *Strobilanthes* to include genera established by Nees von Esenbeck (1832, 1847), i.e., *Phylebophyllum*, *Endopogon*, *Leptacanthus*, *Buteraea*, *Adenacanthus*, *Goldfussia*, *Triaenacanthus*, and *Mackenzia* but excluding three genera with more than four ovules, *Aechmanthera*, *Hemigraphis* and *Stenosiphonium*. This classification has been accepted by Bentham (1876), Clarke (1885), Gamble (1935), Terao (1982, 1983), Wood (1994), and Scotland & Vollesen (2000). However, based primarily on pollen and seed morphology, Bremekamp (1944) proposed a different scheme by splitting *Strobilanthes* and the three allied genera into 54 segregate genera in 27 informal groups. Bremekamp's classification was adopted by many Indian and Chinese flora accounts (Santapau 1952, Vajravelu 1990, Hu & Tsui: in press).

Strobilanthes s.l. is widespread throughout tropical Asia, from India and Sri Lanka eastwards to New Guinea and Melanesia, throughout the Himalayas, Myanmar, China, Thailand, Indochina and Malesia, reaching Korea and Japan in the north, and north-eastern Australia in the south. Wood (1994) proposed a thorough revision of *Strobilanthes* in the Himalayas, including Afghanistan, Nepal, Bhutan, parts of NE India (Arunachal Pradesh) and Tibet (Xizang), but excluding Khasia and Nagaland in Northern India and SW China (i.e. Yunnan and Sichuan).

The variability of pollen morphology in *Strobilanthes* and the potential utility of it for generic delimitation were first recognized by Radlkofer (1883); subsequently, Lindau (1893, 1895) proposed a modification of Anderson's classification and distinguished two genera from *Strobilanthes*:

Pseudostenosiphonium Lindau and *Lamiacanthus* Kuntze. However, Lindau's investigation of the pollen morphology of *Strobilanthes* was limited and the genera described by him have not been widely accepted. Vishnu-Mittre & Gupta (1966) investigated the pollen morphology of 63 species of Indian *Strobilanthes*, while more recently Carine & Scotland (1998) studied the pollen morphology and classification of *Strobilanthes* from southern India and Sri Lanka, recognising a total of twenty two pollen types. Although the *Strobilanthes* flora of southern India is rich and varied it is quite distinct from that of the Himalayas and so this study extends the sampling within the genus.

The taxonomy of *Strobilanthes* in China is poorly known, although the account of it for the "Flora Reipublicae Popularis Sinicae" and "Flora of China" has been just prepared. According to the authors of this account, Hu and Tsui (in press), *Strobilanthes* s.l. is represented in China by more than 100 species in 20 segregate genera, with a few species in Bremekamp's 'genus *adhuc incertum*'. Tsui (1990) published a new genus, *Paragutzlaffia*, on the basis of pollen morphology, although the pollen morphology of the Chinese *Strobilanthes* is little known. As pointed out by Carine & Scotland (1998), very extensive sampling and rigorous empirical investigation are essential to resolve problems of delimitation in this large and species rich genus. The aims of the current study are to provide a more extensive knowledge of pollen morphology of Chinese *Strobilanthes* and segregate genera and their taxonomy.

MATERIAL AND METHODS

Pollen grains of 37 species were examined using light microscopy (LM) and scanning electron microscopy (SEM). Pollen samples were acetolysed following the technique of Erdtman (1960) and divided into two parts, one for LM and the other for SEM. The

slides were prepared for LM by mounting pollen in glycerine jelly. Size measurements were taken based on 20 pollen grains; the values of P (polar axis length) and E (equatorial diameter) were measured and the P/E ratio was calculated. For SEM, prepared pollen samples were dehydrated in an ethanol series, and mounted on glass coverslips, then air dried from 95% ethanol; the coverslips were then attached to aluminium stubs and sputter coated (Emscope SC500) with gold-palladium. Observations were made using a Zeiss DSM 962 scanning electron microscope at 15KV. Descriptive terminology follows Carine & Scotland (1998) and Punt et al. (1994).

All pollen samples were obtained from the herbarium, Kunming Institute of Botany (KUN). A list of voucher specimens from which pollen was sampled is given (see list below).

RESULTS

From LM observations, two distinct pollen shape classes can be recognised, ellipsoidal and spheroidal (Tables I, II), as in earlier studies. Four pollen types with ellipsoidal pollen have been distinguished on the basis of exine ornamentation and four spheroidal pollen types which were recognised on the basis of differences in ornamentation, and the number, distribution and type of apertures (following Carine & Scotland 1998). Carine & Scotland (1998) recognised 22 pollen types in their study of *Strobilanthes* from southern India and Sri Lanka. Five of these previously described

Table I. Measurements for *Strobilanthes* species with ellipsoidal pollen.

Taxon	P (µm)	E (µm)	P/E	Exine thickness (µm)	Sexine: Exine ratio	Spine length (µm)	Shape of endoaperture	Ribs
<i>S. aenobarba</i>	64–68	38–44	1.6	2.5–3.0	0.40–0.50		Lalongate	18
<i>S. alata</i>	80–85	47–56	1.6	3.5–4.0	0.60–0.65	~1	Circular	15
<i>S. claviculata?</i>	70–78	38–44	1.8	4.0	0.75		Lalongate	15
<i>S. cognata</i>	64–66	41–44	1.5	5.0–6.0	0.70–0.80	~1	Lalongate	21
<i>S. congesta</i>	75–84	52–56	1.5	3.5–4.0	0.60–0.70	~1	Circular	15
<i>S. cusia</i>	65–72	36–46	1.7	4.0–5.0	0.68–0.8	~1	Circular/Lalongate	15
<i>S. cyclas</i>	68–75	42–46	1.6	3.5	0.50–0.75	~1	Lalongate	15
<i>S. cyphanthus</i>	68–74	36–45	1.8	3.50	0.75		Circular	18
<i>S. dyeriana</i>	65–70	32–40	1.8	2.5	0.60		Circular	15
<i>S. fluviatilis</i>	57–66	40–46	1.4	3.5	0.75	~1	Circular	18
<i>S. forrestii</i>	56–64	40–42	1.5	3.5–4.5	0.70–0.80		Lalongate	21
<i>S. glomerata</i>	65–68	38–40	1.7	2.5–3.0	0.45–0.50		Lalongate	15
<i>S. gongshanensis</i>	61–68	43–56	1.3	3.5–4.0	0.55–0.65		Circular	15
<i>S. gossypina</i>	48–55	35–40	1.4	2.5–3.0	0.65–0.70		Circular	18
<i>S. grandissima</i>	58–62	38–42	1.5	3.5–4.0	0.50–0.65		Circular	15
<i>S. hygrophiloides</i>	56–65	38–45	1.5	3.5	0.75–0.8		Lalongate	15
<i>S. jugorum</i>	55–58	36–38	1.5	3.5–4.0	0.60–0.70	~1	Circular	15
<i>S. limprichtii</i>	82–90	56–64	1.4	3.0–4.5	0.65–0.80		Circular	18
<i>S. longispicata</i>	85–92	46–58	1.7	3.5	0.80		Lalongate	15
<i>S. menglaensis</i>	65–72	42–45	1.6	2.5–3.5	0.60–0.8		Circular	18–21
<i>S. monadelpha</i>	78–85	45–50	1.7	3.0–3.5	0.55–0.70		Circular	18
<i>S. mucronatoproducta</i>	58–62	45–48	1.3	3.5	0.50–0.65	~2.5	Lalongate	15
<i>S. oligantha</i>	63–68	41–44	1.6	3.0–3.5	1.00–1.50		Lalongate	15
<i>S. petiolaris</i>	68–72	38–42	1.7	2.5–3.0	0.45–0.60		Lalongate	15
<i>S. polyneuros</i>	60–66	42–48	1.4	3.0	0.40–0.50		Lalongate	15
<i>S. pteroclada</i>	68–72	40–44	1.6	2.5–3.0	0.60–0.70		Circular	18
<i>S. rufohirta</i>	72–82	50–58	1.4	3.5–4.5	0.75–0.80		Circular	18
<i>S. scoriarum</i>	65–68	44–48	1.5	3.0–3.5	0.60–0.70		Lalongate	15
<i>S. stolonifera</i>	61–67	40–48	1.5	3.5–4.0	0.70	~1	Lalongate	18
<i>S. versicolor</i>	70–80	40–52	1.6	3.5–4.5	0.75–0.85		Lalongate	18
<i>S. yunnanensis</i>	58–65	38–45	1.5	3.5	0.60–0.75		Circular	21

Table II. Measurements for *Strobilanthes* species with spheroidal pollen.

Taxon	Pollen class	Diam. (µm)	Exine thickness (µm)	Sexine:exine Ratio	Spine length (µm)
<i>S. affinis</i>	3-colporate,equatorial with small pseudoapertures	52–56	3.5–4.0	0.68–0.7	~3
<i>S. alatiramosa</i>	5-colporate,equatorial	68–72	4.5–5.0	0.70–0.85	6.5–7.0
<i>S. aprica</i>	3-cryptoaperturate equatorial	45–48	4.0–5.0	0.50–0.65	~3
<i>S. divaricata</i>	3-colporate, equatorial	65–72	3.5–4.0	0.60–0.75	~3
<i>S. henryi</i>	3-cryptoaperturate equatorial	60–65	4.0–5.0	0.60–0.85	~4
<i>S. shweliensis</i>	3-colporate, equatorial	72–75	4.5–5.0	0.70–0.85	7.0–7.5

types are also represented in our study; together with three previously unreported pollen types (Table I).

Pollen morphological descriptions

Ellipsoid class

Pollen ellipsoidal (Figs. 1–7), 3-colporate, size (polar axis \times equatorial diameter) 48–92 \times 32–64 μm , P/E ratios 1.3–1.8 (prolate or occasionally perprolate), in equatorial view, circular in polar view. Pollen grains with pseudocolpi, the numbers of ribs (longitudinal bands) between pseudocolpi varying from 15 or 18 to 18–21 among the different species, the longitudinal ribs usually coalescent at poles; in some species (e.g. *S. limprichtii*, *S. yunnanensis*), the ribs encircle the poles (Fig. 3), longitudinal ribs with perforate tectum. Ectoapertures long or short, narrow. Endoapertures circular or lalongate. Four pollen types are found:

1. *Strobilanthes gossypina* – type (Fig. 1; corresponding to Type 1 of Carine & Scotland 1998). Characterised by exine ribs with a punctate to microreticulate tectum, the ribs equal in length, with slightly spiral appearance. Occurs in *S. claviculatus*, *S. fluvialis*, *S. forrestii*, *S. gossypina*, *S. grandissima*.
2. *S. polyneuros* – type (Figs. 2–3; corresponding to Type 3 of Carine & Scotland 1998). Characterised by ectexine ribs with ladder-like reticulum, which is highly variable in form between different species. The most frequently encountered pollen type in the Chinese species studied here, occurring in *S. aenobarba*, *S. alata*, *S. congesta*, *S. cyphanthus*, *S. dyeriana*, *S. glomerata*, *S. gongshanensis*, *S. hygrophiloides*, *S. jugorum*, *S. limprichtii*, *S. longispicata*, *S. menglaensis*, *S. monadelpha*, *S. oligantha*, *S. petiolaris*, *S. polyneuros*, *S. pteroclada*, *S. rufohirta*, *S. scoriarum*, *S. versicolor*, *S. yunnanensis*.
3. *S. cusia* – type (Figs. 4–6; corresponding to Type 4 of Carine & Scotland, 1998). Characterised by ectexine ribs, each with a continuous central raised strip. Occurs in *S. cognata*, *S. cusia*, *S. cycla*, *S. stolonifera*.
4. *S. mucronatoproducta* – type (Fig. 7). Characterised by ectexine ribs densely covered with large rounded verrucae along the centre of each rib. Occurs in *S. mucronatoproducta*. Of the pollen types described by Carine & Scotland, 1998 this most closely resembles their Type 5, which they describe as having “each longitudinal rib with aggregates along the middle”. In the examples illustrated by Carine & Scotland, the aggregates range from verrucae to bacula.

Spheroidal class (Figs. 8–12)

Pollen grains with round or long pores, tectate, columellate and echinate. Spines conical; two species (*S. divaricata*, *S. shweliensis*) have pollen with extended acute spines, while some have subacute or obtuse spines (e.g. *S. alatiramosa*, *S. henryi*); length of spines variable between species. Spine bases with rounded outline, spines 3–7.5 μm long. Between the spines, the exine is always perforate. Apertures 3-porate, 3-cryptoaperturate, 5-colporate or pantocolporate. Four pollen types are found:

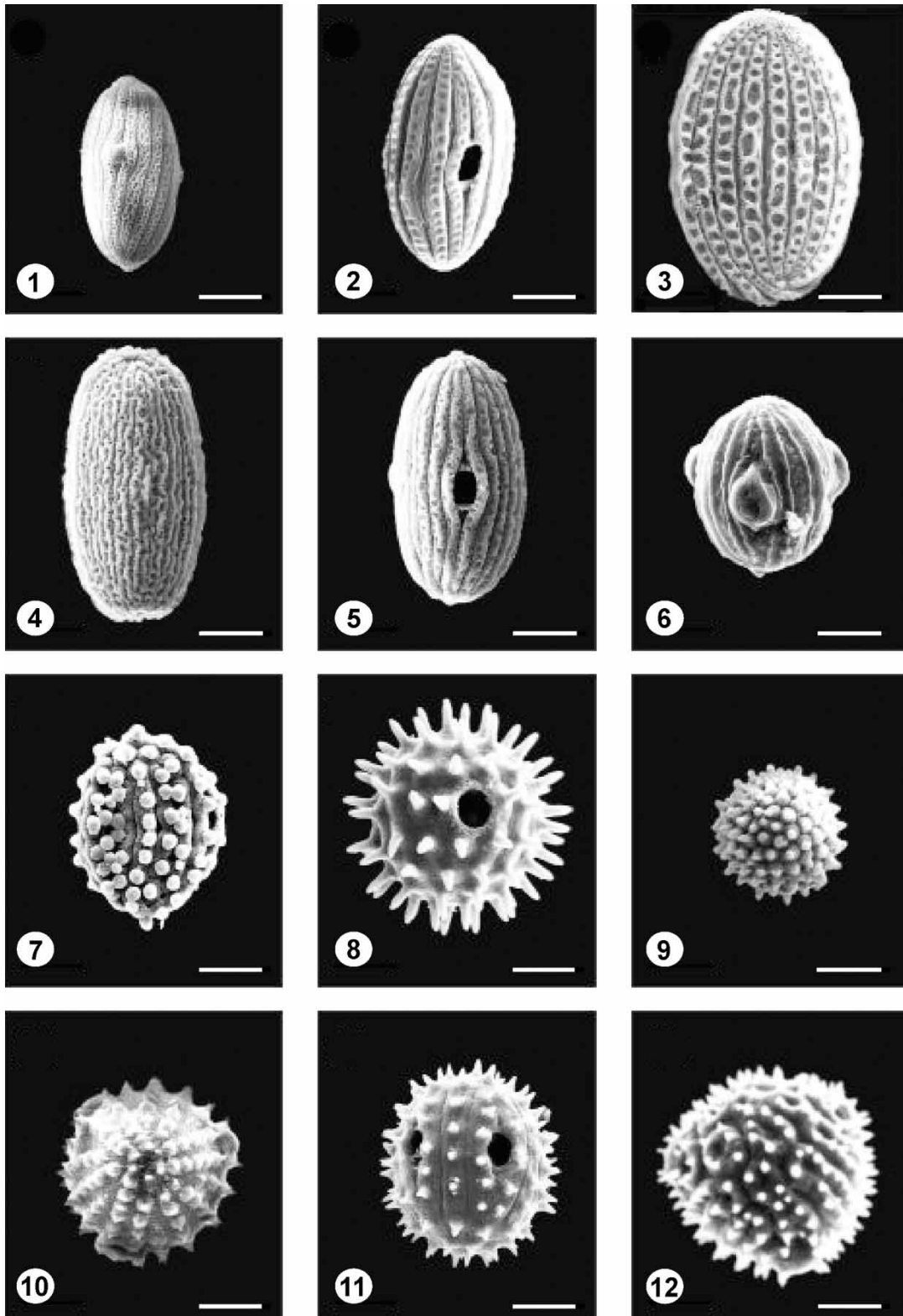
1. *Strobilanthes divaricata* – type (Fig. 8; corresponding to Type 14 of Carine & Scotland 1998). Pollen grains 3-zonoporate, characterised by long spines. Occurs in *S. divaricata*, *S. shweliensis*.
2. *S. aprica* – type (Figs. 9–10; corresponding to Type 8 of Carine & Scotland, 1998). Pollen grains 3-cryptoaperturate, with short conical spines evenly situated over the surface of the grains. In *S. henryi* the echinae are arranged in rows, which are radially symmetrical when seen in polar view. Occurs in *S. aprica*, *S. henryi*.
3. *S. alatiramosa* – type (Fig. 11). Pollen grains 5-zonocolporate with echinae arranged along longitudinal, microreticulate ribs of ectexine (Fig. 11). Corresponds most closely to Type 22 of Carine & Scotland (1998) but differs in having the exine divided into longitudinal ribs. Occurs in *S. alatiramosa*.
4. *S. affinis* – type (Fig. 12). Pollen grains 3-zonocolporate but the apertures difficult to elucidate in LM and SEM because of the presence of rounded or narrow and irregular pseudoapertures surrounded, as the apertures are also, by winding ribs of exine with short, acute spines with 5–10 spines encircling each aperture or pseudoaperture. Occurs in *S. affinis*. This pollen type does not closely resemble any of those described by Carine & Scotland (1998).

DISCUSSION

Our observations, on a selection of Chinese species of *Strobilanthes*, largely agree with those of previous workers. Eight pollen types were present in the material examined, five of which are similar to pollen types recognised by Carine & Scotland (1998) from southern India and Sri Lanka, while three have not previously been recorded.

The pollen morphology of Chinese *Strobilanthes* species is little known. However, most works, including Tsui (1990) and Hu & Tsui (In press) have closely followed Bremekamp's treatment of the genus. Bremekamp (1944) employed pollen morphology as a main character in *Strobilanthes* and segregate genera. Among the Chinese species studied by Bremekamp (1944), 7 groups and 10 genera were recognised, with most other species being referred to the group *genus adhuc incertum* (15 of which were represented among the 37 species studied by us). Because pollen morphological data were not available for most species, Bremekamp was unable to properly assess the status of *Strobilanthes* and the segregate genera. Also, he incorrectly described the pollen morphology of two species (*S. divaricata*, *S. oligantha*).

Subsequently, based on the extensive investigations of pollen morphology, some combinations and synonyms were made between *Strobilanthes* and segregate genera by later researchers (Table III). Scotland & Vollesen (2000) in their important new classification treated *Strobilanthes* as a single genus (with numerous infrageneric taxa), and stated that even very distinct pollen morphologies can be highly homoplastic. Carine & Scotland (2000) comprehensively studied 68 taxa and 32 morphological characters (8 of them palynological), and suggested that pollen data should be used with caution, but that morphological data can resolve



Figs. 1–7. Scanning electron micrographs of ellipsoidal pollen types seen in equatorial view: (1) *Strobilanthes gossypina*; (2) *S. polyneuros*; (3) *S. limprichtii*; (4) *S. cusia*; (5) *S. cognata*; (6) *S. cyclo*; (7) *S. mucronatopunctata*.

Figs. 8–12. Scanning electron micrographs of spheroidal pollen seen in polar or equatorial view: (8) *S. divaricatus*; (9) *S. aprica*; (10) *S. henryi*; (11) *S. alatiramosa*; (12) *S. affinis*. Scale bars – 20 μ m.

Table III. Examined species of *Strobilanthes* and their synonyms (Bremekamp 1944 and other authors).

Taxon	Synonyms
<i>S. aenobarba</i> W. W. Smith	China (Tibet), genus adhuc incertum (Bremekamp 1944);
<i>S. affinis</i> Griff.	<i>Pteracanthus aenobarba</i> (W. W. Smith) C. Y. Wu et C. C. Hu
<i>S. alatiramosa</i> H. S. Lo et D. Fang	<i>Tarphochlamys affinis</i> (Griff.) Brem.
<i>S. alata</i> Wall. ex Nees	Described after 1944
<i>S. aprica</i> Hance	<i>Pteracanthus alatus</i> (Wall. ex Nees) Brem.
<i>S. congesta</i> Terao	<i>Gutzlaffia aprica</i> (Hance) Brem.
<i>S. cognata</i> R. Benoist	Described after 1944
	China, genus adhuc incertum
<i>S. claviculata</i> C. B. Clarke ex W. W. Smith	China, genus adhuc incertum/ <i>Pteracanthus claviculata</i>
<i>S. cusia</i> Nees	(C. B. Clarke et W. W. Smith) C. Y. Wu et C. C. Hu
<i>S. cyclo</i> C. B. Clarke ex W. W. Smith	<i>Baphicacanthus cusia</i> (Nees) Brem.
	China, genus adhuc incertum
<i>S. cyphantha</i> Diels	China, genus adhuc incertum/ <i>Pteracanthus cyphanta</i>
<i>S. divaricata</i> Nees	(Diels) C. Y. Wu et C. C. Hu
<i>S. dyeriana</i> Mast.	<i>Difflugossa divaricata</i> (Nees) Brem.
<i>S. fluviatilis</i> C. B. Clarke ex W. W. Smith	<i>Perilepta dyeriana</i> (Mast.) Brem.
	<i>Sericocalyx fluviatilis</i> (C. B. Clarke ex W. W. Smith) Brem.
<i>S. forrestii</i> Diels	China, genus adhuc incertum/ <i>Pteracanthus forrestii</i>
<i>S. glomerata</i> Nees	(Diels) C. Y. Wu et C. C. Hu
<i>S. gongshanensis</i> H. P. Tsui	<i>Goldfussia glomerata</i> (Nees) Brem.
<i>S. gossypina</i> T. And.	Described after 1944
	<i>Phlebophyllum lanatum</i> (Nees) Brem.
<i>S. grandissima</i> H. P. Tsui	Described after 1944/ <i>Pteracanthus grandissima</i>
<i>S. henryi</i> Hemsl.	(H. P. Tsui) C. Y. Wu et C. C. Hu
	<i>Gutzlaffia henryi</i> (Hemsl.) Clarke ex S. Moore /
<i>S. hygrophiloides</i> C. B. Clarke ex W. W. Smith	<i>Paragutzlaffia henryi</i> (Hemsl.) H. P. Tsui
<i>S. jugorum</i> R. Ben	China genus adhuc incertum/ <i>Pteracanthus hygrophiloides</i>
<i>S. limprichtii</i> Diels	(Clarke ex W. W. Smith) H. W. Li
	Tonkin, genus adhuc incertum
<i>S. longispicata</i> Hayata	China, genus adhuc incertum
<i>S. menglaensis</i> H. P. Tsui	China (Formosa), genus adhuc incertum /
<i>S. monadelpha</i> Nees	<i>Semmostachya longispicata</i> (Hayata) C. F. Hsieh et T. C. Huang
<i>S. mucronatopunctata</i> Lindau	Described after 1944
<i>S. petiolaris</i> Nees	<i>Sympagis monadelpha</i> (Nees) Brem.
<i>S. polyneura</i> C. B. Clarke ex W. W. Smith	Tonkin, genus adhuc incertum
	<i>Sympagis petiolaris</i> (Nees) Brem.
<i>S. pteroclada</i> R. Ben	China genus adhuc incertum
<i>S. oligantha</i> Miq.	China genus adhuc incertum/ <i>Hymenochlaena pteroclada</i>
	(R. Ben) C. Y. Wu et C. C. Hu
<i>S. rufohirta</i> C. B. Clarke ex W. W. Smith	<i>Championella oligantha</i> (Miq.) Brem.
<i>S. scoriarum</i> W. W. Smith	China genus adhuc incertum/ <i>Pyrrothrix rufo-hirta</i>
<i>S. stolonifera</i> R. Ben	(Clarke ex W. W. Smith) C. Y. Wu et C. C. Hu
<i>S. shweliensis</i> W. W. Smith	<i>Goldfussia scoriarum</i> (W. W. Smith) Brem.
	China, genus adhuc incertum
<i>S. versicolor</i> Diels	China, genus adhuc incertum
<i>S. yunnanensis</i> Diels	China, genus adhuc incertum/ <i>Pteracanthus versicolor</i>
	(Diels) H. W. Li
	China, genus adhuc incertum/ <i>Pteracanthus yunnanensis</i>
	(Diels) C. Y. Wu et C. C. Hu

species relationships in *Strobilanthes*. Based on the present study, it would appear that although there is quite considerable variation in pollen morphology among Chinese *Strobilanthes*, there are insufficient grounds for using this to recognise a large number of segregate genera. One example among several that could be cited is *Paragutzlaffia* Tsui, which Tsui (1990) had separated on the basis of its pollen morphology; however, it has cryptoaperturate pollen like that of *S. henryi*, the two differing only in quantitative characters and both were classified by Carine & Scotland (1998) in their pollen Type 8. Therefore, we follow Scotland & Vollesen (2000) in treating all the species as a single genus.

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Botanic Garden Edinburgh (the latter is supported by the Scottish Executive Environmental and Rural Affairs Department).

SPECIMENS EXAMINED

List of all taxa for which pollen samples were obtained from the Herbarium of Kunming Institute of Botany (KUN).

- Strobilanthes aenobarba* W. W. Sm.: G. M. Feng 4461
S. affinis (Griff.) Bremek.: T. T. Yu 17460
S. alatiramosa Lo et D. Fang : X. Zhou 94
S. alatus (Wall. ex Nees) Bremek.: Qing-Tibetan Group 6620
S. aprica Hance: S. E. Liu 14122
S. claviculata C. B. Clarke et W. W. Sm : The North-East Expedition Group 535
S. cognata R. Benoist: Xiang-Qian group 3433
S. congesta Terao: Dulongjiang Expedition Group 1420
S. cusia (Nees) Bremek.: H. Zhu 2182
S. cyclo C. B. Clarke ex W. W. Sm.: S. G. Wu 220
S. cyphanthus Diels Qing-Tibetan Expedition Group 8642
S. divaricata (Nees) Bremek.: Y. M. Shui 11487
S. dyeriana (Mast.) Bremek.: S. Q. Chen 8202
S. fluvialis (C. B. Clarke ex W. W. Sm.) Bremek.: C. Y. Wu 31
S. forrestii Diels : Lijiang Botanic Garden 100952
S. glomerata Nees: Q. Lin 770892
S. gongshanensis H. P. Tsui : Bijiang Group 1299
S. gossypina (Wall.) Nees: C. W. Wang 83759
S. grandissima H. P. Tsui : Q. Lin 790680
S. henryi Hemsl.: R. C. Qin 23306
S. hygrophiloides C. B. Clarke ex W. W. Sm : Qing-Tibetan Group 12634
S. jugorum (R. Ben.) Bremek.: G. D. Tao 0686
S. limprichtii Diels: G. M. Feng 8200
S. longispicata Hayata : T. T. Yu 17371
S. menglaensis H. P. Tsui: G. M. Feng 21680
S. monadelph (Nees) Bremek.: H. T. Tsai 59125
S. mucronatopunctata Lindau: S. J. Xuan 0074
S. oligantha (Miq.) Bremek.: C. W. Wang 83606
S. petiolaris (Nees) Bremek.: C. Y. Wu 5485
S. polyneuros C. B. Clarke ex W. W. Sm. : G. D. Tao 39785
S. pteroclada R. Benoist: S. Q. Chen 12628
S. rufohirta C. B. Clarke: C. W. Wang 82105
S. scoriarum (Nees) Bremek.: S. K. Wen 580303
S. shweliensis (W. W. Sm.) E. Hossain: R. C. Qing 50113
S. stolonifera R. Benoist: G. M. Feng 2596
S. versicolor Diels: Qing-Tibetan Expedition Group 7012
S. yunnanensis Diels: Xiang-Liao Group 104

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