Notes on dictyosporous hyphomycetes from China VII. The genus *Nimbya*

G.Z. Zhao¹,² and T.Y. Zhang¹*

¹Department of Plant Pathology, Shandong Agricultural University, Taian, Shandong Province 271018, P.R. China
²Key Laboratory of Systematic Mycology & Lichenology, Institute of Microbiology, Chinese Academy of Sciences, P.O. Box 2714, Beijing 100080, P.R. China


Two new species, *Nimbya dianthi* and *N. dolichi* are described. They differ from previously reported *Nimbya* species in conidial morphology and host range. Another five species are recorded from China and the genus is reviewed based on literature. The diagnostic characters of 17 accepted species of *Nimbya* are tabulated and a key to the all known species is provided.

Key words: new species, *Macrospora*, *Nimbya dianthi*, *Nimbya dolichi*.

Introduction

The genus *Nimbya* was introduced as a segregate of *Alternaria* by Simmons (1989), with *N. scirpicola* (Fuckel) Simmons as the type. *Nimbya* species produce multicellular, transversely distoseptate conidia with rarely a few longitudinal septa. Recent molecular characterization has revealed that *Nimbya* and *Embellisia* are sister taxa of the remaining *Alternaria* and *Ulocladium* spp., and they are more closely related to *Alternaria* than is *Stemphylium* (Pryor and Bigelow, 2003).

Five species of *Nimbya* were originally reported (Simmons, 1989), and subsequently, ten species have been added to the genus (Table 1). Most species are plant pathogens causing leaf lesions. Six species have been recorded on *Amaranthaceae*, six on *Cyperaceae* and *Juncaceae*, one on *Euphorbiaceae*, one on *Compositae* and one on *Solanaceae*. Teleomorphs are known for four species (Table 1.) and these have been studied in detail (Lucas and Webster, 1964; Simmons, 1989; Johnson et al., 2002). Two new species are described in this paper. They differ from previously reported *Nimbya* species in conidial morphology and host range. A further five species have been recorded

*Corresponding author: T.Y. Zhang; e-mail: tyzhang1937@yahoo.com.cn

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Table. 1. Diagnostic characteristics of the species of *Nimbya*.

<table>
<thead>
<tr>
<th>Species</th>
<th>Conidio-</th>
<th>Conidia</th>
<th>Transverse</th>
<th>Number of</th>
<th>Shape of</th>
<th>Teleomorph</th>
<th>Host/Habitats</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>phore size (µm)</td>
<td>Size (µm)</td>
<td>distosepta (lumina)</td>
<td>secondary conidia</td>
<td>rostrat</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Nimbya alternantherae</em></td>
<td>80-115 ×</td>
<td>Narrowly ovoid</td>
<td>6-10</td>
<td>0-2</td>
<td>Column or filiform</td>
<td>Unknown</td>
<td><em>Alternanthera philoxeroides</em></td>
<td>Simmons, 1995</td>
</tr>
<tr>
<td>(Holcomb &amp; Antonop.)</td>
<td>18-20</td>
<td></td>
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<tr>
<td>E.G. Simmons &amp; Alcorn</td>
<td>40-150 ×</td>
<td>Ellipsoid to broadly obclavate</td>
<td>7-10</td>
<td>Common</td>
<td>Column</td>
<td>Unknown</td>
<td><em>Carex hoodii</em></td>
<td>Simmons, 1989</td>
</tr>
<tr>
<td><em>Nimbya caricis</em> E.G.</td>
<td>5-6</td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Simmons</td>
<td>65-95 ×</td>
<td>Ellipsoid to obclavate</td>
<td>12-15</td>
<td>0</td>
<td>Column or filiform</td>
<td>Unknown</td>
<td><em>Celosia cristata</em></td>
<td>Simmons, 1995</td>
</tr>
<tr>
<td><em>Nimbya celosiae</em> E.G.</td>
<td>5-7</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Simmons &amp; Holcomb</td>
<td>up to 50</td>
<td>Broadly obclavate</td>
<td>7-9</td>
<td>0</td>
<td>Filiform</td>
<td>Unknown</td>
<td><em>Froelichia floridana</em></td>
<td>Simmons, 1995</td>
</tr>
<tr>
<td><em>Nimbya crassoides</em></td>
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<td></td>
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<td></td>
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<tr>
<td>(Davis) E.G. Simmons</td>
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</tr>
<tr>
<td><em>Nimbya dianthi</em> T.Y.</td>
<td>30-85 ×</td>
<td>Oblclavate</td>
<td>3-9</td>
<td>0-2</td>
<td>Cylindrical or filiform</td>
<td>Unknown</td>
<td><em>Dianthus sp.</em></td>
<td>This paper</td>
</tr>
<tr>
<td>Zhang &amp; G.Z.Zhao</td>
<td>4.5-7.5</td>
<td></td>
<td></td>
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</tr>
<tr>
<td><em>Nimbya dolichi</em> T.Y.</td>
<td>31-65 ×</td>
<td>Ellipsoid or obclavate</td>
<td>5-9</td>
<td>0</td>
<td>Filiform</td>
<td>Unknown</td>
<td><em>Dolichos sp.</em></td>
<td>This paper</td>
</tr>
<tr>
<td>Zhang &amp; G.Z.Zhao</td>
<td>5-10</td>
<td></td>
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<tr>
<td><em>Nimbya euphorbiciola</em></td>
<td>45-110 ×</td>
<td>Oblclavate or cylindrical</td>
<td>5-8</td>
<td>0</td>
<td>Column</td>
<td>Unknown</td>
<td><em>Euphorbia heterophylla</em></td>
<td>Chen et al., 1997</td>
</tr>
<tr>
<td>W.Q. Chen &amp; T.Y. Zhang</td>
<td>4.5-7</td>
<td></td>
<td></td>
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<tr>
<td><em>Nimbya gomphrenae</em></td>
<td>65-123 ×</td>
<td>Elong-obclavate</td>
<td>5-14</td>
<td>1</td>
<td>Filiform</td>
<td>Unknown</td>
<td><em>Gomphrena globosa</em></td>
<td>Simmons, 1989</td>
</tr>
<tr>
<td>(Togashi) E.G. Simmons</td>
<td>5-8</td>
<td>to obclavate</td>
<td></td>
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<tr>
<td><em>Nimbya heteroschemos</em></td>
<td>56-216 ×</td>
<td>Obclavate</td>
<td>6-9</td>
<td>0</td>
<td>Beakless or narrowly filiform</td>
<td>Unknown</td>
<td><em>Carex vulpina</em></td>
<td>Simmons, 1989</td>
</tr>
<tr>
<td>(Fautrey) E.G. Simmons</td>
<td>11-20</td>
<td></td>
<td></td>
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</tr>
<tr>
<td><em>Nimbya juncicola</em> E.G.</td>
<td>75-200 ×</td>
<td>Narrowly ellipsoid or narrowly obclavate</td>
<td>Up to 17</td>
<td>2</td>
<td>Column</td>
<td><em>Pleospora valesiaca</em> (Niesl) Muller</td>
<td><em>Juncaceae</em></td>
<td>Lucas and Webster, 1964; Simmons, 1989</td>
</tr>
</tbody>
</table>
Table. 1 continued. Diagnostic characteristics of the species of *Nimbya*.

<table>
<thead>
<tr>
<th>Species</th>
<th>Conidio-</th>
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<th>Number of</th>
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<tr>
<td></td>
<td>phore size (µm)</td>
<td>Size (µm)</td>
<td>distosepta</td>
<td>secondary</td>
<td>rostrat</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Nimbya major</em> (Pavgi &amp; U.P. Singh) E.G. Simmons</td>
<td>Up to 150</td>
<td>60-90 × 7-10</td>
<td>Narrowly obclavate</td>
<td>8-10</td>
<td>0-3</td>
<td>Column</td>
<td>Unknown</td>
<td><em>Nicotiana plumbaginifolia</em> Simmons, 2000</td>
</tr>
<tr>
<td><em>Nimbya perpunctulata</em> E.G. Simmons</td>
<td>70-125 × 4-5</td>
<td>80-100 × 10-14</td>
<td>Ellipsoid or subcylindrical</td>
<td>6-10</td>
<td>0</td>
<td>Filiform</td>
<td>Unknown</td>
<td><em>Alternanthera philoxeroides</em> Simmons, 2004</td>
</tr>
<tr>
<td><em>Nimbya pimpriana</em> (V.G. Rao) E.G. Simmons</td>
<td>205-260 × 12.5-17 (including beak)</td>
<td>60-80 × 10-14</td>
<td>Narrowly obclavate</td>
<td>5-13</td>
<td>0</td>
<td>Filiform</td>
<td>Unknown</td>
<td><em>Celosia cristata</em> Simmons, 1995</td>
</tr>
<tr>
<td><em>Nimbya rhapontici</em> (Nelen) E.G. Simmons</td>
<td>Up to 75</td>
<td>70-118 × 12-22</td>
<td>Long ovoid to ellipsoid</td>
<td>7-10</td>
<td>0</td>
<td>Long filiform</td>
<td>Unknown</td>
<td><em>Rhaponticum carthamoides</em> Simmons, 1997</td>
</tr>
<tr>
<td><em>Nimbya scirpicola</em> (Fuckel) E.G. Simmons</td>
<td>50</td>
<td>100-120 × 15-20</td>
<td>Long narrow-obclavate</td>
<td>9-11</td>
<td>2-3</td>
<td>Column</td>
<td><em>Macrospora scirpicola</em> (DC.: Fr.) Funke</td>
<td><em>Cyperaceae</em> Simmons, 1989; Wong and Hyde, 2001</td>
</tr>
<tr>
<td><em>Nimbya scirpinfestans</em> E.G. Simmons &amp; D.A. Johnson</td>
<td>10-30 × 3-4</td>
<td>30-80 × 4-6 or 90-130 × 6-8</td>
<td>Narrowly ellipsoid or narrowly ovoid</td>
<td>3-8</td>
<td>1-2</td>
<td>Column</td>
<td><em>Macrospora scirpinfestans</em> E.G. Simmons &amp; D.A. Johnson</td>
<td><em>Scirpus acutus</em> Johnson et al., 2002</td>
</tr>
<tr>
<td><em>Nimbya scirpivora</em> E.G. Simmons &amp; D.A. Johnson</td>
<td>15-40 × 4-5</td>
<td>20-60 × 5-8</td>
<td>Narrow-ovoid</td>
<td>4-9</td>
<td>Abundant</td>
<td>Narrow column</td>
<td><em>Macrospora scirpivora</em> E.G. Simmons &amp; D.A. Johnson</td>
<td><em>Scirpus sp.</em> Johnson et al., 2002</td>
</tr>
</tbody>
</table>
from China. The diagnostic characteristics of 17 known species of *Nimbya* are listed in Table 1 and a key to all these species is provided.

**Results: Nimbya species from China**

*Nimbya alternantherae* (Holcomb & Antonopoulos) Simmons & Alcorn, Mycotaxon 55: 142. 1995. (Fig. 1)


*Material examined:* CHINA, Guangyuan, Sichuan Province, on leaves of *Alternanthera philoxeroides* (Mart) Griseb, G.Z. Zhao, HSAUP II02670 (ZGZ II00370); Fuzhou, Fujian Province, on leaves of *A. philoxeroides*, H.M. Liu, HSAUP L-376; Nanchang, Jiangxi Province, on leaves of *A. philoxeroides*, H. Deng, HSAUP II04334 (DHII0334) and Chongqing, HSAUP II02798* (ZGZ II00498).

*Notes:* This species was originally described as *Alternaria alternantherae* (Holcomb and Antonopoulos, 1976), a pathogen of a leafspot disease of alligatorweed, *Alternanthera philoxeroides* (Mart.) Griseb., in Louisiana, and also is pathogenic on ornamental *Amaranthaceae* species (Holcomb, 1978). Spots occurred on leaves and stems with the leafspots more numerous and prominent. Disease symptoms first appeared as small purple lesions that developed into centrally tan-coloured, necrotic leafspots and enlarged to 2-3(-4) mm diam. Simmons (1995) transfer the species and another isolate from leafspot of *Alternanthera denticulate* to *Nimbya*. The holotype was used up in isolation work. Simmons (1995) designed the neotype: BPI dried-down culture EGS 39-124 ex ATCC32833 ex Holcomb and Antonopoulos's holotype.

The species was first reported in China as *Alternaria alternantherae* on *Alternanthera philoxeroides* (Cao et al., 1990), which was also used as a biocontrol agent to prevent *Alternanthera philoxeroides* spreading in China (Xiang, 1998; Xiang et al., 2002a,b,c).

*Nimbya celosiae* Simmons & Holcomb, Mycotaxon 55: 144. 1995. (Fig. 2)

*Material examined:* CHINA, Fuzhou, Fujian Province, on leaves of *Celosia cristata* L., HSAUP II04055 (DHII055); Guilin, Guangxi Zhuang Autonomous Region, on leaves of *C. cristata*, HSAUP992034 (ZGZ990534).

*Notes:* *Nimbya celosiae* is similar to *N. alternantherae* in both parasitizing plants of *Amaranthaceae* and in conidial shape. *Nimbya alternantherae* have distinctly constricted transverse septate conidia and conidial beaks exhibit various swollen cells, while conidia of *N. celosiae* are not distinctly constricted and conidial beaks are evenly long and narrow (filiform).

The size range of conidia of the Chinese collections are 50-120 × 15-21 µm, which are compatible with those of original descriptions (60-100 × 10-18 µm) by Simmons (1995).

*The ‘II0’ indicates that the specimen was collected in 2000.*
Fig. 1. Conidiophores and conidia of *Nimbya alternantherae* from HSAUP II02670.
Fig. 2. Conidiophores and conidia of *Nimbya celosiae* from HSAUP Il4055.
**Nimbya dianthi** T.Y. Zhang & G.Z. Zhao, **sp. nov.**

*Conidiophora* solitary, erecta, septata, recta vel paulo curvata, eramosa, pallide brunnea, 30-85 × 4.5-7.5 µm. *Conidia* solitary vel breviter catenata, obclavata, pallide brunnea vel brunnea, transverse 3-9- (pseudo-) septata, longitudinaliter vel oblique 0-1- distoseptata, leviter constricta, levia, 31-67 × 9.5-13.5 µm; cellula basali saepe rotundata; rostra 31-100 × 2.5-4.5 µm, aliquando pseudorostrate praedita.

**Holotypus**: in foliis vivis *Dianthi* sp. Shaanxi Provincia, Sinica. HSAUP 960301 (ZTY96-120).

Conidiophores solitary, erect, straight or slightly curved, unbranched, septate, pale brown, 30-85 × 4.5-7.5 µm. *Conidia* solitary or in short chains, obclavate, pale brown to brown, conidial body with 3-9 transverse septa, 0-1 longitudinal or oblique septa, slightly constricted at septa, surface smooth, 31-67 × 9.5-13.5 µm excluding beak, with broadly rounded, dark brown basal cell; upper cell tapering into a long beak, cylindrical or filiform, pale brown, septate, up to 31-100 × 2.5-4.5 µm. Some of the juvenile and mature conidia are pseudorostrate. After becoming fertile, the tip of the pseudorostrum often expands and extends, becoming nearly as thick as the normal conidiophore.

**Substrate**: On leaves of *Dianthus* sp.

**Notes**: This fungus is the first species of *Nimbya* reported on member of the Caryophyllaceae. *Nimbya dianthi* is similar to *N. dolichi* in conidium morphology, but the latter has relatively broader conidia with a longer and column beak. Besides, the beaks of primary conidia in *N. dianthi* usually become secondary conidiophores (pseudorostra) and produce secondary conidia.

**Nimbya dolichi** T.Y. Zhang & G.Z. Zhao, **sp. nov.**

In substrato naturali coloniae epiphyllae vel caulicolae. Mycelium fere immersum. *Hyphae* ramosae, septatae, hyalinae, subhyalinae vel albo-lutescentes, irregulares. *Conidiophora* macronematosa, simplicia, 1-2-geniculata vel ramosa, septata, 31-65 × 5-10 µm; *Conidia* solitary vel raro catenata, recta vel curvata; anguste ellipsoidea vel anguste obclavata, transverse 5-9- distoseptata et 0-5-euseptata, longitudinaliter vel oblique 0-4 distoseptata, 30-65 × 10.5-15.5 µm, dilute brunnea vel brunnea, laevia; rostra 11-80 × 2.0-3.5 µm.

**Holotypus**: in foliis *Dolichotis* sp, in Monte Xiaowutai, Hebei Provincia, Sinica, HMAS 65889.

Colonies mainly epiphyllous and caulicolous. *Mycelium* mostly immersed. *Hyphae* branched, septate, smooth, colourless, subhyaline to light brown, irregular. *Conidiophores* macronematous, arise directly from intra substrate hyphae, erect, simple, branched, with a single apical scar or rarely 1-2 geniculate with 2-3 scars, 31-65 × 5-10 µm. *Conidia* solitary or rarely in chains of 2-3, straight or slightly curved, ellipsoides or obclavata, conidial bodies 30-65 × 10.5-15.5 µm, dilute brown, surface smooth, 5-9 transverse distosepta and 0-5 transverse eusepta, 0-4 longitudinal or oblique distosepta. Beaks filiform, septate, hyaline to subhyaline, ca. 11-80 × 2-3.5 µm.
Fig. 3. Conidiophores and conidia of *Nimbya dianthi* from holotype.
Fig. 4. Conidiophores and conidia of *Nimbya dolichi* from holotype.
Fig. 5. Conidiophores and conidia of *Nimbya euphorbiicola* (Chen and Zhang, 1997).

*Substrate:* On leaves of *Dolichos* sp.

*Notes:* *Nimbya dolichi* is similar to *N. dianthi* in conidium body shape and size, but its conidia are filiformly true beaked, and the pseudorostrum is seldom present. It is the first species of *Nimbya* reported on *Leguminosae*.

*Nimbya euphorbiicola* W.Q. Chen & T.Y. Zhang, Mycosystema, 16: 106. 1997.  (Fig. 5)


*Notes:* Conidial morphology of *N. euphorbiicola* is similar to those of *Nimbya heteroschemos* (Fautrey) E.G. Simmons and *N. gomphrenae* (Togashi) Simmons, but differs in smaller conidia (45-65 × 11-15 µm). While conidia of *N. heteroschemos* are 75-100 × 18-22 µm and those of *N. gomphrenae* are 70 - 140 × 11-15 µm. And also the three species habit on different plant families.
Simmons (1994) found three conidia of *Nimbya* sp. on *Euphorbia marginata* when he observed the slide (BPI 0445288) of the lectotype of *Macrosporium euphorbiae* (=*Alternaria euphorbiae*). But there are insufficient numbers of conidia for speculation as to its identity with other known species of *Nimbya*.

*Nimbya gomphrenae* (Togashi) Simmons, Sydowia, 41: 314. 1989. (Fig. 6)  

Fig. 6. Conidiophores and conidia of *Nimbya gomphrenae* from HMUABO 100353.
Fig. 7. Conidiophores and conidia of *Nimbya scirpicola* from HSAUP II₀2524.

*Notes*: Togashi (1944) described this species from Taiwan as *Alternaria gomphrenae*, which lately was combined to *Nimbya* by Simmons (1989). That should be the first report of the species in the genus from China.

*Nimbya scirpicola* (Fuckel) E.G. Simmons, Sydowia 41: 314, 1989.  (Fig. 7)

= *Sporidesmium scirpicola* Fuckel, Fungi rhenani 78. 1863
= *Clasterosporium scirpicola* (Fuckel) Sacc., Syll. Fung. 4: 398. 1886.
= *Cercospora scirpicola* (Fuckel) Zind. -Bakker, Rev. Mycol. 5: 66. 1940.

*Material examined*: CHINA, Wulumuqi, the Xinjiang Uygur Autonomous Region, on culms and stalks of an unidentified dead plant of *Poaceae*, HSAUP II₀2524 (ZGZ II₀ 224).

*Notes*: It is believed that this fungus is a parasite since some unobvious lesions were observed where the fungus was sporulating.
Nimbya scirpicola was described causing a leaf spot on Scirpus sp. (Cyperaceae). The fungus on Chinese specimen is very similar to the original description by Simmons (1989), but has a minor difference in conidial morphology and size. The conidiophores of the Chinese fungus are slightly narrower (5-10 µm) and the conidium beak is relatively thicker (5-8 µm) than that of the original description. However, the minor morphological difference and different host range do not provide enough evidence to support the Chinese collection as a distinguishable new species. The teleomorph, Macrospora scirpicola Fuckel, has been reported many times, and it is known in China from Hong Kong (Wong and Hyde, 2001).

Key to the known species of Nimbya

1. Conidia thin ovoid to long ellipsoidal ................................................................. 2
2. Conidia obclavate, ellipsoidal to thin obclavate ................................................... 5
3. Conidia filiformly beaked, on Compositae ......................................................... Nimbya rhapontici
   4. Conidia longer than 80 µm .............................................................................. 4
   5. Conidia thin ovoid, shorter than 80 µm, on Cyperaceae ................................... N. scirpivora
     6. Conidia 6-8 µm diam., on Cyperaceae ......................................................... N. scirpinfestans
     7. Conidia thicker than 10 µm diam., on Amaranthaceae .................................... 16
   8. Conidia with column-shaped beaks ................................................................. 3
   9. Conidia thin obclavate to long ellipsoidal ....................................................... 11
   10. Conidia thick obclavate, ellipsoidal to obclavate .............................................. 13

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11. Conidia shorter than 90 µm (av.), less than 10 µm diam. (av.), on Solanaceae ....N. major
11. Conidia longer than 90 µm (av.), thicker than 10 µm diam. (av.) .............................. 12

12. Conidia thicker than 15 µm diam. (av.), with up to 11 transverse distosepta, on Cyperaceae ................................................................. N. scirpicola
12. Conidia thinner than 15 µm diam. (av.), with up to 17 transverse distosepta, on Juncaceae ................................................................. N. juncicola

13. Conidia shorter than 85 µm (av.).................................................................................. 14
13. Conidia longer than 85 µm (av.)................................................................................... 15

14. Conidia ellipsoidal to broadly obclavate, spore bodies relatively large (65-95 × 10-16 µm) ............. N. caricos
14. Conidia obclavate, spore bodies relatively small (31-67 × 9.5-13.5 µm) .................. N. dianthi

15. Conidia obclavate or subcylindrical, with 5-8 distosepta, on Euphorbiaceae .................. N. euphorbiicola
15. Conidia ellipsoidal to obclavate, with 12-15 distosepta, on Amaranthaceae .... N. celosiae

16. Conidia 18-20 µm diam.................................................................................. N. alternantherae
16. Conidia 10-14 µm diam................................................................................  N. perpunctulata

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