Revisions and key to the Vernonieae (Compositae) of Thailand

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Abstract
Seventeen genera and 48 species, in five subtribes, are recognized in Thailand. These include 15 endemic taxa, half of which are in the largest genus, Acilepis, with others in the genera Camchaya, Koyamasia, and Okia. A new monotypic genus, Pulicarioidea, is established with P. annamica, the new name for the species formerly known as Vernonia pulicarioidea. New combinations are also made for Acilepis kerrii, Cyanthillium montanum, Koyamasia curtisii and Okia pseudobirmanica. Forty-six characters including habit, leaf, flower, achene and pollen morphology were analyzed using UPGMA. Five clusters of taxa were identified. Keys to genera, species and varieties, descriptions, vernacular names, ecological data and illustrations are provided.

Keywords
Acilepis, Asteraceae, Camchaya, Cichorioideae, Cyanthillium, Decaneuropsis, Elephantopus, Ethulia, Gymnanthemum, Iodocephalopsis, Koyamasia, Kurziella, Monosis, Okia, Pseudelephantopus, Pulicarioidea, southeast Asia, Strobocalyx, Struchium, Tarlmounia

Overview of the Vernonieae and taxonomic history of the tribe in Thailand

The Vernonieae have been shown to be unequivocally monophyletic and are well represented in both the Old and New Worlds, with centers of diversity in east Africa and Brazil (Keeley et al. 2007, Keeley and Robinson 2009). Recent revisions by Robinson (1999a, b, 2007) based on morphology, secondary chemistry and palynological studies,
combined with data from the molecular work of Keeley et al. (2007) and Keeley and Robinson (2009), confirm a division into two separate lineages, one for the Old World and one for the New World taxa. Within these lineages Keeley and Robinson (2009) recognized six Old World and 14 New World subtribes and a total of 125 genera. Additional studies since that publication have added to this number, particularly in the Old World (e.g., Bunwong et al. 2009, Robinson and Skvarla 2006, 2009). The range and circumscription of the type genus, Vernonia, was also greatly changed by Robinson’s 1999 studies. Once thought to be distributed worldwide and to contain >1000 species, Vernonia is now confined to fewer than 25 species and restricted to the Americas. Name changes are not complete for Old World species formerly ascribed to this genus, however, and the generic status of these species will certainly change in the future when these larger scale studies are completed.

Koyama’s publications of Thai Vernonieae (1984, 1993, 1997, 1998, 2003, 2004, 2005) included descriptions of all species known at that time, and also included descriptions of several new genera. Over the course of this work Koyama also synonymized taxa given in the earlier treatments of Kerr (1936) and Suvatti (1978), the only other workers to specifically address the Vernonieae in Thailand. These latter authors held widely differing concepts regarding the number of Vernonieae species as well as conflicting generic concepts (i.e. 16 genera and 196 species, and two genera and 11 species, respectively). Koyama recognized a total of 44 species, most of which were placed in the traditionally large core genus Vernonia s.l.; only four other genera, Camchaya, Elephantopus, Ethulia, and Struchium, were recognized in his treatments. However, only the former genus is southeast Asian with its species native to Thailand, the latter three are found throughout tropical areas of both the New and Old Worlds.

The largest concentration of endemic Vernonieae is found in the northern and northeastern regions of Thailand, and outside of the country’s political boundaries in the adjacent regions of Burma and Yunnan, China. Taxa are typically found in open areas within dipterocarp, deciduous, evergreen and pine-oak forests, at elevations from sea level to over 2000 m. There are 15 endemics: Acilepis chiangdaoensis, A. doichangensis, A. kerrii, A. namnaoensis, A. ngaoensis, A. principis, A. pseudosutepensis, A. sutepensis, Camchaya pentagona, C. spinulifera, C. tenuiflora, C. thailandica, Koyamasia calcarea, K. curtisii var. tomentosa, and Okia pseudobirmanica (treated as species of Vernonia by Koyama 1984, 1993, 1997, 1998, 2003, 2004, 2005). Of these, five are restricted to limestone substrates in evergreen forests (Acilepis pseudosutepensis, Koyamasia calcarea, K. curtisii var. tomentosa, Okia birmanica and O. pseudobirmanica). Cyanthillium cinereum, Elephantopus scaber, E. mollis, Ethulia conyzoides, Pseudelephantopus spicatus, and Struchium sparganophorum are found widely throughout the tropics worldwide. Non-weedy, but also widespread in the Malay Peninsula are Cyanthillium patulum, Decaneuropsis cumingiana, Strobocalyx arborea, Cyanthillium montanum and Koyamasia curtisii.

Koyama’s treatments were used as the starting points for this study, with modifications in generic assignment by Robinson (1999a, b, 2007), Bunwong et al. (2009), and Robinson and Skvarla (2009). Koyama did not consider subtribes, so these are also assigned according to the work of Robinson (1999a, 2007). The relationships among
Vernonieae taxa of many south and southeast Asian, Indo-Chinese and Malaysian Vernonieae lack any kind of treatment beyond the earliest naming and description and hence have not been included in this study. Additionally, there are > 200 species in this region which fact has also made understanding of the relationships among these taxa extremely challenging. The present study provides a revision of the genera and species, with keys and complete descriptions for all Vernonieae found within Thailand.

**Materials and methods**

**Specimens and morphological measurements**

Herbarium specimens were obtained from AAU, B, BCU, BK, BKF, BM, C, E, G, K, KKU, L, P, PSU, QBG and US. Field collections were also made throughout Thailand by the first author and have been deposited at KKU, QBG and US. Information recorded from specimens included distribution, and when available ecological data and vernacular name(s). Only mature vegetative and reproductive parts were measured or scored. Macromorphological measurements, presence/absence and specifics of surfaces and vestitures were obtained by light microscope. Achenes, leaf surfaces and unacetolized pollen were observed with scanning electron microscopy (SEM) using a LEO, 1450VP. A complete listing of taxa and voucher information are given in Table 1.

**Phenetic analysis**

Twenty-six binary and 20 multistate characters were obtained for 42 species (Table 1, 2), morphological characters are shown in Figs 1, 2, and representative pollen types in Fig. 3. At least 15 specimens per taxon were measured and scored. Data for some taxa were already available (Bunwong and Chantaranothai 2008) and were used as recorded in that study as the methodology was the same as that used here. All data were prepared using MacClade 4.03 (Maddison and Maddison 2001) and imported into PAUP* 4.0b10 (Swofford 2002) for Unweighted Pair Group Mathematical Average (UPGMA) cluster analysis. UPGMA tree were constructed using distance mesure of mean character difference. The number of 1000 replicates is used for all bootstrap tests.

**Results and discussion**

Five clusters of taxa are recognized in the UPGMA analysis as shown in Fig. 4. These groups largely correspond to three Old World subtribes recognized by Robinson (1999b), the Centrapalinae, Erlangeinae, Gymnantheminae, and two adventive New World subtribes, Elephantopinae, and Vernoniiinae. In addition, seven taxa, *Cyanthillium montanum*, *Kurziella gymnoclada*, *Okia birmanica*, *O. pseudobirmanica*, *Koyamasia curtisi*, *K. curtisi*
Table 1. Taxa and voucher information for species included in UPGMA analysis.

<table>
<thead>
<tr>
<th>Species</th>
<th>Locality (Province)</th>
<th>Voucher information</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Acilepis attenuata</em> (I)</td>
<td>Udon Thani</td>
<td>S. Bunwong 347</td>
</tr>
<tr>
<td><em>Acilepis attenuata</em> (II)</td>
<td>Khon Kaen</td>
<td>S. Bunwong 351</td>
</tr>
<tr>
<td><em>Acilepis attenuata</em> (III)</td>
<td>Loei</td>
<td>S. Bunwong 373</td>
</tr>
<tr>
<td><em>Acilepis attenuata</em> (IV)</td>
<td>Sakon Nakon</td>
<td>S. Bunwong 354</td>
</tr>
<tr>
<td><em>Acilepis chiangdaoensis</em></td>
<td>Chiang Mai</td>
<td>S. Bunwong 78</td>
</tr>
<tr>
<td><em>Acilepis divergens</em> (I)</td>
<td>Chiang Mai</td>
<td>S. Bunwong 366</td>
</tr>
<tr>
<td><em>Acilepis divergens</em> (II)</td>
<td>Chiang Mai</td>
<td>S. Bunwong 377</td>
</tr>
<tr>
<td><em>Acilepis kingii</em></td>
<td>Chiang Mai</td>
<td>S. Bunwong 77</td>
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<tr>
<td><em>Acilepis nannaonensis</em></td>
<td>Chaiyaphum</td>
<td>S. Bunwong 385</td>
</tr>
<tr>
<td><em>Acilepis ngaenosis</em></td>
<td>Ranong</td>
<td>S. Bunwong 386</td>
</tr>
<tr>
<td><em>Acilepis peguensis</em></td>
<td>Loei</td>
<td>S. Bunwong 372</td>
</tr>
<tr>
<td><em>Acilepis pseudosutepensis</em></td>
<td>Tak</td>
<td>S. Bunwong 388</td>
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<tr>
<td><em>Acilepis saligna</em></td>
<td>Mae Hong Son</td>
<td>S. Bunwong 357</td>
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<tr>
<td><em>Acilepis silhetensis</em></td>
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</tr>
<tr>
<td><em>Acilepis suteptensis</em> (I)</td>
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<td><em>Acilepis suteptensis</em> (II)</td>
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<td><em>Camchaya gracilis</em></td>
<td>Ubon Ratchathani</td>
<td>S. Bunwong 346</td>
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<td><em>Camchaya loloana</em> (I)</td>
<td>Khon Kaen</td>
<td>S. Bunwong 330</td>
</tr>
<tr>
<td><em>Camchaya loloana</em> (II)</td>
<td>Ubon Ratchathani</td>
<td>S. Bunwong 339</td>
</tr>
<tr>
<td><em>C. loloana var. mukdahanensis</em> (I)</td>
<td>Mukdahan</td>
<td>S. Bunwong 338</td>
</tr>
<tr>
<td><em>C. loloana var. mukdahanensis</em> (II)</td>
<td>Ubon Ratchathani</td>
<td>S. Bunwong 343</td>
</tr>
<tr>
<td><em>Camchaya pentagona</em></td>
<td>Ubon Ratchathani</td>
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<tr>
<td><em>Camchaya spinulifera</em> (I)</td>
<td>Udon Thani</td>
<td>S. Bunwong 327</td>
</tr>
<tr>
<td><em>Camchaya spinulifera</em> (II)</td>
<td>Sakon Nakon</td>
<td>S. Bunwong 352</td>
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<tr>
<td><em>Camchaya spinulifera</em> (III)</td>
<td>Nong Khai</td>
<td>S. Bunwong 336</td>
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<tr>
<td><em>Camchaya tenuiflora</em></td>
<td>Loei</td>
<td>S. Bunwong 348</td>
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<tr>
<td><em>Camchaya thailandica</em></td>
<td>Udon Thani</td>
<td>S. Bunwong 328</td>
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<td><em>Cyanthillium cinereum</em></td>
<td>Loei</td>
<td>S. Bunwong 350</td>
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<td><em>Cyanthillium hookerianum</em></td>
<td>Unon Ratchathani</td>
<td>S. Bunwong 341</td>
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<tr>
<td><em>Cyanthillium montanum</em> (I)</td>
<td>Mae Hong Son</td>
<td>S. Bunwong 356</td>
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<td><em>Cyanthillium montanum</em> (II)</td>
<td>Chiang Mai</td>
<td>S. Bunwong 371</td>
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<tr>
<td><em>Decaneuropsis cumingiana</em></td>
<td>Perchaboon</td>
<td>S. Bunwong 74</td>
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<tr>
<td><em>Decaneuropsis eberhardtii</em></td>
<td>Chaiyaphum</td>
<td>S. Bunwong 384</td>
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<td><em>Decaneuropsis garrettiana</em></td>
<td>Chiang Mai</td>
<td>S. Bunwong 75</td>
</tr>
<tr>
<td><em>Elephantopus mollis</em></td>
<td>Ubon Ratchathani</td>
<td>S. Bunwong 340</td>
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<tr>
<td><em>Elephantopus scaber</em> (I)</td>
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<td>S. Bunwong 325</td>
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<td><em>Elephantopus scaber</em> (II)</td>
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<td>S. Bunwong 334</td>
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<tr>
<td><em>E. scaber var. penicillatus</em></td>
<td>Ubon Ratchathani</td>
<td>S. Bunwong 345</td>
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<tr>
<td><em>Gymnanthemum extensus</em></td>
<td>Chiang Mai</td>
<td>S. Bunwong 378</td>
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<tr>
<td><em>Iodocephalopsis eberhardtii</em></td>
<td>Chiang Mai</td>
<td>S. Bunwong 335</td>
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<td><em>Koyamasia calcarea</em></td>
<td>Chiang Mai</td>
<td>P. Suksathan 2847</td>
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<td><em>Koyamasia curtisii</em></td>
<td>Chiang Rai</td>
<td>S. Wathana 875</td>
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<td><em>Kurziella gymnoclada</em></td>
<td>Khon Kaen</td>
<td>S. Bunwong 391</td>
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<td><em>Monosis volkamerifolia</em></td>
<td>Chiang Mai</td>
<td>S. Bunwong 362</td>
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</tbody>
</table>
### Revisions and key to the Vernonieae (Compositae) of Thailand

<table>
<thead>
<tr>
<th>Species</th>
<th>Locality (Province)</th>
<th>Voucher information</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Pseudelephantopus spicatus</em> (I)</td>
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<td><em>Pseudelephantopus spicatus</em> (II)</td>
<td>Chiang Rai</td>
<td>S. Bunwong 352</td>
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<tr>
<td><em>Strobocalyx arborea</em></td>
<td>Loei</td>
<td>M. Norsangsri 1052</td>
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<tr>
<td><em>Strobocalyx solanifolia</em></td>
<td>Loei</td>
<td>S. Bunwong 395</td>
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<td><em>Tarlmounia elliptica</em> (I)</td>
<td>Khon Kaen</td>
<td>S. Bunwong 390</td>
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<tr>
<td><em>Tarlmounia elliptica</em> (II)</td>
<td>Khon Kaen</td>
<td>S. Bunwong 392</td>
</tr>
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</table>

#### Table 2. Morphological characters and character states included in this study.

<table>
<thead>
<tr>
<th>No.</th>
<th>Characters and character states</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Habit; erect herb (0), scandent (1), shrub (2), tree (3)</td>
</tr>
<tr>
<td>2</td>
<td>Stem; acauline (0), cauline (1)</td>
</tr>
<tr>
<td>3</td>
<td>Stem rib; absent (0), present (1)</td>
</tr>
<tr>
<td>4</td>
<td>Stem vestiture; puberulous (0), tomentose (1), villose-pilose (2), sericeous (3)</td>
</tr>
<tr>
<td>5</td>
<td>Petiole length; 0-1 mm (0), &gt; 1 mm (1)</td>
</tr>
<tr>
<td>6</td>
<td>Leaf shape; ovate or lanceolate (0), obovate or oblanceolate (1), elliptic or oblong (2)</td>
</tr>
<tr>
<td>7</td>
<td>Leaf margin; crenate (0), serrate (1), entire or undulate (2)</td>
</tr>
<tr>
<td>8</td>
<td>Leaf apex; obtuse or rounded (0), acute or acuminate (1), apiculate or cuspidate (2), caudate or aristeate (3)</td>
</tr>
<tr>
<td>9</td>
<td>Leaf base; attenuate (0), cuneate or obtuse (1)</td>
</tr>
<tr>
<td>10</td>
<td>Leaf texture; coriaceous (0), chartaceous (1)</td>
</tr>
<tr>
<td>11</td>
<td>Leaf trichomes: whip-shaped with long terminal cell; absent (0), present (1)</td>
</tr>
<tr>
<td>12</td>
<td>Leaf trichomes: whip-shaped with short terminal cell; absent (0), present (1)</td>
</tr>
<tr>
<td>13</td>
<td>Leaf trichomes: filiform; absent (0), present (1)</td>
</tr>
<tr>
<td>14</td>
<td>Leaf trichomes: flagellate; absent (0), present (1)</td>
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<tr>
<td>15</td>
<td>Leaf trichomes: cylindrical; absent (0), present (1)</td>
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<tr>
<td>16</td>
<td>Leaf trichomes: T-shaped; absent (0), present (1)</td>
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<tr>
<td>17</td>
<td>Vestiture on upper leaf surface; puberulous (0), tomentose (1), villose-pilose (2), sericeous (3), scabrous (4)</td>
</tr>
<tr>
<td>18</td>
<td>Vestiture on lower leaf surface; puberulous (0), tomentose (1), villose-pilose (2), sericeous (3), scabrous (4)</td>
</tr>
<tr>
<td>19</td>
<td>Gland on upper leaf surface; absent (0), present (1)</td>
</tr>
<tr>
<td>20</td>
<td>Gland on lower leaf surface; absent (0), present (1)</td>
</tr>
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<td>21</td>
<td>Capitulescence type; spicate (0), paniculate (1), solitary (2), scapose (3), corymbose (4)</td>
</tr>
<tr>
<td>22</td>
<td>Phyllary rows; 1-2 (0), 3-5 (1), &gt; 5 (2)</td>
</tr>
<tr>
<td>23</td>
<td>Phyllary arrangement; decussate (0), imbricate (1)</td>
</tr>
<tr>
<td>24</td>
<td>The middle phyllary shape; ovate (0), lanceolate (1), oblong (2)</td>
</tr>
<tr>
<td>25</td>
<td>The outer and the middle phyllary apex; obtuse (0), acute or acuminate (1), apiculate or aristate (2), spinose (3)</td>
</tr>
<tr>
<td>26</td>
<td>The outer and the middle phyllary with reflexed apex; absent (0), present (1)</td>
</tr>
<tr>
<td>27</td>
<td>Phyllary margin; ciliate (0), piliferous (1), spinulose (2), entire (3)</td>
</tr>
<tr>
<td>28</td>
<td>Phyllary vestiture; puberulous (0), tomentose (1), villose-pilose (2), arachnoid (3), sericeous (4)</td>
</tr>
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<td>29</td>
<td>Capitate gland on phyllaries; absent (0), present (1)</td>
</tr>
<tr>
<td>30</td>
<td>Number of floret per a capitulescence; 1-4 (0), 5-30 (1), &gt;30 (2)</td>
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<td>31</td>
<td>Corolla symmetry; actinomorphic (0), zygomorphic (1)</td>
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<tr>
<td>32</td>
<td>Corolla trichomes; absent (0), present (1)</td>
</tr>
<tr>
<td>No.</td>
<td>Characters and character states</td>
</tr>
<tr>
<td>-----</td>
<td>-----------------------------------------------------------------------------------------------</td>
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<td>34</td>
<td>Pollen type; echinate (0), sublophate (1), lophate (2)</td>
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<td>35</td>
<td>Pollen furrow; absent (0), present (1)</td>
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<td>36</td>
<td>Pollen pore shape; circular (0), semicircular (1)</td>
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<tr>
<td>37</td>
<td>Number of pollen pore; 3 pores (0), 6 pores (1)</td>
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<tr>
<td>38</td>
<td>Pollen spine length; 0 µm (0), &gt;0-5 µm (1), &gt;5 µm (2)</td>
</tr>
<tr>
<td>39</td>
<td>Pollen columella; prominent (0), inconspicuous (1)</td>
</tr>
<tr>
<td>40</td>
<td>Pollen micropuncta; absent (0), present (1)</td>
</tr>
<tr>
<td>41</td>
<td>Achene shape; turbinate (0), clavate (1), terete (2)</td>
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<tr>
<td>42</td>
<td>Achene trichomes; absent (0), present (1)</td>
</tr>
<tr>
<td>43</td>
<td>Achene glands; absent (0), present (1)</td>
</tr>
<tr>
<td>44</td>
<td>Number of achene rib; 1-9 (0), ≥10 (1)</td>
</tr>
<tr>
<td>45</td>
<td>Carpopodium; absent (0), present (1)</td>
</tr>
<tr>
<td>46</td>
<td>Pappus; absent (0), present in every floret (1), present in some florets (2)</td>
</tr>
</tbody>
</table>

Figure 1. Illustration of characters used in morphological descriptions and UPGMA analysis. A Leave length B Leave width C Petiole length D Involucral length E Involucral diameter F Capitula height G Anther length H Style length I Stigma length J Receptacle diameter K corolla tubescorolla tube length L Corola lobe length M Achene length N Inner pappus length (Modified from Robinson 1999a)
var. tomentosa, and *Pulicarioidea annamica* not previously assigned to subtribe, appear to belong to the Erlangeinae. However, this assignment is considered tentative as further work will be needed to show definitive placement of these species.

*Camchaya* is a well-supported genus within the subtribe Centrapalinae (Fig. 4). It is characterized by an annual habit, erect, leafy stems, achenes without a carpododium, a deciduous pappus, and echinolophate hexaporate pollen. Bunwong et al. (2009) distinguished the genus *Iodocephalopsis* from *Camchaya* based on the absence of a spine at the margin of the involucral bracts, differences in bract shape, and the former taxon’s tricolporate pollen. Although both genera are clearly closely related, their placement within the subtribe Centrapalinae may be subject to change. Robinson (pers. comm.) expressed doubt about the existence of true Centrapalinae in Thailand because the taxa are morphologically distinct from those in this same subtribe in Africa, the taxa for which the subtribe was originally described. As a result, the position of Thai taxa now ascribed to this subtribe will need to be evaluated within a larger analysis that also includes African Centrapalinae taxa before a final decision can be made.

Structural features including pollen place the Asian *Gymnanthemum* and *Decaneuropsis* clearly in the subtribe Gymnantheminiae, but DNA sequencing is still need-
**Figure 3.** Representative pollen types of Vernonieae. **A** Echinate 3-colporate **B** Lophate 3-colporate **C** Lophate 3-porate **D** Lophate 6-porate (Applied from Bunwong and Chantaranothai 2008).

**Figure 4.** UPGMA tree for 42 Thai Vernonieae based on vegetative, reproductive and pollen morphology (see Table 2, Figs 1, 2, 3). Number above the lines indicate bootstrap support (1000 replications). Zero length branches indicated by arrows.
ed for confirmation. The place of Monosis is less certain. For example, genera such as Decaneuropsis (and possibly Strobocalyx and Tarlmounia) have been assigned to the Gymnanthemiae (i.e. Robinson 2007, Robinson and Skvarla 2007, Robinson et al. 2008, 2010) while others have been removed and placed in their own subtribe, i.e., Distephanus, now in subtribe Distephaninae (Keeley and Robinson 2009). Typical African Gymnanthemiae differ in habit from their Thai counterparts as well. African species are typically low-growing scendent shrubs while southeast Asian taxa are large shrubs and treelets. Taxa also differ in corolla morphology and in inflorescence type, characteristically thrysiform in African taxa rather than corymbiform as in the Thai species (Robinson and Skvarla 2007). On the other hand, both African and southeast Asian taxa now placed in this subtribe share deciduous involucral bracts, blunt sweeping hairs on the style, an indurate appendage on the anthers, reflexed and deeply divided corolla lobes, and tricolporate, non-lophate pollen (Robinson 2007, Robinson et al. 2008, Robinson and Skvarla 2009). Whether the Thai genera should be placed in a new subtribe separate from the African Gymnanthemiae will require a more detailed study that includes putative members of the subtribe from across its geographical range.

A similar situation also appears to exist in the subtribe Erlangeinae which, like the Gymnanthemiae and Centrapalinae, is primarily African (Keeley and Robinson 2009). The six Thai endemic Acilepis species, as well as Kurziella gymnoclada, now assigned to the Erlangeinae, differ from their African relatives in both reproductive and morphological characters. Also, as is the case for the other subtribes in this study, no African taxa were included in the analyses and, as a result, relationships to other members of this subtribe, including the type genus Erlangea, are unknown. Additionally, other taxonomic changes may also be necessary to create monophyletic genera. Further, the subgroup composed of Iodocephalopsis, Struchium and Koyamasia curtisii also needs a more thorough evaluation. Robinson (1999a,b) placed Struchium in the primarily New World subtribe Lepidaploinae, and its putative alliance with Old World taxa, as seen here (Fig. 4), may be due to morphological convergence rather than to a close genetic relationship. Until such a time when a wider range of Erlangeinae taxa can be included in an analysis with Thai species, the subtribal status and the relationships among this threesome will remain unclear.

Unlike the Centrapalinae, Erlangeinae, and Gymnanthemiae described above, however, the membership of taxa in the Elephantopinae is clear (Fig. 4). Additionally, this subtribe has been previously shown to be monophyletic using DNA sequence data (Keeley et al. 2007). Species in this subtribe are annual to biennial herbs or subshrubs with liguliform zygomorphic corollas, capitula clustered within foliose bracts, filiform hairs on the leaf surfaces and echinolophate triporate pollen, a distinctive combination of characters that clearly sets this subtribe off from the rest of the Vernonieae. Keeley et al. (2007) also found that the Elephantopinae are New World in origin, and Elephasopus mollis, E. scaber and Pseudelephantopus spicatus now found in disturbed locations throughout the tropics has achieved this distribution by following in the wake of people and their domestic animals. They are excellent camp followers.
Conclusions

There is now a taxonomic framework that will allow for future development of and testing of hypotheses of Vernonieae relationships over a wide region of the Old World including Africa and south and southeast Asia. Of particular interest are the relationships of taxa now putatively in the same subtribe but whose characteristics differ (i.e., between Asia and Africa). Thailand may also be key to understanding subtribal radiations across the Old World as it is located at the crossroads of biotic migrations westward from Malaysia and eastward from India and Africa. Understanding the subtribal histories will allow us to follow the historical pathways of dispersal, and identify habitat types that promote endemism and local adaptive radiations. The Vernonieae has been referred to as the “evil tribe” (Keeley et al. 2007) because of its taxonomically refractory nature. It has always been difficult to make clear distinctions at every level from the most inclusive subtribe and genus (i.e., *Vernonia*) to the individual species. However, the Vernonieae is also one of the few plant groups blessed with the right combination of geographical distribution, and diversity of genera and species to make it possible to gain a good picture of plant evolution across a region of rich biotic diversity, such as is found in Thailand and southeast Asia.

A key to the genera and species within each genus is provided below. Subtribes are shown in Fig. 4. It is hoped that the reader will use this to gain greater understanding of the tribe in Thailand, and that it will spur further work on this beautiful and challenging group.

urn:lsid:ipni.org:names:235016-2:1.3
http://species-id.net/wiki/Vernonieae


Herbs, shrubs, vines or trees. Stems acaulescent or caulescent. Leaves simple, usually alternate sometimes opposite or ternate, petiolate or sessile; lamina ovate, obovate, lanceolate, oblanceolate or elliptic, pubescent, margin serrate or entire, apex rounded, acute or acuminate, base cuneate or attenuate, membranaceous, chartaceous or coriaceous. Capitulescences terminal or axillary, solitary, paniculate or corymbiform with cymose branches, sometimes spicate. Capitula discoid, homogamous, pedunculate or sessile, florets bisexual and fertile. Involucres with numerous, imbricate, persistent bracts. Florets purple to white, actinomorphic or zygomorphic, lobes 3–5, pubescent or glabrous. Anthers usually 5, purple to yellow or white, syngenesious bases usually calcarate. Styles purple to white, 2-branched, inner surface covered with stigmatic papillae, outer surface covered with sweeping hairs. Achenes subterete, clavate or obovate, 3–10-ribbed, carpopodium present or
absent. Pappus present or absent; if present bristly or coroniform, in 1–2 series, persistent or deciduous. Pollen echinate or lophate, 3-porate, 6-porate or 3-colporate, with or without micropuncta.

**Key to the genera**

1. Corolla strongly zygomorphic, liguliform with single deepest sinus ............2
   – Corolla actinomorphic, without single deepest sinus ..................................3
2. Pappus of straight bristles ................................................................. *Elephantopus*
   – Pappus of contorted bristles ................................................... *Pseudelephantopus*
3. Pappus absent ............................................................................................4
   – Pappus present ..........................................................................................5
4. Achenes with 7–10 ribs; pollen lophate and sub-3-colporate *Iodocephalopsis*
   – Achenes with 4–6 ribs; pollen non-lophate .................................. *Ethulia*
5. Corolla 3- or 4-lobed; capitula appearing sessile; pappus thick and coroniform ................................................................. *Struchium*
   – Corolla 5-lobed; capitula mostly pedunculate; pappus of bristles ..........6
6. Vines, scandent shrubs or trees ...................................................................7
   – Herbs or subshrubs .....................................................................................11
7. Achenes less than 2.5 mm long; involucres less than 4 mm long; pollen not or weakly sublophate, with continuous perforated tectum between colpi .....8
   – Achenes more than 2.5 mm long; involucres more than 4 mm long; pollen lophate, with or without continuous perforated tectum between colpi .......9
8. Achenes glabrous; involucre glanduliferous; stems and leaves sericeous with long-armed T-shaped trichomes ............................................ *Tarlmounia*
   – Achenes pubescent; involucre eglanduliferous; leaves and stems not sericeous with T-shaped trichomes ..................................................... *Strobocalyx*
9. Involucres 7–10 mm long; pollen psilolophate with high muri .......... *Monosis*
   – Involucres 4–5 mm long; pollen strongly echinate ..................................10
10. Small trees or shrubs; corolla tubes broad, not closely investing the style shaft .......................................................... *Gymnanthemum*
    – Scandent shrubs; corolla tubes slender, closely investing style shaft .........
11. Pappus in one series, without strongly differentiated outer series ..........12
    – Pappus in 2 series ......................................................................................14
12. Plants leafless at anthesis; pappus persistent; pollen echinate, 3-colporate ..... 
    – Plants with persistent leaves; pappus caduceus; pollen lophate ..........13
13. Achenes obovate, without evident carpopodia; phyllaries not reflexed; pollen 6-porate ................................................................. *Camchaya*
    – Achenes oblong; phyllaries reflexed; pollen 3-porate .......................... *Koyanasia*
14. Pappus of flattened setae ................................................................. *Pulicarioidea*
    – Pappus of capillary bristles not dilated at the base ................................15
Leaves and stems with T-shaped hairs........................................... *Cyanthillium*
– Leaves and stems without T-shaped hairs.................................................. 16

Peduncles fistulose, 25–40 cm long......................................................... *Okia*
– Peduncles not fistulose, mostly less than 15 cm long................. *Acilepis*

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urn:lsid:ipni.org:names:174526-1:1.3
http://species-id.net/wiki/Acilepis


**Type.** *Acilepis squarrosa* D.Don, Prodr. Fl. Nepal. 169. 1825.

Perennial herbs. Stems acaulescent or caulescent. Leaves simple, alternate or rosulate, petiolate, lamina ovate, obovate or elliptic, pubescent, margin serrate or entire, apex rounded, acute or acuminate, base cuneate or attenuate, subcoriaceous. Capitulescences terminal or axillary, corymbose, paniculate, spiciform, capose, solitary. Capitula discoid, homogamous, pedunculate or sessile, florets bisexual and fertile. Involucres herbaceous. Florets 6–80; corollas purple to white, actinomorphic, lobes 5. Anthers 5. Styles purple, 2-branched, inner surface covered with stigmatic papillae, outer surface covered with sweeping hairs reaching to below style bifurcation. Achenes subterete or obovate, usually 10-ribbed, carpopodium present. Pappus in 2 series of bristles, persistent, the outer ones are shorter than the inner ones. Pollen lophate, 3-porate, without micropuncta.

Sixteen species are recognized in Thailand.

**Key to the species of Acilepis in Thailand**

1  Capitula with more than 30 florets ............................................................. 2
– Capitula with less than 30 florets .................................................................. 6
2  Phyllaries mostly reflexed .......................................................................... 3
– Phyllaries not reflexed .................................................................................. 4
3  Leaves basal; corolla and achenes pubescent ........................................... *Acilepis attenuata*
– Leaves cauline; corollas and achenes without pubescence .................. *Acilepis silhetensis*
4  Capitula terminal, pedunculate.................................................................. 5
– Capitula axillary, sessile............................................................................ *Acilepis squarrosa*
5  Phyllaries with dense tomentum; capitula subsessile............................ *Acilepis doichangensis*
– Phyllaries with sparsely arachnoid hairs; peduncles elongate ............ *Acilepis ngaoensis*
6  Capitula pedunculate, involucre ≥ 5 mm long ........................................ 7
– Capitula subsessile, involucre ≤ 5 mm long.............................. *Acilepis divergens*
7  Phyllaries herbaceous, apex mucronate or aristate ............................... 8
– Phyllaries scarious, spinose.................................................................... *Acilepis chiangdaoensis*
Revisions and key to the Vernonieae (Compositae) of Thailand

37

8 Leaves chartaceous; achenes pubescent .......................................................... 9
– Leaves membranaceous; achenes lacking trichomes ................................ 9
9 Upper leaves elliptic, acute to acuminate; achenes glandular ..................... 10
– Upper leaves linear-lanceolate to falcate, or caudate; achenes eglandular ....

................................................... 10

– Leaves subsessile or with petioles up to 6 mm long ................................ 11
9 Upper leaves elliptic, acute to acuminate; achenes glandular ..................... 10
– Upper leaves linear-lanceolate to falcate, or caudate; achenes eglandular ....

................................................... 10

– Leaves subsessile or with petioles up to 6 mm long ................................ 11
10 Leaves petiolate, petioles up to 25 mm long.............................................. 13

– Leaves petiolate, petioles up to 25 mm long.............................................. 13
11 Capitula with ≥ 20 florets, involucres cup-shaped or campanulate ............ 12
– Capitula with 8–12 florets, involucres narrowly campanulate ... 12

– Capitula with 8–12 florets, involucres narrowly campanulate ... 12

– Capitula with ≥ 20 florets, involucres cup-shaped or campanulate ............ 12
12 Herbs 1–2 m tall; leaves 15–20 by 5–8 cm ..................... 12
– Herbs 0.2–0.4 m tall; leaves 4–6 by 1–2.5 .................................................. 15

– Herbs 0.2–0.4 m tall; leaves 4–6 by 1–2.5 .................................................. 15
13 Corolla without hairs; achenes 2–3.5 mm long ......................................... 14
– Corolla with sparse hairs; achenes 4–5 mm long ..................................... 14
14 Inner pappus 8–9 mm long; involucres 8–10 mm long ......................... 17
– Inner pappus 6–7 mm long; involucres 6–7 mm long ........................... 17
15 Receptacle glabrous ................................................................................. 16
– Receptacle pubescent ................................................................................. 16
16 Phyllaries and peduncles densely villose; pappus 6–7 mm long; anthers purple....

...................................................... 17

– Phyllaries and peduncles sparsely pilose; pappus 8–9 mm long; anthers yellowish................................. 17

...................................................... 17

– Phyllaries and peduncles densely villose; pappus 6–7 mm long; anthers purple....

...................................................... 17

– Phyllaries and peduncles sparsely pilose; pappus 8–9 mm long; anthers yellowish................................. 17

...................................................... 17


urn:lsid:ipni.org:names:77114130-1:1.2
http://species-id.net/wiki/Acilepis_attenuata

Vernonia attenuata DC., Prodr. 5: 33. 1836.

Type. India orientalis, Wallich 3020 (holotype: K!). Fig. 5A.

Description. Perennial herbs 50–120 cm tall. Stems erect, conspicuously ribbed, puberulous. Leaves simple, rosulate, 9–22 by 2–8 cm, obovate to obovate-lanceolate or elliptic, margin entire or serrate, apex obtuse or acute, base cuneate or attenuate, subcoriaceous, upper surface scabrous and lacking glands; lower surface scabrous with whip-shaped hairs and capitulate glands; lateral veins 5–11-paired; petioles up to 5 mm long. Capitulescences terminal, scapose. Capitula campanulate, 15–18 mm long, pedunculate. Receptacle flat, 6–8 mm in diam., glabrous. Involucres campanulate, in 6–7 series, 7–11 mm long, herbaceous. Phyllaries imbricate, green with purple apex, margin piliferous, outer surface arachnoid without glands; the outer and the middle ones ovate, apex apiculate, upper half reflexed; the inner ones ovate-lanceolate to oblong, apex acuminate. Florets 40–65; corollas funnelform, purple, puberulous
glandular; corolla tubes 6–8.5 mm long; corolla lobes 2–3 mm long. Anthers 2.5–3 mm long, apical appendage acute, base obtuse. Styles purple, 7–10 mm long, branches 2.5–4 mm long. Achenes subterete, 2.5–3 mm long, 10-ribbed, pubescent with twin hairs and capitate glands. Pappus bristles, the inner ones 7–7.5 mm long.

Figure 5. Morphology of Vernonieae in Thailand 1. A Acilepis attenuata B Acilepis divergens C Acilepis namnaoensis D Acilepis ngaoensis E Acilepis peguensis F Acilepis principis G Acilepis saligna H Acilepis silhetensis I Acilepis squarrosa.
Revisions and key to the Vernonieae (Compositae) of Thailand

Distribution. Thailand: Mae Hong Son, Chiang Mai, Nong Bua Lum Phu, Khon Kaen, Udon Thani, Sakon Nakhon, Kanchanaburi, Satun. Myanmar.


Ecology. Dipterocarp or dry evergreen forest, alt. 50–780 m; flowering October to February.

Diagnostic characters. Leaves rosulate and capitulescences terminal with scapose.

Vernacular name. Kra Dum Muang (กระดุมม่วง).

urn:lsid:ipni.org:names:77114132-1:1.2
http://species-id.net/wiki/Acilepis_chiangdaoensis


Type. Thailand, Chiang Mai, Doi Chiangdao, M. Tagawa, K. Iwatsuki & N. Fukuoka T-4038 (holotype: KYO!).

Description. Perennial herbs, 1–2 m tall. Stems erect, conspicuously ribbed, villose. Leaves 10–30 by 4–10 cm, lanceolate, margin serrate, apex acuminate, base attenuate, subcoriaceous, upper surface scabrous and without glands; lower surface scabrous with whisps-shaped hairs, cylindrical hairs and capitate glands; lateral veins 7–10-paired; petioles up to 3 cm long. Capitulescences terminal, paniculate. Capitula campanulate, 10–12 mm long, pedunculate. Receptacle flat, 2–2.5 mm in diam., pubescent. Involucres campanulate in 4–5 series, 8–10 mm long, scarious. Phyllaries imbricate, green or purple apically, margin piliferous, outer surface villose, glands capitate; the outer and the middle ones lanceolate, apex spinose; the inner lanceolate to oblanceolate, apex acuminate. Florets 10–15, narrowly funnelform, purple or white, glandular; corolla tubes 4–5 mm long; corolla lobes 2.5–3 mm long. Anthers 2.5–2.8 mm long, apical appendage acute, base obtuse. Styles purple, 4.5–6 mm long, branches 2.5–3 mm long. Achenes subterete, 2.5–3.5 mm long, 10-ribbed, pubescent with twin hairs and capitate glands. Pappus bristles, the inner ones 6–6.5 mm.


Specimens examined. Thailand. Chiang Mai, Chiangdao wildlife sanctuary, 19°26.08’N, 98°53.76’E, S. Bunwong 77 (KKU, US); Doi Chiangdao, 3 Jan 1966, M. Tagawa, K. Iwatsuki & N. Fukuoka T-4038 (KYO); Chiang Mai, Doi Sutep national park,
Ecology. Mixed deciduous or pine-oak forest, alt. 600–800 m; flowering December to February.

Diagnostic characters. Large leaves and scarious spinose apical phyllaries.

Vernacular name. Dok See Pa (ดอกสีป่า), DoK Doi Pa (ดอกดอยป่า).


Eupatorium divergens Roxb., Fl. Ind. 3: 414. 1832.


Type. India; Wallich 3027A (holotype: K!). Fig. 5B.

Description. Robust herbs to subshrubs, 1–3 m tall. Stems erect, inconspicuously ribbed, pilose-villose or tomentose. Leaves 10–13 by 3–5 cm, ovate or elliptic, margin serrate, apex acute, base attenuate, subcoriaceous; both surfaces scabrous with whip-shaped hairs and capitate glands; lateral veins 6–10-paired; petioles up to 1 cm long. Capitulescences terminal and axillary, corymbose. Capitula narrowly campanulate, subsessile or shortly pedunculate, 9–10 mm long. Receptacle flat, ca. 1 mm in diam., glabrous. Involucres narrowly campanulate or slightly oblong-cylindrical, in 3–4 series, 4–5 mm long, 3–3.5 mm in diam., herbaceous. Phyllaries green or purple apically, margin piliferous, outer surface arachnoid, glandular; the outer and the middle ones ovate, acuminate or apiculate; the inner ones lanceolate to oblanceolate, apex acuminate. Florets 6–10; corollas funnelform, purple, glandular; corolla tubes 4–5 mm long; corolla lobes 2–2.5 mm long. Anthers 2–2.5 mm long, apical appendage acute, base obtuse. Styles purple, 5–6 mm long, branches 1.5–2 mm long. Achenes obovate, ca. 2 mm long, 10-ribbed, glandular. Pappus bristles, the inner ones 4–5 mm long.


Specimens examined. Thailand. Chiang Mai, Doi Angkhang, 19°54′08″N, 99°2′34″E, 3 Jan 2008, S. Bunwong 377 (KKU, US); Chiang Mai, Doi Chiangdao, 29 Dec 1961, K. Bunchuai 102 (BKF, C, E, K, L, P); Doi Chiangdao, 6 Jan 1975, R. Geesink, P. Hiepko & C. Phengklai 8115 (BKF, C); Doi In Thanon, 12 Jan 1994, N. Fukuoka & H. Koyama T-62103 (BKF); Doi In Thanon, 9 Dec 1984, H. Koyama, S. Mitsuta & T. Yahara T-39916 (BKF); Doi In Thanon, 9 Dec 1984, H. Koyama, S. Mitsuta & T. Yahara T-48693 (BKF); Om Koi, 20 Jan 1964, B. Hansen, G. Siedenfaden & T. Smitinand 10796 (BKF, C, L); Doi Sutep, 24 Jan 1909, A.F.G. Kerr 524 (BM, K); Sa Moeng, 3 Feb 1913, A.F.G. Kerr 2918 (BM, K); Chom Thong, 9 Feb
Revisions and key to the Vernonieae (Compositae) of Thailand


Ecology. Mixed deciduous and cloud forests, alt. 300–1850 m; flowering October to April.

Diagnostic characters. Acilepis divergens is clearly distinguished by having a corymbose capitulescences with short peduncle and its capitula that are among the smallest in Acilepis spp.

Vernacular names. San Ngern (สารเงิน), Nat Foi (หน้าดฝอย).

urn:lsid:ipni.org:names:77114133-1:1.2
http://species-id.net/wiki/Acilepis_doichangensis


Description. Robust herbs, rhizomatous, 0.5–2 m tall. Stems erect, conspicuously ribbed, puberulose. Leaves 7–15 by 2–6 cm, elliptic or oblanceolate, margin subentire or remotely serrulate, apex acute or acuminate, base cuneate, subcoriaceous; both surfaces scabrous with hairs and capitate glands; lateral veins 8–10-paired; petioles up to 5 mm long. Capitulescences terminal and axillary, paniculate. Capitula campanulate, subsessile or pedunculate. Receptacle flat, glabrous. Involucres narrowly campanulate, in 5–6 series, 10–12 mm long, herbaceous. Phyllary margins piliferous, outer surface tomentose, glandular; the outer and the middle ones ovate, acuminate; the inner ones lanceolate to oblong, apex acute. Florets ca. 35; corollas funnelform, purple, glandular; corolla tubes 4–5 mm long; corolla lobes 4–5 mm long. Achenes oblong, ca. 5 mm long, 10-ribbed, glabrous. Pappus bristles, the inner ones ca. 8 mm long.


Ecology. Hill evergreen forest, alt. 1000–1300 m; flowering September to January.

Diagnostic characters. Acilepis doichangensis is distinguished from A. attenuata and A. silhetensis by its tomentose involucre and glabrous achenes.

Vernacular names. Dok See Pa (ดอกสีป่า), DoK Doi Pa (ดอกดอยป่า).
**Acilepis kerrii** (Craib) Bunwong, Chantar. & S.C.Keeley, comb. nov.  
urn:lsid:ipni.org:names:77138473-1  
http://species-id.net/wiki/Acilepis_kerrii


**Type.** Thailand, Me Nan, Sop Ngao, rock crevices by river, *A.F.G. Kerr* 2404 (holotype: K!, isotype: BM!).

**Description.** Perennial herbs, ca. 30 cm tall. Stems erect, basal branching, inconspicuously ribbed, puberulous. Leaves cauline, 4–6 by 1–2.5 cm, oblanceolate or elliptic, margin slightly serrate, apex acute or obtuse, base cuneate, chartaceous; both surfaces pubescent; lateral veins 7–10-paired; petioles up to 3 mm long. Capitulescences terminal or axillary, solitary or in loose panicked. Capitula campanulate, 10–11 mm long, subsessile or pedunculate. Involucres campanulate, in 4–5 series, 7–8 mm long. Phyllaries margin piliferous, outer surface nearly glabrous; the outer and the middle ones ovate, apex acute; the inner ones ovate-lanceolate, apex acute. Florets 20–25; corollas funnelform, purple, glandular, corolla tubes 6.5–7 mm long; corolla lobes 2–3 mm long. Achenes narrowly turbinate, ca. 3 mm long, 10-ribbed, puberulous. Pappus bristles, the inner ones 6–7 mm long.

**Distribution.** Thailand: Chiang Mai, Nan. Endemic.

**Specimens examined.** Thailand, Me Nan, Sop Ngao, 21 Feb 1912, *A.F.G. Kerr* 2404 (K, BM); Chiang Mai, Doi Fa Hom Pok national park, 20°2.72′N, 99°8.74′E, 24 Feb 1958, *Th. Sørensen, K. Larsen & B. Hansen* 1602 (K).

**Diagnostic characters.** *Acilepis kerrii* can be distinguished by its subsessile capitula in axillary leaves.

**Ecology.** Rock cliff by river in hill evergreen forest, alt. 700–1400 m; flowering February.

**Vernacular name.** Muang Dong (ม่วงดง).

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urn:lsid:ipni.org:names:60456951-2:1.2  
http://species-id.net/wiki/Acilepis_kingii

*Vernonia kingii* C.B.Clarke, Compos. Ind. 12. 1876.

**Type.** Myanmar, Yomah province, Pegu, Irrawaddy & Sittang Valley, *S. Kurz* s.n. (holotype: K!).

**Description.** Perennial herbs, 1–1.5 m tall. Stems erect, conspicuously ribbed, puberulous. Leaves 10–20 by 4–8 cm, lanceolate, margin serrate, apex acuminate, base attenuate, subcoriaceous; both surfaces scabrous with whip-shaped hairs and capitate glands; lateral veins 9–10-paired; petioles up to 2.5 cm long. Capitulescences terminal
and axillary, paniculate. Capitula campanulate, 10–12 mm long, pedunculate. Receptacles flat, 2–2.5 mm in diam., hairy. Involucres narrowly campanulate, in 4–5 series, 5–6 mm long, 3–3.5 mm in diam., herbaceous. Phyllaries light green or purple apically, margin piliferous, outer surface arachnoid, capitate glands; the outer and the middle ones ovate, apex obtuse and apiculate; the inner ones ovate-lanceolate to oblong, apex obtuse or apiculate. Florets 8–12; corollas funnelform, purple or white, glandular; corolla tubes 4–5 mm long; corolla lobes 2.5–3 mm long. Anthers yellowish, 2.5–3 mm long, apical appendage acute, base acute. Styles purple, 5–7 mm long, branches 2–3 mm long. Achenes subterete, 2.5–3.5 mm long, 10-ribbed, pubescent, glands capitate. Pappus bristles, the inner ones 6–6.5 mm long.

**Distribution.** Thailand: Mae Hong Son, Chiang Mai, Chiang Rai. China (Yunnan), India, Myanmar, Laos.


**Ecology.** Hill evergreen or pine-oak forest, alt. 1000–1800 m; flowering January to March.

**Diagnostic characters.** *Acilepis kingii* is recognized by obtuse and apiculate phyllaries and loose paniculate capitulescence.

**Vernacular name.** Muang Doi (ม่วงดอย).

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urn:lsid:ipni.org:names:60456953-2:1.2
http://species-id.net/wiki/Acilepis_namnaoensis


**Type.** Thailand, Phetchabun, Nam Nao national park, *H. Koyama, H. Terao & Th. Wongprasert* T-311840 (holotype: KYO!). Fig. 5C.

**Description.** Perennial herbs, 1–2 m tall. Stems erect, conspicuously ribbed, villose. Leaves 15–20 by 5–8 cm, obovate or oblanceolate, margin serrate, apex acuminate, base cuneate, subcoriaceous; both surfaces scabrous with whip-shaped hairs and capitate glands; lateral veins 6–8-paired; petioles up to 10 mm long. Capitulescences terminal and axillary, paniculate. Capitula campanulate, 12–15 mm long, pedunculate. Receptacle flat, 2–2.5 mm in diam., hairy. Involucres campanulate, in 4–5 series, 7–8 mm long, 6–7 mm in diam., herbaceous. Phyllaries light green, margin piliferous, outer surface densely arachnoid, glands capitate; the outer and the middle ones ovate, apex spinose; the inner ones ovate-lanceolate, apex apiculate. Florets ca. 20; corollas
funnelform, purple, glandular; corolla tubes ca. 5 mm long; corolla lobes ca. 3 mm long. Anthers yellowish, ca. 3 mm long, apical appendage acute, base acute. Styles purple, 5–8 mm long, branches 1.5–2.5 mm long. Achenes subterete, 3.5–4 mm long, 10-ribbed, covered with sparse hairs and glands. Pappus bristles, the inner ones 6–7 mm long.

**Distribution.** Thailand: Phetchabun, Chaiyaphum. Endemic.


**Ecology.** Dry dipterocarp or dry evergreen forest, alt. 800 m; flowering November to December.

**Diagnostic characters.** *Acilepis namnaoensis* is characterized by its cup-shaped involucre and spinose phyllaries with whitish tomentum. Its specific epithet is derived from Nam Nao national park in Pethchabun province.

**Vernacular name.** Nad Muang Nam Nao (หน้าดม่วงน้ำาหนาว).


[urn:lsid:ipni.org:names:60456956-2:1.2](http://species-id.net/wiki/Acilepis_ngaoensis)


**Type.** Thailand, Ranong, Muang District, Ngao waterfall, *T. Shimizu, H. Toyokuni, H. Koyama, T. Yahara & C. Niyomdham* T-26543 (holotype: KYO!). Fig. 5D.

**Description.** Perennial herbs, 60–120 cm tall. Stems erect, conspicuously ribbed, puberulous. Leaves 10–20 by 2–5 cm, elliptic or oblanceolate, margin serrate, apex acuminate to acuminate, base cuneate, subcoriaceous; both surfaces scabrous with whip-shaped hairs and capitulate glands; lateral veins 9–11-paired; petioles up to 10 mm long. Capitulescences terminal or axillary, solitary or loosely paniculate. Capitula campanulate, 10–20 mm long, pedunculate. Receptacle flat, hairy. Involucres campanulate, in 6–7 series, 10–15 mm long, herbaceous. Phyllaries light green or purple apically, margin piliferous, outer surface arachnoid, glands capitulate; the outer and the middle ones ovate or lanceolate, apex spinose; the inner ones lanceolate or oblong, apex apiculate. Florets ca. 80; corollas funnelform, purple, glandular; corolla tubes 7–8 mm long; corolla lobes 3–4 mm long. Anthers 3.5–4 mm long, apical appendage acute, base obtuse. Styles purple, 7–9 mm long, branches 3–3.5 mm long. Achenes subterete, 3–4 mm long, 10-ribbed, pubescent with twin hairs and glands. Pappus bristles, the inner ones 8–9 mm long.

**Distribution.** Thailand: Ranong. Endemic.

**Specimens examined.** Thailand. Ranong, Muang District, Ngao waterfall, 9°51.38’N, 98°37.68’E, 25 Jan 2008, S. Bunwong 386 (KKU, US); Ngao waterfall, 10
Revisions and key to the Vernonieae (Compositae) of Thailand

Ecology. Rocky dry dipterocarp, alt. 100 m; flowering December to January.

Diagnostic characters. *Acilepis ngaoensis* is recognized by having large capitula with long peduncles, phyllaries not reflexed, and capitulescences solitary or loosely paniculate. Its specific epithet is derived from Ngao waterfall national park in Ranong province.

Vernacular name. Nad Muang Ngao (น้ำผึ้งแม่น้ำบางหว้า).


Vernonia peguensis C.B.Clarke, Compos. Ind.: 13. 1876.

Type. Myanmar, Yomah province, Pegu, *S. Kurz* 882 (holotype: K!). Fig. 5E.


Type: Thailand, Loei, Phu Kradung national park, *H. Koyama, H. Terao & Th. Wongprasert* T-31211 (holotype: KYO!).

Description. Perennial herbs, 0.5–150 cm tall. Stems erect, conspicuously ribbed, sericeous. Leaves 10–20 by 3–6 cm, oblanceolate or obovate, margin serrate, apex acute or acuminate, base attenuate, chartaceous; both surfaces scabrous with whip-shaped hairs and capitate glands; lateral veins 4–8-paired; petioles up to 30 mm long. Capitulescences terminal or axillary, paniculate. Capitula campanulate, 10–12 mm long, pedunculate. Receptacle flat, 2–2.5 mm in diam., hairy. Involucres narrowly campanulate or slightly oblong-cylindrical, in 4–5 series, 5–6 mm long, 3–4 mm in diam., herbaceous. Phyllaries light green, margin piliferous, outer surface arachnoid, glands capitate; the outer and the middle ones ovate, apex acuminate or aristate; the inner ones lanceolate to oblong, apex acuminate. Florets 10–15; corollas funnelform, white or purple, glandular; corolla tubes 4.5–5 mm long; corolla lobes 2.5–3 mm long. Anthers purple, 3–3.5 mm long, apical appendage acute, base obtuse. Styles purple, 6–7 mm long, branches 2–2.5 mm long. Achenes subterete, 2.5–3.5 mm long, 10-ribbed, glandular. Pappus bristles, the inner ones 5.5–6 mm long.


**Ecology.** Deciduous or hill dry evergreen forest, alt. 800 m; flowering November to December.

**Diagnostic characters.** The distinctive features of *A. peguensis* are membranaceous leaves and achenes without hair.

**Vernacular name.** Dok Khon Kai Noi (ดอกขนไก่น้อย).

urn:lsid:ipni.org:names:77114239-1:1.2
http://species-id.net/wiki/Acilepis_principis


**Type.** Thailand, Molu, *Prince H. d’Orleans* s.n. (holotype: P!). Fig. 5F.

**Description.** Perennial herbs, 0.5–2 m tall. Stems erect, conspicuously ribbed, puberulous. Leaves 10–25 by 3–8 cm, ovate-lanceolate or lanceolate, margin serrate, apex acute, base cuneate, subcoriaceous; upper surface scabrous without glands; lower surface scabrous with whip-shaped hairs and capitate glands, lateral veins 9–15-paired; petioles up to 10 mm long. Capitulescences terminal or axillary, paniculate. Capitula campanulate, 10–15 mm long, pedunculate. Receptacle flat, 2.5–3 mm in diam., hairy. Involucres campanulate, in 5–6 series, 7–8 mm long, 4–5 mm in diam., herbaceous. Phyllaries light green or purple apically, margin piliferous, outer surface arachnoid, eglandular; the outer and the middle ones ovate, apex aristate or apiculate; the inner ones ovate-lanceolate, apex obtuse or apiculate. Florets 20–25; corollas funnelform, purple or white, glabrous; corolla tubes 5–6 mm long; corolla lobes 3–4 mm long. Anthers purple, 3–4 mm long, apical appendage acute, base obtuse. Styles purple, 8–9 mm long, branches 3–4 mm long. Achenes subterete, 2.5–3 mm long, 10-ribbed, pubescent with twin hairs. Pappus bristles, the inner ones 7–8 mm long.

**Distribution.** Thailand: Chiang Rai, Nan, Lamphun, Lampang, Tak. Endemic.

Diagnostic characters. This species is similar to *A. kingii* and *A. saligna* in capitula shape but differs in the achenes without hair and with the upper leaves lanceolate-oblong with caudate apex or falcate shape.

Ecology. Evergreen forest, alt. 600–1400 m; flowering December to March.

Vernacular name. Ma Nee Nin (เม้นนีนิล).

urn:lsid:ipni.org:names:77114240-1:1.2
http://species-id.net/wiki/Acilepis_pseudosutepensis


Type. Thailand, Uthai Thani, Huay Ka Kaeng; *J.F. Maxwell* 76-94 (holotype: AAU!, isotype: L!).

Description. Perennial herbs, 60–150 cm tall. Stems erect, conspicuously ribbed, sericeous. Leaves simple, alternate at base, 10–14 by 4–7 cm, ovate-lanceolate or elliptic, margin serrate, apex acuminate, base cuneate or acuminate, subcoriaceous; upper surface scabrous without glands; lower surface scabrous with whip-shaped hairs and capitate glands; lateral veins 9–11-paired; petioles up to 10 mm long. Capitulescences terminal and axillary, paniculate. Capitula campanulate, 10–15 mm long, pedunculate. Receptacle flat, 1.5–3 mm in diam., glabrous. Involucres narrowly campanulate, in 5–6 series, 8–10 mm long, 3–4 mm in diam., herbaceous. Phyllaries light green or purple apically, margin piliferous, outer surface densely arachnoid, capitate glands; the outer and the middle ones ovate or lanceolate, apex apiculate or aristate; the inner ones ovate-lanceolate to oblong, apex apiculate. Florets 10–15; corollas funnelform, purple, glandular; corolla tubes 7–8 mm long; corolla lobes 3–4 mm long. Anthers 3.5–4 mm long, apical appendage acute, base obtuse. Styles purple, 7–9 mm long, branches 3–3.5 mm long. Achenes subterete, 2–3.5 mm long, 10-ribbed, pubescent with twin hairs and capitate glands. Pappus bristles, the inner ones 6–7 mm long.


Diagnostic characters. *Acilepis pseudosutepensis* is recognized by elongate peduncles, loose capitulescences, densely villose and scarious phyllaries.

Ecology. Limestone mountain or mixed evergreen forest, alt. 200–400 m; flowering December to February.

Vernacular name. Ka Ma Plong (กาม่าปล่อง).
urn:lsid:ipni.org:names:1010886-1:1.1.2.1.1.2
http://species-id.net/wiki/Acilepis_saligna

Vernonia saligna DC., Prodr. 5: 33. 1836.

Type. India Orient, Silhet, Wallich 3061 (isotype: E!, isotype: G!, holotype: K!). Fig. 5G.

Description. Perennial herbs, 2–2.5 m tall. Stems erect, conspicuously ribbed, sericeous. Leaves 10–15 by 3–6 cm, lanceolate or elliptic, margin serrate, apex acuminate, base cuneate, subcoriaceous; both surfaces scabrous with whip-shaped hairs and capitate glands; lateral veins 6–10-paired; petioles up to 6 mm long. Capitulescences terminal or axillary, paniculate. Capitula campanulate, 6–7 mm long, pedunculate. Receptacle flat, 2–2.5 mm in diam., hairy. Involucres in 5–6 series, 6–7 mm long, 3.5–4.5 mm in diam., herbaceous, campanulate. Phyllaries light green or purple apically, margin piliferous, outer surface arachnoid, glands capitulate; the outer and the middle ones ovate, apex acuminate or cuspidate; the inner ones ovate-lanceolate to oblong, apex rounded or apiculate. Florets 10–15; corollas funnelform, purple, puberulous glandular; corolla tubes 6–7 mm long; corolla lobes 2–3 mm long. Anthers purple, 2.5–3 mm long, apical appendage acute, base obtuse. Styles purple, 5–7 mm long, branches 1.5–2 mm long. Achenes subterete, 3–3.5 mm long, 10-ribbed, pubescent with twin hairs and capitate glands. Pappus bristles, the inner ones 6–7 mm long.

Distribution. Thailand: Mae Hong Son, Chiang Mai. China (Yunnan), India, Nepal, Bhutan, Myanmar, Laos, Vietnam.


Diagnostic characters. Acilepis saligna differs from A. kingii by its sessile leaves and smaller capitula in a dense panicle.

Ecology. Pine-oak forest, alt. 1100–1400 m; flowering November to December.

Vernacular name. Pai Lin (ไพลิน).

urn:lsid:ipni.org:names:1010888-1:1.1.2.1.1.2
http://species-id.net/wiki/Acilepis_silhetensis

Decaneurum silhetense DC., Prodr. 5: 67. 1836.

Type. India, Silhet; Wallich 2921 (holotype: E!). Fig. 5H.
Description. Perennial herbs, 1–3 m tall. Stems erect, inconspicuously ribbed, pilose. Leaves 7–12 by 2–4 cm, lanceolate or oblanceolate, margin serrate, apex acute or acuminate, base attenuate, subcoriaceous; both surfaces scabrous with whip-shaped hairs and capitulate glands; lateral veins 5–10-paired; petioles up to 1 cm long. Capitulescences terminal, paniculate or solitary. Capitula campanulate, 15–20 mm long, pedunculate. Receptacle flat, 6–10 mm in diam., hairy. Involucres in 6–7 series, 11–18 mm long, 10–15 mm in diam., herbaceous, campanulate. Phyllaries dark purple or green with purple apex, margin piliferous, outer surface arachnoid lacking glands; the outer and the middle ones ovate, apex acuminate, upper half strongly reflexed; the inner ones ovate-lanceolate to oblong, apex acuminate or aristate. Florets 50–75; corollas funnelform, purple, glandular; corolla tubes 8–12 mm long; corolla lobes 3.5–5 mm long. Anthers 3.5–4.5 mm long, apical appendage acute, base obtuse. Styles purple, 10–12 mm long, branches 3.5–4.5 mm long. Achenes subterete, 4–5 mm long, 10-ribbed, glandular. Pappus bristles, the inner ones 6.5–8 mm long.


Diagnostic characters. This species is distinguished by its strongly reflexed phyl-laries and glandular achenes lacking trichomes.

Ecology. Dipterocarp or pine-oak forest, alt. 700–1350 m; flowering August to January.

Vernacular names. Phak Phet Kao Kum (ผักเผ็ดข้าวแก่), Ya Klung (หญ้าคลัง), Ya Hang Nok Kiew (หญ้าหางนกเขียว), Hudsakuen (หุสดีคน).

urn:lsid:ipni.org:names:174526-1:1.3
http://species-id.net/wiki/Acilepis_squarrosa


Type. Nepal, Hamilton s.n. (not seen). Fig. 5I.

Description. Perennial herbs, 30–80 cm tall. Stems erect, inconspicuously ribbed, villose. Leaves 3–10 by 1–3 cm, oblanceolate, margin serrate, apex acute, base cuneate, coriaceous; both surfaces scabrous with whip-shaped hairs and capitate glands; lateral veins 5–10-paired; petioles up to 5 mm long. Capitulescences terminal and axillary, solitary. Capitula campanulate, 15–20 mm long, sessile or subsessile. Receptacle flat, 4.5–5.5 mm in diam., glabrous. Involucres campanulate, in 12–13 series, 15–20 mm long, 10–15 mm in diam., herbaceous. Phyllaries light green or purple apically, margin piliferous, outer surface arachnoid and lacking glands; the outer and the middle ones ovate or lanceolate, apex acuminate or apiculate; the inner ones ovate-lanceolate to oblong, apex acuminate or apiculate. Florets 50–80; corollas funnelform, purple, puberulous, glands capitate; corolla tubes 7–10 mm long; corolla lobes 4–6 mm long. Anthers 3–3.5 mm long, apical appendage acute, base obtuse. Styles purple, 9–11 mm long, branches 2–3 mm long. Achenes subterete, 2.8–3.2 mm long, 10-ribbed, pubescent without glands. Pappus bristles, the inner ones 7–11 mm long.


Specimens examined. Thailand, Phetchabun, Nam Nao national park, 16°44.29’N, 101°34.19’E, 26 Dec 2007, S. Bunwong 374 (KKU, US); Mae Hong Son, Pai, 16 Jan 1983, H. Koyama & H. Terao & Th. Wongprasert T-32609 (BKF); Pai, 16 Jan 1786, Y. Paisooksantivatana 1780–86 (BK); Pai, 23 Nov 1989, Y. Paisooksantivatana 2548-89 (BK); Chiang Mai, Hod, 13 Jan 1983, H. Koyama & H. Terao & Th. Wongprasert T-32454 (BKF); Hod, 4 Dec 1975, J. Sadakorn 664 (BK); Lampang, Doi Khun Tan, 28 Dec 1984, H. Koyama & C. Phengklai T-39155 (BKF, L); Tak, Maesod, 13 Jan 1989, Y. Paisooksantivatana 2306-89 (BK);

**Diagnostic characters.** *Acilepis squarrosa* is easily recognized by its large capitula (with more than 100 phyllaries) sessile in the axils of the leaves

**Ecology.** Dipterocarp, deciduous, hill evergreen or pine-oak forest, alt. 10–1200 m; flowering September to May.

**Vernacular names.** Kiang Pa Chang (เกี๋ยงพาช้าง), Nat Dhum (หนาดดำา), Nat Khum (หนาดคำา).

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urn:lsid:ipni.org:names:77114242-1:1.2

http://species-id.net/wiki/Acilepis_sutepensis


**Type.** Thailand, Chiang Mai, Doi Sutep, *A.F.G. Kerr* 3561 (holotype: K!).

**Description.** Perennial herbs, 60–150 cm tall. Stems erect, conspicuously ribbed, villose. Leaves rosulate, 10–14 by 4–7 cm, ovate-lanceolate or elliptic, margin serrate, apex acuminate, base cuneate or acuminate, subcoriaceous; both surfaces scabrous with whip-shaped hairs and capititate glands, lateral veins 9–11-paired; petioles up to 10 mm long. Capitulescences terminal and axillary, paniculate. Capitula campanulate, 10–15 mm long, pedunculate. Receptacle flat, 1.5–3 mm in diam., glabrous. Involucres narrowly campanulate, in 5–6 series, 8–10 mm long, 3–4 mm in diam., herbaceous. Phyllaries light green or purple apically, margin piliferous, outer surface sparsely arachnoid with capititate glands; the outer and the middle ones ovate or lanceolate, apex apiculate or aristate; the inner ones ovate-lanceolate to oblong, apex apiculate. Florets 13–20; corollas funnelform, purple, glandular; corolla tubes 7–8 mm long; corolla lobes 3–4 mm long. Anthers 3.5–4 mm long, apical appendage acute, base obtuse.
Styles purple, 7–9 mm long, branches 3–3.5 mm long. Achenes subterete, 2–3.5 mm long, 10-ribbed, pubescent with twin hairs and capitate glands. Pappus bristles, the inner ones 8–9 mm long.


**Diagnostic characters.** Acilepis sutepensis is distinguished from A. pseudosutepensis by having larger capitula and sparse hairs on the phyllaries.

**Ecology.** Hill evergreen or pine-oak forest, 1100–1500 m; flowering November to March.

**Vernacular name.** Mu Nin (มุนิน).

urn:lsid:ipni.org:names:77114244-1:1.2
http://species-id.net/wiki/Acilepis_tonkinensis


**Type.** Vietnam, Tonkin, Balansa 3078 (holotype: P!).

**Description.** Perennial herbs, 1–1.5 m tall. Stem erect, inconspicuously ribbed, villose. Leaves alternate, 5–10 by 1.5–4 cm, elliptic or obovate, margin serrate, apex acute, base cuneate or truncate, subcoriaceous; upper surface scabrous, lower surface pilose glandular; lateral veins 6–11-paired; petioles up to 5 mm long. Capitulescences terminal, paniculate. Capitula campanulate, 9–12 mm long, pedunculate. Receptacle flat, hairy. Involucres broadly campanulate, in 5–6 series, 8–10 mm long, herbaceous. Phyllaries purple, outer surface arachnoid, glands capitate; the outer and the middle ones ovate, apex acute; the inner ones ovate-lanceolate to oblong, apex apiculate. Florets ca. 20; corollas funnelform, purple, glandular; co-
rolla tubes ca. 5 mm long; corolla lobes ca. 4 mm long. Achenes subterete, ca. 3 mm long, 10-ribbed, pubescent with twin hairs and capitate glands. Pappus bristles, the inner ones 8–9 mm long.

**Distribution.** Thailand: Chiang Mai. Vietnam.

**Specimens examined.** Thailand, Chiang Mai, Doi Sa Ket, 18°52.26’N, 99°8.17’E, 15 Feb 1983, H. Koyama, H. Terao & Th. Wongprasert T-33577 (KYO); Doi Sa Ket, J. Kubiniok 392/6 (CMU).

**Diagnostic characters.** *Acilepis tonkinensis* can be recognized by its pubescent receptacle and broadly ovate phyllaries with acute apices.

**Ecology.** Granite bedrock in dry dipterocarp forest, alt. 930–1200 m; flowering January to February.

**Vernacular name.** Dok Muang Doi (ดอกม่วงดอย).

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urn:lsid:ipni.org:names:77114245-1:1.2
http://species-id.net/wiki/Acilepis_virgata


**Type.** Laos, Xieng-Kouang, *Spire* 1302 (holotype: P!).

**Description.** Perennial herbs, ca. 1 m tall. Stems erect, conspicuously ribbed, pilose. Leaves cauline 8–10 by 2.5–3.5 cm, elliptic, margin serrate, apex acuminate, base cuneate, subcoriaceous; upper surface pilose along main and lateral veins; lower surface pilose glandular; lateral veins 7–10-paired; petioles up to 5 mm long. Capitulescences terminal, paniculate. Capitula campanulate, 7–10 mm long, pedunculate. Receptacle flat, hairy. Involucres campanulate, herbaceous, in 5–6 series, ca. 6 mm long. Phyllaries green with purple tips, outer surface arachnoid, glands capitate; the outer and the middle ones ovate-lanceolate, apex acuminate; the inner ones ovate-lanceolate to oblong, apex acute. Florets ca. 20; corollas funnelform, purple, glandular; corolla tubes ca. 3 mm long; corolla lobes ca. 4 mm long. Achenes subterete, ca. 2 mm long, 10-ribbed, pubescent with twin hairs and capitate glands. Pappus bristles, the inner ones 6–7 mm long.

**Distribution.** Thailand: Surat Thani. Laos.

**Specimens examined.** Thailand, Surat Thani, Khao Sok national park, 8°54.99’N, 98°31.68’E, 2 Mar 1983, H. Koyama, H. Terao & Th. Wongprasert T-33960 (KYO).

**Diagnostic characters.** *Acilepis virgata* is distinguished from *A. tonkinensis* by phyllaries that are nearly scarious and capitula that are long pedunculate in loosely paniculate capitulescences.

**Ecology.** Evergreen forest, alt. 180 m; flowering March.

**Vernacular name.** Muang Ngam (ม่วงงาม).
urn:lsid:ipni.org:names:8072-1:1.1.2.1.1.1
http://species-id.net/wiki/Camchaya

**Type.** Camchaya kampotensis Gagnep., Notul. Syst. 4: 14. 1920.

**Description.** Annual herbs. Stems erect, pubescent. Leaves simple, alternate, usually petiolate; lamina ovate to lanceolate, pubescent with hairs and glands, margin serrate, apex acute to acuminate, base attenuate, usually chartaceous. Capitulescences terminal or axillary, paniculate or corymbose. Capitula campanulate or hemispherical, pedunculate, homogamous; florets bisexual and fertile. Involucres campanulate or hemispherical. Phyllaries imbricate, persistent, the outer and the middle ones ovate or lanceolate, the inner ones linear-oblong, sometimes pubescent, glands capitate. Corollas purple or white, narrowly funnelform, pubescent with hairs and/or capitate glands; corolla lobes 5. Anthers apical appendage acute, base rounded. Styles purple, 2-branched, slender, acute, inner surface covered with stigmatic papillae, outer surface and shaft covered with sweeping hairs reaching to below style bifurcation. Achenes obovate, usually 10-ribbed, carpopodium absent. Pappus in one series of often deciduous bristles. Pollen echinolophate, 6-porate, without micropuncta.

Seven species are recognized in Thailand.

**Key to the species**

<table>
<thead>
<tr>
<th></th>
<th>Phyllaries broadly ovate without marginal spines</th>
<th>Phyllaries broadly ovate with marginal spines</th>
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<tbody>
<tr>
<td>1</td>
<td>C. gracilis</td>
<td>C. thailandica</td>
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<tr>
<td>2</td>
<td>Achenes 4–5-ribbed</td>
<td>Achenes 10-ribbed</td>
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<td>3</td>
<td>Achenes 5 (6–9)-ribbed</td>
<td>C. pentagona</td>
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<tr>
<td>4</td>
<td>Phyllaries without glands, spines up to 10 mm</td>
<td>C. spinulifera</td>
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<tr>
<td>5</td>
<td>Phyllaries acuminate, achenes 2.5–3 mm long</td>
<td>C. kampotensis</td>
</tr>
<tr>
<td>6</td>
<td>Leaves with T-shaped hairs, phyllaries spinose ≤ 1 mm long</td>
<td>C. loloana</td>
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<tr>
<td></td>
<td>Leaves without T-shaped hairs, phyllaries spinose ≥ 1 mm long</td>
<td>C. tenuiflora</td>
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Revisions and key to the Vernonieae (Compositae) of Thailand

Type. Laos, Bassac, Thorel 2396 (holotype: P!). Fig. 6A.

Description. Annual herbs, 50–100 cm tall. Stems erect, terete, inconspicuously ribbed; villose with uniseriate hairs, T-shaped hairs and glands. Leaves alternate, elliptic-oblong, 3–6 by 0.3–1 cm, margin serrate or entire, apex acute, base attenuate, subcoriaceous; upper surface scabrous lacking glands, lower surface scabrous with whip-shaped hairs and capitate glands, lateral veins 8–10–paired; petioles up to 3 mm long. Capitulescences terminal and axillary, corymbose. Capitula campanulate, 8–10 mm long, pedunculate. Receptacle flat, 2–3 mm in diam., glabrous. Involucres campanulate, in 4–5 series, 7–8 mm long, 6–7 mm in diam. Phyllaries imbricate, light green or purple, margin entire without spines, outer surface arachnoid, glandular; the outer ones ovate, apex acute to acuminate; the inner ones ovate-lanceolate, apex acute to acuminate. Florets 50–70; corollas funnelform, purple, puberulous, glands capitate; corolla tubes 3–5 mm long; corolla lobes 2–3 mm long. Anthers ca. 2 mm long, apical appendage acute, base rounded. Styles purple, 5–7 mm long, branches 1.5–2 mm long. Achenes obovate, ca. 2 mm long, puberulous with twin hairs and capitate glands, 4–5-ribbed, carpopodium absent. Pappus 1–2 mm long in 1 series, frequently deciduous or lacking.


Diagnostic characters. *Camchaya gracilis* is characterized by phyllaries without marginal spines, achenes with 4–5 ribs and leaves that are narrowly elliptic-oblong. This species is included in *Camchaya* as it shares 6-porate pollen found in no other genera.

Ecology. Dipterocarp forest, alt. 150 m; flowering October to December.

Vernacular name. Ao Ra Nid (อรย์นิช).

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urn:lsid:ipni.org:names:188171-1:1.1.2.1.1.1
http://species-id.net/wiki/Camchaya_kampotensis

Type. Myanmar, Kampot, Geoffray 331 (holotype: P!).

Description. Annual herbs 30–80 cm tall. Stems erect, terete, inconspicuously ribbed, pubescent with T-shaped hairs and glands. Leaves lanceolate, 7–25 by 5–9 cm, margin serrate, apex acute, base attenuate, chartaceous; both surfaces puberulous glandular; petioles up to 7 mm long. Capitulescences terminal and axillary, paniculate or solitary. Capitula campanulate, 10–15 mm long, pedunculate. Involucres campanulate, herbaceous, in 6–7 series, 9–12 mm long. Phyllaries imbricate, green or light purple, margin with spines up to 5 mm long, outer surface puberulous, glands capitulate; the outer and the inner ones lanceolate, apex acuminate; the inner ones lanceolate or linear-oblong, apex acute. Corollas funnelform, purple, puberulous, glands capitrate.
Anthers ca. 2 mm long, apical appendage acute, base rounded. Styles purple. Achenes obovate, 2.5–3 mm long, glabrous, 10-ribbed. Pappus in 1 series of deciduous bristles or lacking.


Diagnostic characters. Camchaya kampotensis can be recognized by its acute to broadly acuminate phyllaries and its large achenes.

Ecology. Evergreen forest, alt. 700–900 m; flowering December.

Vernacular name. Nin La Pad (นิลปัทน์).

urn:lsid:ipni.org:names:188172-1:1.1.1.3
http://species-id.net/wiki/Camchaya_loloana

Types. Thailand, Chiang Mai, Chiangdao district; A.F.G. Kerr 6650 (holotype: BK!, isotype: BM!, isotype: K!, isotype: P!). Fig. 6B.

Camchaya loloana var. loloana

Description. Annual herbs, 30–70 cm tall. Stems erect, terete, inconspicuously ribbed, pubescent with T-shaped hairs and glands. Leaves ovate, 3–10 by 2–4 cm, margin serrate, apex acute or acuminate, base attenuate, chartaceous; both surfaces scabrous with whip-shaped hairs, cylindrical hairs and capitate glands; lateral veins 8–12-paired; petioles up to 10 mm long. Capitulescences terminal and axillary, paniculate. Capitula campanulate, 9–10 mm long, pedunculate. Receptacle convex, 3.5–4 mm in diam., glabrous. Involucres campanulate, in 7–8 series, 8–10 mm long. Phyllaries imbricate, greenish with purple apex, margin with spines up to 1 mm long, outer surface arachnoid, glands capitulate; the outer lanceolate, apex spinose; the inner ones lanceolate or linear-oblong, apex acuminate. Florets 65–100; corollas funnelform, purple rarely white, puberulous, glands capitulate; corolla tubes 7–9.5 mm long; corolla lobes 2.5–3 mm long. Anthers 1.8–2.5 mm long, apical appendage acute, base rounded. Styles purple, 7–11 mm long, branches ca. 2 mm long. Achenes obovate, 1.3–1.7 mm long, glabrous, 10-ribbed. Pappus in one series, bristles 1.5–3 mm long, absent or deciduous.


Diagnostic characters. *Camchaya loloana* is recognized by having short spines on the margins of the phyllaries, 10-ribbed achenes, and leaves with T-shaped hairs.

Ecology. On limestone in dipterocarp, dry evergreen, and hill evergreen forest, alt. 400–1500 m; flowering July to December.

Vernacular name. Dok Lea (ดอกแล่), Phu Muang (พู่ม่วง).


urn:lsid:ipni.org:names:918305-1:1.5

Type. Thailand, Mukdahan, Muang District, Dongman Village, H. Koyama et al. T-30941 (holotype: KYO!). Fig. 6C.

Description. Annual herbs, 10–70 cm tall. Stems erect, terete, inconspicuously ribbed, scabrous with uniseriate hairs and T-shaped hairs. Leaves alternate, 5–11 by 2–5 cm, ovate or lanceolate, margin serrate or undulate, apex acute or acuminate, base attenuate, chartaceous; both surfaces scabrous with whip-shaped hairs, cylindrical hairs and capitulate glands; lateral veins 5–9-paired; petioles up to 15 mm long. Capitulescences terminal and axillary, paniculate. Capitula campanulate, 9–10 mm long, pedunculate. Receptacle convex, 2–2.5 mm in diam., glabrous. Involucres campanulate, in 5–6 series, 7–9 mm long, 4–6 mm in diam. Phyllaries greenish with purple apex, margin with spines up to 0.2 mm long, outer surface arachnoid, glands capitulate; the outer lanceolate, apex spinose; the inner ones lanceolate to oblong, apex acuminate. Florets 30–70; corollas funnelform, purple, puberulous, glands capitulate; corolla tubes ca. 5.5 mm long; corolla lobes 1.5–2 mm long. Anthers 1.5–2 mm long, apical appendage acute, base rounded. Styles purple, 5–6 mm long, branches ca. 2 mm long. Achenes obovate, 1.3–5 mm long, glabrous, 10-ribbed. Pappus in one series of bristles 1.5–2 mm, absent or deciduous.


**Diagnostic characters.** *Camchaya loloana* var. *mukdabanensis* differs from the typical variety by having smaller capitula, a shorter involucre, and fewer florets.

**Ecology.** Rocky area in dipterocarp forest, alt. 250–400 m; flowering August to January.

**Vernacular name.** Phu Muang (พู่ม่วง).

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urn:lsid:ipni.org:names:903797-1:1.5
http://species-id.net/wiki/Camchaya_pentagona

**Type.** Thailand, Ubon Ratchathani; H. Koyama, H. Terao & Th. Wongprasert T-30791 (holotype: KYO!, isotype: AAU!, isotype: L!). Fig. 6D.

**Description.** Annual herbs, 20–60 cm tall. Stems erect, terete, inconspicuously ribbed, scabrous with uniseriate and T-shaped hairs. Leaves alternate, ovate or lanceolate, 3–10 by 2–4 cm, margin serrate or sinuate, apex acute, base attenuate, chartaceous; both surfaces scabrous with whip-shaped hairs, cylindrical hairs and capitate glands; lateral veins 5–10-paired; petioles up to 2 cm long. Capitulescences terminal and axillary, paniculate. Capitula broadly campanulate or hemispherical, 13–15 mm long, pedunculate. Receptacle convex, 3.5–6 mm in diam., glabrous. Involucres hemispherical, in 8–9 series, 11–12 mm long. Phyllaries imbricate, greenish with purple apex, margin with spines up to 0.5 mm long, outer surface arachnoid and lacking glands; the outer and the middle ones lanceolate, apex spinose; the inner ones lanceolate to oblanceolate, paniculate. Capitula broadly campanulate or hemispherical, 13–15 mm long, pedunculate. Receptacle convex, 3.5–6 mm in diam., glabrous. Involucres hemispherical, in 8–9 series, 11–12 mm long. Phyllaries imbricate, greenish with purple apex, margin with spines up to 0.5 mm long, outer surface arachnoid and lacking glands; the outer and the middle ones lanceolate, apex spinose; the inner ones lanceolate to oblanceolate, apex acuminate. Florets 80–150; corollas funnelform, purple, puberulous, glands capitate; corolla tubes 6–7 mm long; corolla lobes 2–2.5 mm long. Anthers ca. 2 mm long, apical appendage acute, base rounded. Styles purple, 6–7.5 mm long, branches ca. 2 mm long. Achenes obovate, 1.7–2 mm long, glabrous, 5(–6–9)-ribbed. Pappus in one series of bristles, 2–3.5 mm long, present in some florets, deciduous.

**Distribution.** Thailand: Ubon Ratchathani. Endemic.


**Diagnostic characters.** *Camchaya pentagona* is distinguished by its typically 5-ribbed achenes.

**Ecology.** Disturbed area in dipterocarp forest, alt. 220–300 m; flowering October to December.

**Vernacular name.** Phu Tab Tim (พู่ทับทิม).
urn:lsid:ipni.org:names:903798-1:1.5
http://species-id.net/wiki/Camchaya_spinulifera

Type. Thailand, Mukdahan, Nikomkhamsoi district, Phu Moo forest park; H. Koyama, H. Terao & Th. Wongprasert T-30837 (holotype: KYO!, isotype: L!). Figs 6E–F.

Description. Annual herbs, 40–100 cm tall. Stems erect, terete, inconspicuously ribbed, scabrous with uniseriate and T-shaped hairs. Leaves alternate, ovate to lanceolate, 4–10 by 1.5–4 cm, margin serrate, apex acute, base attenuate, chartaceous; both surfaces scabrous with whip-shaped hairs, cylindrical hairs, T-shaped hairs and capitate glands; lateral veins 5–13-paired; petioles up to 1 cm long. Capitulescences terminal and axillary, paniculate. Capitula campanulate or hemispherical, 10–15 mm long, pedunculate. Receptacle convex, 4.5–6.5 mm in diam., glabrous. Involucres hemispherical, in 8–9 series, 10–15 mm long, 10–20 mm in diam. Phyllaries imbricate, greenish with purple apex, margin with spines up to 10 mm long, outer surface arachnoid without glands; the outer lanceolate, apex spinose; the inner ones lanceolate to oblong, apex acuminate. Florets 130–220; corollas funnelform, purple, puberulous, glands capitate; corolla tubes 7.5–9 mm long; corolla lobes 2.5–3 mm long. Anthers ca. 2 mm long, apical appendage acute, base rounded. Styles purple, 8–11 mm long, branches 2–2.5 mm long. Achenes obovate, 1.3–1.5 mm long, glabrous, 10-ribbed. Pappus in one series of bristles, 1.5–3 mm long, present in some florets, deciduous.


Diagnostic characters. Camchaya spinulifera is recognized by having the longest marginal spines on their phyllaries of any species, and the lack of glands on the phyllaries.

Ecology. Rocky area in dipterocarp forest, alt. 200–300 m; flowering September to December.
**Vernacular name.** Phu Muang (พู่ม่วง), Up-Pa-Kud (อุปคุต).

urn:lsid:ipni.org:names:188174-1:1.1.1.2
http://species-id.net/wiki/Camchaya_tenuiflora

**Type.** Thailand, Bangkok, *A.F.G. Kerr* 20563 (holotype: BK!, isotype: E!, isotype: K!, isotype: L!, isotype: P!). Fig. 6G.

**Description.** Annual herbs, 20–70 cm tall. Stems erect, terete, inconspicuously ribbed, scabrous with uniseriate and T-shaped hairs. Leaves alternate, ovate or lanceolate, 3–10 by 1.5–2.5 cm, margin serrate, apex acute, base attenuate, chartaceous; both surfaces scabrous with whip-shaped hairs, cylindrical hairs and capitate glands; lateral veins 5–10-paired; petioles up to 10 mm long. Capitulescences terminal and axillary, paniculate and solitary. Capitula campanulate, 8–10 mm long, pedunculate. Receptacle convex, 1.5–3 mm in diam., glabrous. Involucres campanulate, in 6–7 series, 8–9 mm long, 6–10 mm in diam. Phyllaries imbricate, light green with purple apex, margin with spines up to 5 mm long, outer surface arachnoid glandular; the outer and the middle ones lanceolate, apex spinose; the inner ones lanceolate to oblong apex acuminate. Florets 40–60; corollas funnelform, purple or white, puberulous, glands capitate; corolla tubes 4–6 mm long; corolla lobes 1.5–2.5 mm long. Anthers ca. 2 mm long, apical appendage acute, base rounded. Styles purple, 4–7 mm long, branches 1.5–1.7 mm long. Achenes obovate, 1.5–1.7 mm long, glabrous, 10-ribbed. Pappus in 1 series of bristles, 1–4 mm long, present in some florets, deciduous.


**Diagnostic characters.** *Camchaya tenuiflora* differs from *C. loloana* by its longer marginal spine on phyllaries and leaf surfaces without T-shaped hair.

**Ecology.** Open area in evergreen forest, alt. 700 m; flowering October to December.

**Vernacular name.** Phu Ra Wee (พู่ระวี).

urn:lsid:ipni.org:names:77119225-1:1.5
http://species-id.net/wiki/Camchaya_thailandica

**Type.** Thailand. Prov. Udon Thani, rare on rocky area in Phu Phrabat historical park, *S. Bunwong* 328 (holotype KKV!, isotype US!). Figs 6H–I.
**Description.** Annual herbs, 50–100 cm tall. Stems erect, terete, inconspicuously ribbed; scabrous with uniseriate hairs, T-shaped hairs and glands. Leaves alternate, elliptic to oblong, 3–8 by 2–3 cm, margin serrate, apex acute, base attenuate, chartaceous; both surfaces puberulous with cylindrical hairs, T-shaped hairs and capitulate glands; lateral veins 5–10-paired; petioles up to 2 cm long. Capitulescences terminal and axillary, corymbose. Capitula campanulate, 8–10 mm long, pedunculate. Receptacle convex, 2.5–3 mm in diam., glabrous. Involucres broadly campanulate, in 5–6 series, 7–8 mm long, 5–6 mm in diam. Phyllaries imbricate, light green with purple apex, margin pale without spine, outer surface arachnoid glandular; the outer and the middle ones ovate, apex acuminate; the inner ones lanceolate to oblong, apex acuminate. Florets 50–70; corollas funnelform, purple, puberulous, glands capitulate; corolla tubes 6–7 mm long; corolla lobes 2.5–3 mm long. Anthers ca. 2 mm long, apical appendage acute, base rounded. Styles purple, 6–7 mm long, branches 2–2.5 mm long. Achenes obovate, ca. 1.5 mm long, glandular, 10-ribbed. Pappus in 1 series of bristles, 1–2 mm long, present in some florets, deciduous.

**Distribution.** Thailand: Udon Thani. Endemic.

**Specimens examined.** Thailand. Udon Thani, Ban Phue district, Phu Phrabat historical park, 17°43.84’N, 102°29.65’E, S. Bunwong 328 (KKU, US).

**Diagnostic characters.** This species is similar to *Vernonia gracilis* in having ovate phyllaries which its without marginal spine but differs in 10-ribbed achenes and broadly ovate leaf shape.

**Ecology.** Rocky areas in dipterocarp forest, alt. 300 m; flowering November to December.

**Vernacular name.** Muk Udon (มุกอุดร).


urn:lsid:ipni.org:names:8489-1:1.1.2.2.1.2

http://species-id.net/wiki/Cyanthillium


**Description.** Annual herbs. Stems erect, pubescent with T-shaped hairs. Leaves simple, alternate, petiolate; lamina ovate, lanceolate, elliptic or rhombic, pubescent, margin serrate or undulate, apex acute or acuminate, base attenuate, chartaceous. Capitulescences terminal or axillary. Capitula discoid, homogamous, pedunculate, florets bisexual and fertile. Involucre imbricate, persistent. Corollas funnelform, purple to white, actinomorphic, corolla lobes 5. Anthers 5, syngenesious. Styles purple, 2-branched, inner surface covered with stigmatic papillae, outer surface covered with sweeping hairs reaching below style bifurcation. Achenes clavate or turbinate, 5–10-ribbed, carpopodium present. Pappus in one or two series, persistent, the outer ones are shorter than the inner ones. Pollen echinolophate, 3-porate, with micropuncta.

Three species are recognized in Thailand.
Key to the species

1  Pappus in 2-series; capitula narrowly campanulate with 25–30 florets .... 2
–  Pappus in 1-series; capitula subglobose with 80–120 florets

................................................................................ Cyanthillium patulum

2  Herbs up to 1 m tall, stems and involucres sericeous; achene indistinctly ribbed
................................................................................ Cyanthillium cinereum
–  Herbs up to 2 m tall, stems and involucres pilose-villos to tomentose; achene with distinct 5–8 ribs

................................................................................ Cyanthillium montanum

urn:lsid:ipni.org:names:1015961-2:1.3
http://species-id.net/wiki/Cyanthillium_cinereum


Type. Sri Lanka, Herb. Hermann 3: 16, No. 419 (BM, lectotype designated by Jeffrey 1998: 224). Fig. 7A.

Description. Annual herbs, 20–100 cm tall. Stems erect, conspicuously ribbed, sericeous. Leaves 3–5 by 2–3 cm, lanceolate or ovate to broadly ovate, margin undulate to serrate, apex acute to acuminate, base attenuate, chartaceous; upper surface sericeous without glands; lower surface sericeous with cylindrical hairs, T-shaped hairs and capitulate glands, lateral veins 5–7-paired; petioles up to 2 cm long. Capitulescences terminal or axillary, paniculate. Capitula campanulate, 5–6 mm long, pedunculate. Receptacle flat, 2–2.5 mm in diam., glabrous. Involucres campanulate, in 3–4 series, 4–4.5 mm long, 2.5–3 mm in diam. Phyllaries imbricate, green with purple apex, margin piliferous, outer surface sericeous glandular; the outer and the middle ones lanceolate, apex acute to acuminate; the inner ones lanceolate to oblong, apex acuminate. Florets 25–30; corollas funnelform, purple or white, puberulous glandular; corolla tubes 3–3.5 mm long; corolla lobes ca. 1 mm long. Anthers ca. 0.6 mm long, apical appendage acute, base obtuse. Styles purple, ca. 3 mm long, branches ca. 0.5 mm long. Achenes clavate, 1.5–1.8 mm long, ribs inconspicuous, densely pubescent with twin hairs and capitulate glands. Pappus in 2 series of bristles, the inner ones 3–3.5 mm long, persistent.

**Figure 7.** Morphology of *Vernonieae* in Thailand 3. A *Cyanthillium cinereum* B *Cyanthillium montanum* C *Cyanthillium patulum* D *Decaneuropsis cumingiana* E *Decaneuropsis eberhardtii* F *Decaneuropsis garrettiana*.


**Diagnostic characters.** The species is a widespread weed of disturbed areas throughout the tropics. It is widely known by its former name, *Vernonia cinerea*. Its leaf shape and capitula size are vary continuously so that plants in dry areas frequently have small capitula and leaves while those in more mesic situations have larger heads and leaves.
Ecology. Open areas of dipterocarp or dry evergreen forest, alt. 0–250 m; flowering January to December.

Vernacular name. Mor Noi (หมอน้อย), Kan Toop (ก้านธูป), Tua Haa Din (ถั่วแดงดิน), Fa Rang Kok (ฝรั่งโคก), Suea Sam Kha (เสือสามขา), Ya Dok Kao (หญ้าดอกขาว), Ya La Ong (หญ้าละออง).


urn:lsid:ipni.org:names:77138521-1
http://species-id.net/wiki/Cyanthillium_montanum

*Vernonia cinerea* b. *montana* C.B.Clarke, Comp. Ind.: 21. 1876.

Type. India, Assam, Khasi hill (not seen). Fig. 7B.

Description. Annual herbs, 1–2 m tall. Stems erect, conspicuously ribbed, pilose-villose. Leaves 7–8 by 2–4 cm, ovate or ovate-lanceolate, margin serrate or dentate, apex acute, base attenuate, chartaceous; upper surface puberulous glandular; lower surface villose with whip-shaped hairs, T-shaped hairs and capitate glands; lateral veins 5–7-paired; petioles up to 2 cm long. Capitulescences terminal or axillary, paniculate. Capitula narrowly campanulate, 5–7 mm long, pedunculate. Receptacle flat, 2–2.5 mm in diam., glabrous. Involucres narrowly campanulate, in 3–4 series, 5–6 mm long, 3–4 mm in diam. Phyllaries imbricate, purplish, margin piliferous, outer surface hirsute without glands; the outer and the middle ones lanceolate, acuminate; the inner ones lanceolate to oblong, apex acuminate. Florets 20–30; corollas funnelform, purple, corolla tubes 4–5 mm long; corolla lobes ca. 2 mm long. Anthers 0.5–2 mm long, apical appendage acute, base obtuse. Styles purple, 5–6 mm long, branches 1–2 mm long. Achenes clavate, 1.5–2 mm long, 5–8-ribbed, densely pubescent with twin hairs and capitate glands. Pappus in 2 series of bristles, the inner ones 5–6 mm long.


Specimens examined. Thailand, Loei, Phu Ruea national park, 17°28.29’N, 101°21.10’E, S. Bunwong 16, (KKU); S. Bunwong 62 (KKU); Chiang Mai, Mae Rim district, Pong Yang or rock town, 18°56.15’N, 98°49.36’E, 10 Dec 2007, S. Bunwong 371 (KKU); Doi Sutep, 22 Feb 1988, J.F. Maxwell 88-213 (CMU); Doi Sutep, 1 Aug 1958, Th. Sørensen, K. Larsen & B. Hansen 6588 (BKF, C); Doi Inthanon, 8 Jan 1983, H. Koyama, H. Terao & Th. Wongprasert T-32130 (BKF); Chiangdao, 9 Feb 1983, H. Koyama, H. Terao & Th. Wongprasert T-33279 (BKF); Chiangdao, 3 Jan 1990, J.F. Maxwell 90-10 (CMU, E, L); Doi Maeya, 19 Jan 1983, H. Koyama, H. Terao & Th. Wongprasert T-32800 (BKF); Hod, 11 Jan 1983, H. Koyama, H. Terao & Th. Wongprasert T-32307 (BKF); Doi Anga, 16 Jan 1935, H.B.G. Garrett 922 (AAU,
Cyanthillium montanum is separated from *C. cinereum* by having villose to tomentose hairs on stems, branches, lower leaf surfaces and involucres, rather than appressed sericeous hairs. This species restricted to pine oak forest on the mountains.

**Ecology.** Hill evergreen or pine-oak forest, alt. 500–1000 m; flowering October to March.

**Vernacular name.** Pliw Doi (ปลิวดอย).

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urn:lsid:ipni.org:names:962414-1:1.1.2.1.1.2
http://species-id.net/wiki/Cyanthillium_patulum


**Type.** China, Cult. 1758, Philip Miller s.n. (not seen). Fig. 7C.

**Description.** Annual herbs, 1–2 m tall. Stems erect, conspicuously ribbed, white sericeous. Leaves 3–10 by 2–5 cm, elliptic to ovate or slightly rhombic, margin serrate or slightly sinuate, apex acute or obtuse, base attenuate, chartaceous; upper surface puberulous glandular; lower surface sericeous with T-shaped hairs and capitate glands; lateral veins 4–8-paired; petioles up to 2 cm long. Capitulescences terminal or axillary, paniculate. Capitula broadly campanulate or subglobose, 7–10 mm long, pedunculate. Receptacle flat, 2–3 mm in diam., glabrous. Involucres hemispherical, in 4–5 series, 6–7 mm long, 5–6 mm in diam. Phyllaries imbricate, light green, margin piliferous, outer surface arachnoid glandular; the outer and the middle ones lanceolate, apex acuminate or aristate; the inner ones lanceolate to oblanceolate, apex acuminate. Florets 80–120; corollas funnelform, purple or white, corolla tubes 4–5 mm long; corolla lobes ca. 2 mm long. Anthers 1.5–2 mm long, apical appendage acute, base obtuse. Styles purple, 4–5 mm long, branches 1–1.5 mm long. Achenes turbinate, 1–1.5 mm long, 5-ribbed, glandular. Pappus in 1 series of bristles, 2–3 mm long, deciduous.


Diagnostic characters. *Cyanthillium patulum* differs from *C. cinereum* by having only single series of pappus, a 5-ribbed achenes without hair and a globose capitula.

Ecology. Open area in dry evergreen forest or secondary forest, alt. 0–100 m; flowering August to February.

Vernacular name. Mud Muang (หมุดม่วง).


Type. *Vernonia cumingiana* Benth. in Hook.f., Kew Journ. 4: 232. 1852.

Description. Perennial plants. Stems scandent, young branches terete, pubescent or glabrous. Leaves simple, alternate, petiolate, pubescent with uniseriate hairs; lamina ovate, lanceolate or elliptic; margin entire, apex acute or acuminate, base cuneate, subcoriaceous. Capitulescences terminal or axillary. Capitula discoid, homogamous, pedunculate, florets bisexual and fertile. Involucre campanulate, in 4–6-series. Phyllaries imbricate, 7–12 mm long, persistent, lacking glands. Corollas funnelform, purple or white, actinomorphic, corolla basal tubes slender, closely investing style shaft; corolla lobes 5. Anthers 5, syngenesious. Styles 2-branched, inner surface covered with stigmatic papillae, outer surface covered with sweeping hairs on the outer surface reaching below style bifurcation. Achenes clavate or turbinate, 10-ribbed, hairy, without glands, carpopodium present. Pappus in 2 series of bristles. Pollen subechinolophate, 3-colporate, with micropuncta.

Three species are recognized in Thailand.

Key to the species

1 Phyllaries whitish puberulous................................................................. 2
– Phyllaries ferruginous tomentose ....................... *Decaneuropsis cumingiana*

2 Phyllaries obtuse; leaves glandular...................... *Decaneuropsis garrettiana*
– Phyllaries acute; leaves eglandular ...................... *Decaneuropsis eberhardtii*
urn:lsid:ipni.org:names:77094684-1:1.1
http://species-id.net/wiki/Decaneuropsis_cumingiana

Type. Philippines, M. Cuming 1092 (holotype: G!). Fig. 7D.
Type: Thailand, Kanchanaburi, Sangka, A.F.G. Kerr 8302 (holotype: K!).

**Description.** Climbing or scandent shrubs, 3–10 m tall. Stems sprawling, young branches rounded, inconspicuously ribbed, ferruginous tomentose. Leaves 7–10 by 3–4 cm, elliptic to oblong-elliptic, margin entire, apex acute, base cuneate, subcoriaceous; upper surfaces puberulous with glands, lower surface sericeous with whip-shaped hairs, cylindrical hairs and capitulate glands; lateral veins 5–6-paired; petioles up to 1 cm long. Capitulescences terminal and axillary, paniculate. Capitula campanulate, 12–15 mm long, pedunculate. Receptacle flat, 4–4.5 mm in diam., hairy. Involucre campanulate, in 5–6 series, 7–8 mm long, 6–7 mm in diam. Phyllaries imbricate, dull green, margin piliferous, outer surface ferruginous tomentose, glands capitulate; the outer and the middle ones ovate, apex acute; the inner ones lanceolate to oblong, apex acute. Florets 20–30; corollas funnelform, purple, glandular, corolla tubes 5–6.5 mm long; corolla lobes ca. 2 mm long. Anthers 2.8–3 mm long, apical appendage acute, base obtuse. Styles purple, 7–7.5 mm long, branches 3.5–4 mm long. Achenes clavate, 3–3.5 mm long, 10-ribbed, puberulous without glands. Pappus in 2 series of bristles, the outer ones are shorter than the inner ones, the inner ones 9–9.5 mm long, persistent.


**Specimens examined.** Thailand, Phetchabun, Nam Nao national park, 16°44.29’N, 101°34.19’E, 18 Mar 2003, S. Bunwong 74 (KKU); Chiang Mai, Doi Sutep, 15 Apr 1910, A.F.G. Kerr 1114 (BK, BM, K); Doi Sutep, 16 Feb 1958, Th. Sørensen, K. Larsen & B. Hansen 6942 (C, K); Lampang, 6 Mar 2525, Winit 1287 (BK, BKF, K), 31 Mar 1930, Winit 1916 (K); Saraburi, Mauk Lek, 9 Nov 1924, A. Marcan 1844 (BK, BM, K); Yala, Banang Sata, 10 Dec 1966, B. Sangkhachand 1409 (BKF).

**Diagnostic characters.** Decaneuropsis cumingiana is recognized by its ferruginous pubescence on the leaves and phyllaries.

**Ecology.** Evergreen or pine-oak forest, alt. 200–850 m; flowering November to April.

**Vernacular name.** Phaya Rak Pa (พญา rak pa), Pan Sieng (พันเชียง).
urn:lsid:ipni.org:names:77094685-1:1.1
http://species-id.net/wiki/Decaneuropsis_eberhardtii

Type. Vietnam, Tonkin, Eberhardt 4230 (holotype: P!). Fig. 7E.
Type: Thailand, A.F.G. Kerr 9969 (holotype: K!, isotype: L!, isotype: P!).

Description. Climbing or scendent shrubs. Stems sprawling, young branches inconspicuously ribbed, puberulous. Leaves 10–15 by 5–7 cm, elliptic or obovate, margin entire, apex acute, base cuneate, subcoriaceous; both surfaces puberulous with cylindrical hairs, lateral veins 5–7-paired; petioles up to 1 cm long. Capitulecences terminal and axillary, paniculate. Capitula campanulate, 10–15 mm long, pedunculate. Receptacle flat, 2–3 mm in diam., hairy. Involucres campanulate, in 4–5 series, 7–8 mm long, 4–5 mm in diam. Phyllaries imbricate, dark green or purple apically, margin piliferous, outer surface puberulous without glands; the outer and the middle ones ovate, acute or apiculate; the inner ones ovate or ovate-lanceolate, apex acute or obtuse. Florets 11–13; corollas funnelform, purple, glabrous; corolla tubes 5–5.5 mm long; corolla lobes 2–2.5 mm long. Anthers 3–3.5 mm long, apical appendage acute, base acute. Styles purple, 6–6.5 mm long, branches 4–5 mm long. Achenes turbinate, 2.5–3 mm long, 10-ribbed, covered with dense hairs. Pappus in 2 series of bristles, the inner ones 6–7 mm long, persistent.


Diagnostic characters. Decaneuropsis eberhardtii differs from D. cumingiana by having white hairs on leaves and phyllaries.

Ecology. Dry evergreen forest, alt. 500–800 m; flowering December to February.

Vernacular name. Ya Kaa Krua (ยาแก้เครือ).
urn:lsid:ipni.org:names:77094686-1:1.1
http://species-id.net/wiki/Decaneuropsis_garrettiana


**Type.** Thailand, Lampang, Me Maw, A.F.G. Kerr 2341 (isotype: BM!, isotype: E!, holotype: K!). Fig. 7F.

**Description.** Climbing or scandent shrubs, young branches terete, inconspicuously ribbed, puberulous. Leaves 9–25 by 4–15 cm, elliptic or obovate, margin entire, apex acute, base cuneate, chartaceous; upper surface puberulous without glands; lower surface puberulous with whip-shaped hairs, cylindrical hairs and capitate glands, lateral veins 4–11-paired; petioles up to 3.5 cm long. Capitulescences terminal and axillary,paniculate. Capitula campanulate, 12–15 mm long, pedunculate. Receptacle flat, 5–5.5 mm in diam., hairy. Involucres campanulate, in 5–6 series, 10–12 mm long, 8–8.5 mm in diam. Phyllaries imbricate, green, margin piliferous, outer surface puberulous without glands; the outer and the middle ones ovate or ovate-lanceolate, obtuse; the inner ones obovate-lanceolate, apex obtuse. Florets 20–30; corollas funnelform, dark purple, glandular; corolla tubes 7–8 mm long; corolla lobes ca. 2 mm long. Anthers 3–3.5 mm long, apical appendage acute, base acute. Styles white, 7–7.5 mm long, branches 3.5–4 mm long. Achenes subterete, 2.8–3 mm long, 10-ribbed, covered with dense hairs without glands. Pappus in 2 series of bristles, the inner ones 6.5–8.5 mm long, persistent.

**Distribution.** Thailand: Chiang Mai, Chiang Rai, Lampang, Phrae, Kanchanaburi, Myanmar.

**Specimens examined.** Thailand, Chiang Mai, Doi Chiangdao wildlife sanctuary, 19°24.11’N, 98°55.10’E, 20 Dec 2003, S. Bunwong 75 (KKU); Chiang Mai, Fang, 26 Jan 1973, S. Sutheesorn 2287 (BK); Doi Inthanon, 5 Dec 1969, C.F. van Beusekom & C. Phengklai 2316 (AAU, BKF, C, E, L, P); Muang District, 14 Feb 1990, R. Pooma 386 (BKF); Muang District, 20 Dec 1963, S. Phusamseang 66 (BKF, K, L); Muang District, 12 Dec 1997, W. Pongamornkul 23 (QBG); Muang District, 24 Dec 1997, W. Pongamornkul 48 (QBG); Muang District, 25 May 1995, W. Nanakorn et al. 5337 (QBG); Chiang Rai, Chiang kaung, 10 Jan 1922, H.B.G. Garrett 130 (BK, BKF, K); Thoeng, 23 Jan 1970, S. Sutheesorn 1639 (BK); Kanchanaburi, 15 Jan 1926, A.F.G. Kerr 10216 (BK, BM, K).

**Diagnostic characters.** Decaneuropsis garrettiana is distinguished from D. cumingiana and D. eberhardtii by its obtuse phyllaries.

**Ecology.** Mixed deciduous, evergreen or pine-oak forest, alt. 400–800 m; flowering November to February.

**Vernacular name.** Krue Muang Doi (เครือม่วงดอย).
**Elephantopus L., Sp. Pl.: 814. 1753.**

urn:lsid:ipni.org:names:73926-3:1.1
http://species-id.net/wiki/Elephantopus

**Type.** *Elephantopus scaber* L., Sp. Pl.: 814. 1753.

**Description.** Annual or perennial herbs. Stems rosulate or caulescent, surface pubescent. Leaves simple, alternate or rosette, usually petiolate; lamina obovate, oblancoate, elliptic, pilose-villos glandular; margin crenate, dentate or serrate; apex acute or obtuse, base attenuate, usually chartaceous. Capitulescences terminal or axillary, scapose or paniculate. Capitula discoid, tubular; clusters subtended by secondary foliose bracts, homogamous; florets bisexual and fertile. Phyllaries 8, in 2 series, decussate, persistent, oblong, outer surface puberulous or sometimes pilose-villos, glands capitate. Florets 4; corollas purple or white, glabrous or glandular, zygomorphic; corolla tubes slender; corolla lobes 5. Anthers 5, syngenesious, apical appendage acute, anther base not calcarate. Styles purple or white, 2–3-branched, inner surface covered with stigmatic papillae, outer surface covered with sweeping hairs reaching to below style bifurcation. Achenes usually clavate, 10-ribbed, pubescent, carpopodium present. Pappus in 1 series of usually 5 bristles dilated at base. Pollen lophate, 3-porate, without micropuncta.

Two species are recognized in Thailand.

**Key to the species**

1 Leaves cauline; capitulescences terminal and axillary.... *Elephantopus mollis*

– Leaves rosulate; capitulescences scapiform.................... *Elephantopus scaber*


urn:lsid:ipni.org:names:202942-1:1.5
http://species-id.net/wiki/Elephantopus_mollis

**Elephantopus tomentosus** Koster, Blumea 1: 464. 1935, non L.

**Type.** Venezuela, Caracas, Humboldt & Bonpland 627 (holotype: P!). Fig. 8A.

**Description.** Perennial herbs, 0.5–2.0 m tall. Stems caulescent, erect or procumbent, terete, inconspicuously ribbed, pilose. Leaves alternate, 10–20 by 3–5 cm, elliptic or oblong, margin crenate, apex acute, base attenuate, subcoriaceous; both surfaces sparsely pilose with filiform hairs, cylindrical hairs and capitate glands; lateral veins 10–16-paired; petioles up to 10 mm long. Capitulescences terminal and axillary, paniculate. Foliage bracts 3, deltoid. Capitula tubular, 7–8 mm long. Receptacle flat, ca. 1 mm in diam., glabrous. Involucres tubular, 6.5–8 mm long, 3–4 mm in diam. Phyllaries 8, in 2 series, decussate, light green, margin entire, outer surface puberulous, without glands; the outer ovate, apex acute; the inner ones lanceolate, apex acuminate. Florets 4; corollas white, zygomorphic, glabrous; corolla tubes
slender, 3–5 mm long; corolla lobes bilabiate, 1.5–2 mm long. Anthers ca. 1 mm long, apical appendage acute, base rounded. Styles white, 4–5 mm long, branches ca. 1 mm long. Achenes clavate, 2.5–3 mm long, pubescent, densely covered with twin hairs but lacking glands, inconspicuously ribbed. Pappus of 5 bristles in one series, dilated at base, 2.5–4.5 mm long.

**Distribution.** Thailand: Nakhon Ratchasima; Ubon Ratchathani, Satun, Songkhla. Pantropics.


**Diagnostic characters.** *Elephantopus mollis* is clearly recognized by its cauline leaves and completely white flowers.

**Ecology.** Evergreen forest, alt. 0–100 m; flowering October to December.

**Vernacular name.** Doo Mai Ru Lom (โด่ไม่รู้ล้ม), Hun Huay (หุนหาย).
urn:lsid:ipni.org:names:73955-3:1.1
http://species-id.net/wiki/Elephantopus_scaber


**Description.** Perennial herbs. Stems lacking except for the flowering scape, erect, terete, inconspicuously ribbed, sericeous. Leaves in basal rosette at base, obovate or obovate-lanceolate, margin crenate or serrate, apex obtuse or acute, base attenuate, subcoriaceous. Capitulescences terminal, scapose. Foliose bracts 3, deltoid. Capitula tubular. Involucres green or with purple apex. Phyllaries 8, in 2 series, decussate, margin entire or piliferous. Florets 4; corollas salverform, white or purple, zygomorphic. Anthers ca. 2 mm long, apical appendage acute, base acute or rounded. Styles purple. Achenes clavate, 2–3 mm long, pubescent with dense twin hairs, lacking glands. Pappus of 5 bristles with dilated bases in one series, persistent.

Two varieties are recognized in Thailand.

**Key to the varieties**

1. Leaves and inflorescences densely pilose-tomentose.............. *var. penicillatus*

   – Leaves and inflorescences sparsely pilose ...................................... *var. scaber*


**Type.** Laos, Chedom, *Thorel* 1407 (holotype: K!). Fig. 8D.

**Description.** Perennial herbs, 40–100 cm tall. Stems lacking except for inflorescence which is scapose, erect, terete, inconspicuously ribbed and pilose-villose. Leaves in a rosette at base of scape, 6–20 by 6–10 cm, obovate, obovate-lanceolate, elliptic, margin crenate to serrate, apex obtuse, base attenuate, subcoriaceous; upper surface sparsely pilose, without glands; lower surface densely pilose, with filiform cylindrical hairs and capititate glands; lateral veins 7–16-paired; petioles up to 6 cm long. Capitulescences terminal, scapose. Foliose bracts 3, deltoid. Capitula 7–9 mm long. Receptacle flat, ca. 1 mm in diam., glabrous. Involucre tubular, 6.5–8 mm long, 3–4 mm in diam. Phyllaries distichous, decussate, margin entire, outer surface puberulous, glands capititate; the outer ovate-lanceolate, apex acuminate; the inner ones lanceolate or oblong, apex acuminate. Florets 4; corollas salverform, white or purple, zygomorphic, glabrous or rarely hairy; corolla tubes 4–6 mm long; corolla lobes 2.5–3.5 mm long. Anthers ca. 2 mm long, apical appendage acute, base rounded. Styles purple, 6–8 mm long, branches ca. 1 mm long. Achenes 2–2.5 mm long, pubescent with a dense cover of twin hairs, without glands, 10-ribbed. Pappus of 5 bristles ca. 3 mm long, in one series, bristles with dilated bases.


**Diagnostic characters.** *Elephantopus scaber* var. *penicillatus* differs from the typical variety in having large capitula and whitish pilose-tomentose leaf surface and involucres.

**Ecology.** Dipterocarp or dry evergreen forest, alt. 100–400 m; flowering August to January.

**Vernacular name.** Doo Mai Ru Lom (โด่ไม่รู้ล้ม), Kee Fai Nok Khum (ขี้ไฟนกคุ้ม).

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**Elephantopus scaber var. scaber**

**Description.** Perennial herbs, 10–40 cm tall. Stems lacking except for the flowering scape, erect, terete, inconspicuously ribbed, sericeous. Leaves in basal rosette at base, 8–20 by 3–5 cm, obovate or obovate-lanceolate, margin crenate or serrate, apex obtuse or acute, base attenuate, subcoriaceous; upper surface sparsely pilose without glands, lower surface densely pilose with filiform and cylindrical hairs and capitate glands; lateral veins 12–15-paired; petioles up to 2 cm long. Capitulescences terminal, scapose. Foliose bracts 3, deltoid. Capitula 8–10 mm long. Receptacle flat, ca. 0.5 mm in diam., glabrous. Involucres green with purple apex, 7–10 mm long, 2–3 mm in diam. Phyllaries decussate, margin entire or piliferous, outer surface pilose, without glands; the outer lanceolate, apex acuminate to acuminate; the inner ones oblong, apex acuminate. Florets 4; corollas salverform, purple, zygomorphic, glabrous; corolla tubes 3–3.5 mm long; corolla lobes 1.5–2 mm long. Anthers ca. 2 mm long, apical appendage acute, base acute. Styles purple, 7–8 mm long, branches ca. 0.5 mm long. Achenes 2.5–3 mm long, pubescent with dense twin hairs, lacking glands, inconspicuously ribbed. Pappus of 5 bristles with dilated bases in one series.


Diagnostic characters. This plant is characterized by having basal rosette of leaves and spiciform capitulescence with conspicuous scape. Its leaf shape is variable.

Ecology. Open area in dipterocarp, evergreen or pine-oak forest, alt. 0–300 m; flowering August to January.

Vernacular name. Doo Mai Ru Lom (โด่ไม่รู้ล้ม), Kee Fai Nok Khum (ขี้ไฟนกคุ่ม), Ya Kai Nok Khum (หญ้าไก่นกคุ่ม), Ya Prab (หญ้าปราบ), Ya Sam Sib Song Hab (หญ้าสามสิบสองหาบ), Nat Pha (หน้าดผา) Ta Che Go Wa (ตะชีโกวะ), Nat Mee Klan (หน้าดมีแคลน).

urn:lsid:ipni.org:names:8874-1:1.1.2.1.1.1
http://species-id.net/wiki/Ethulia

Type. Ethulia conyzoides L.

Description. Annual herbs. Stems erect. Leaves simple, alternate, petiolate; lamina ovate, lanceolate, elliptic, pubescent, margin serrate, apex acute to acuminate, base attenuate, chartaceous. Capitulescences terminal or axillary, corymbose. Capitula discoid, pedunculate, homogamous; florets bisexual and fertile. Involutecs campanulate,

One species is recognized in Thailand.

urn:lsid:ipni.org:names:205240-1:1.5
http://species-id.net/wiki/Ethulia_conyzoides

**Type.** Egypt, *P. Forsskal* 1387 (holotype: K!).

**Description.** Annual herbs, 50–150 cm tall. Stems erect, conspicuously ribbed, puberulous. Leaves alternate, 5–8 by 1–2 cm, elliptic or lanceolate, margin serrate, apex acuminate or acute, base attenuate, chartaceous; both surfaces ferrugineous with unicellular hairs and capitate glands, shortly petiolate. Capitulescences terminal and axillary, corymbose. Capitula hemispherical, 3–4 mm long. Receptacle ca. 1.5 mm in diam., glabrous. Involucres semispherical, in 3–4 series, 1.5–2 mm long, 1–2 mm in diam. Phyllaries imbricate, green with purple apex, margin piliferous, outer surface puberulous, glands capitate; the outer and the middle ones ovate to lanceolate, apex acute; the inner ones lanceolate to oblone, apex acute. Florets 20–30; corollas funnelform, purple, glandular; corolla tubes 0.5–1 mm long; corolla lobes ca. 1 mm long. Anthers 1.5–2 mm long, apical appendage acute, base obtuse. Styles purple, inner surface covered with stigmatic papillae, sweeping hairs. Achenes turbinate, 1.5–2 mm long, glandular, 6-ribbed. Pappus absent.


**Diagnostic characters.** *Ethulia conyzoides* is distinguished by achenes having 4–6 ribs, pappus and carpopodium are absent.

**Ecology.** Open area along river bank in evergreen forest, alt. 200–400 m; flowering May to September.

**Vernacular name.** Ya Hua Mud (หญ้าหัวหมุด).

http://species-id.net/wiki/Gymnanthemum

**Type.** *Gymnanthemum senegalense* (Pers.) Sch.Bip.
Description. Small trees. Stems caulescent. Leaves simple, alternate, petiolate, lamina ovate, or elliptic, pubescent, margin serrate, apex acuminate, base attenuate, chartaceous. Capitulescences terminal or axillary, corymbose. Capitula discoid, homogamous, pedunculate. Florets bisexual and fertile. Involucre herbaceous, persistent, apex obtuse. Corolla purple to white, actinomorphic; lobes 5. Anthers 5, syngenesious. Styles purple, 2-branched, inner surface covered with stigmatic papillae, outer surface covered with sweeping hairs reaching to below style bifurcation. Achenes subterete or obovate, usually 10-ribbed, carpopodium present. Pappus in 2 series of bristles, persistent, the outer ones are shorter than the inner ones. Pollen subechinolophate, 3-colporate, with prominent micropuncta.

One species is recognized in Thailand.

urn:lsid:ipni.org:names:210894-1:1.4
http://species-id.net/wiki/Gymnanthemum_extensum
Figs 9A–B

*Vernonia extensa* DC., Prodr. 5: 33. 1836.
  Type. Nepal; *Wallich* 3061 (holotype: G!).

*Vernonia cylindriceps* C.B. Clarke, J. Linn. Soc. Bot. 25: 35. 1890.
  Type: India, Hartook Mekong, *C.B. Clarke* 42109 (holotype: K!).

Description. Shrubs or subshrubs 2–6 m tall. Stems caulescent, young branches inconspicuously ribbed, white puberulous. Leaves 7–13 by 2–4 cm, oblanceolate, margin serrate, apex acute, base attenuate, chartaceous; upper surface puberulous, without glands; lower surface puberulous with whip-shaped hairs, cylindrical hairs and capitulate glands; lateral veins 7–12-paired; petioles up to 1 cm long. Capitulescences terminal, corymbose. Capitula narrowly campanulate, 14–16 mm long, pedunculate. Receptacle convex, 1–1.5 mm in diam., hairy. Involucres slightly oblong-cylindrical, in 5–6 series, 8–10 mm long, 3–4 mm in diam. Phyllaries imbricate, green, margin piliferous, outer surface arachnoid without glands; the outer and the middle ones, ovate, apex obtuse; the inner ones lanceolate or ovate-lanceolate, apex obtuse or rounded. Florets 5–10; corollas funnelform, purple or white, glandular, corolla tubes 6–7 mm long; corolla lobes 4–4.5 mm long. Anthers 4–4.5 mm long, apical appendage acute, base obtuse. Styles purple, 9–10 mm long, branches 2, 4–5 mm long. Achenes turbinate, 3–3.5 mm long, 10-ribbed, covered with dense hairs and capitulate glands. Pappus in 2 series of bristles, the inner ones 8.5–9 mm long, persistent.
Figure 9. Morphology of *Vernonieae* in Thailand 5. A–B *Gymnanthemum extensum* C *Iodocephalopsis eberhardtii* D *Koyamasia calcarea* E–F *Koyamasia curtisii* G *Kurziella gymnoclada* H *Monosis parishii* I *Monosis volkameriifolia*


Diagnostic characters. This species is characterized by distinctly sweet smell, the habit of shrubs or subshrubs, and obtuse phyllaries.

Ecology. Evergreen or pine-oak forest, alt. 1000–2000 m; flowering December to April.

Vernacular name. Pim Pai Lin (พิมพ์ไพลิน).

urn:lsid:ipni.org:names:77114298-1:1.2
http://species-id.net/wiki/Iodocephalopsis


Description. Erect perennial herbs. Stems erect, pubescent with T-shaped hairs. Leaves simple, alternate, petiolate; lamina ovate, pubescent. Capitulescences laxly cymose with capitula solitary or 2 or 3 in a group. Capitula discoid, campanulate, pedunculate, homogamous; florets fertile. Involucre campanulate. Phyllaries imbricate with serrate or entire margins. Florets 15–25; corollas funnelform, purplish or whitish; corolla lobes 5. Anthers 5, purplish or yellowish, syngenesious, exerted. Styles purple, 2-branched, without enlarged basal node, inner surface covered with stigmatic papillae, outer surface and lower style shaft covered with sweeping hairs reaching to below style bifurcation. Achenes 7–10-ribbed, glandular, with vermicular series of idioblasts on the surfaces; achene walls with distinct fibrous layer inside, without raphids, base without carpopodium. Pollen echinolophate, sub-3-colporate, pores in short colpus formed of two partially fused lacunae.

One species is recognized in Thailand.
urn:lsid:ipni.org:names:77114298-1:1.2
http://species-id.net/wiki/Iodocephalopsis_eberhardtii


*Type*. Vietnam, Annam, Lang-bian, *Eberhardt* 1711 (holotype: P!). Fig. 9C.


*Type*: Thailand, Chiang Mai, Doi Sutep, *A.F.G. Kerr* 789 (holotype: BM!).

**Description.** Perennial herbs, 0.5–1 m tall. Stems erect, terete, inconspicuously ribbed, puberulous with T-shaped hairs and glands. Leaves alternate, obovate-lanceolate, 4–10 by 1–4 cm, margin serrate or entire, apex acute, base attenuate, chartaceous; both surfaces puberulous with whip-shaped hairs, cylindrical hairs and capitate glands; lateral veins 5–8-paired; petioles up to 3 mm long. Capitulescences terminal or axillary, corymbose or solitary. Capitula campanulate, 8–10 mm long, pedunculate. Receptacle convex, 2.5–4 mm in diam., glabrous. Involute campanulate, in 3–4 series, 6–7 mm long. Phyllaries imbricate, dull green, margin piliferous, outer surface arachnoid, glandular; the outer and the middle ones ovate, apex acute to acuminate; the inner ones ovate-lanceolate, apex acute to acuminate. Florets 15–25; corollas funnelform, purple or white, puberulous, glands capitate; corolla tubes 2.5–4 mm long; corolla lobes 2–2.5 mm long. Anthers ca. 2 mm long, apical appendage acute, base rounded. Styles purple, 3–5 mm long, branches 1–2 mm long. Achenes turbinate, 3–5 mm long, glandular, 7–10-ribbed. Pappus absent.


**Diagnostic characters.** *Iodocephalopsis eberhardtii* is different from *Camchaya* spp. by having 3-colporate pollen, no pappus and phyllaries without marginal spines.

**Ecology.** Edge of evergreen and pine-oak forests, alt. 700–1700 m; flowering August to December.

**Vernacular name.** Muang Cha Rad (ม่วงจรัส).
urn:lsid:ipni.org:names:1010933-1:1.1.2.1.1.1
http://species-id.net/wiki/Koyamasia


**Description.** Perennial herbs. Stems erect, pubescent. Leaves simple, alternate, petiolate, lamina ovate or elliptic, margin serrate, apex acute or acuminate, base attenuate. Capitulescences terminal, solitary or paniculate. Capitula discoid, homogamous; pedunculate, florets bisexual and fertile. Involucre imbricate, phyllary tips recurved. Florets 60–100; corollas purplish or white, actinomorphic; corolla lobes 5. Anthers 5, syngenesious. Styles 2-branched, inner surface covered with stigmatic papillae, outer surface covered with sweeping hairs reaching to below style bifurcation. Achenes subterete, 10-ribbed, carpopodium absent. Pappus in one series of bristles, deciduous. Pollen echinolophate, 3-porate, without micropuncta.

Three species are recognized in Thailand.

**Key to the species**

1 Capitula broadly campanulate, 15–30 mm long, involucres hemispherical, 15–20 mm long, 15–20 mm in diam., florets ca. 100 .... Koyamasia calcarea
– Capitula campanulate, 15–20 mm long, involucres campanulate, 7–10 mm long, 8–15 mm in diam., florets ca. 60 ...................... Koyamasia curtisii

urn:lsid:ipni.org:names:1010934-1:1.1.2.1.1.2
http://species-id.net/wiki/Koyamasia_calcarea


**Type.** Thailand, Chiang Mai, Doi Chiangdao, T. Shimizu, H. Koyama & A. Nalampoon T-10011 (holotype: KYO!). Fig. 9D.

**Description.** Perennial herbs, 20–80 m tall. Stems erect, conspicuously ribbed, puberulous with stipitate glands. Leaves 10–30 by 3–6 cm, ovate or elliptic, margin serrate, apex acute to acuminate, base attenuate, subcoriaceous, upper surface scabrous without glands, lower surface scabrous with whipshaped hairs, and capitulate glands, lateral veins 7–10-paired; petioles up to 6 cm long. Capitulescences terminal, usually solitary. Capitula broadly campanulate, 1.5–3 cm long, pedunculate. Receptacle glabrous. Involucres hemispherical, in 6–7 series, 15–20 mm long, 15–20 mm in diam. Phyllaries imbricate, green or purple, margin entire, outer surface puberulous glandular; the outer and the middle ones ovate to lanceolate, acuminate or aristate, upper half strongly reflexed; the
inner ones ovate-lanceolate, apex acute. Florets more than 80, corollas funnelform, purple or white, glandular, corolla tubes 5–6 mm long; corolla lobes 2–3 mm long. Anthers 3–4 mm long, apical appendage acute, base obtuse. Styles purple. Achenes subterete, 3.5–4.5 mm long, 10-ribbed, glabrous. Pappus in 1 series of bristles, 1–3 mm long, deciduous.

**Distribution.** Thailand: Chiang Mai. Endemic.


**Diagnostic characters.** *Koyamasia calcarea* can be distinguished by its oblong achenes, 3-porate pollen and reflexed phyllaries. Its capitula are also larger than those of *K. curtisii*.

**Ecology.** Restricted to limestone mountain, altitude ca. 1300 m from sea level; flowering October to December.

**Vernacular name.** Akkanee Thewa (อัคคนีเทวา).

*Koyamasia curtisii* (Craib & Hutchinson) Bunwong, Chantar. & S.C.Keeley, comb. nov.

urn:lsid:ipni.org:names:77138474-1
http://species-id.net/wiki/Koyamasia_curtisii


**Type.** Malay Peninsula, Kedah, Langawi, *Curtis* 2127 (holotype: K!). Figs 9E–F.

**Key to the varieties**

1. Lower surface of leaves puberulous .......................................................... var. *curtisii*
– Lower surface of leaves tomentose ........................................................... var. *tomentosa*

*Koyamasia curtisii* var. *curtisii*

**Description.** Herbs 20–100 cm tall. Stems erect, conspicuously ribbed, puberulous with stipitate glands. Leaves 5–15 by 2–7 cm, ovate or elliptic, margin serrate, apex acute to acuminate, base attenuate, chartaceous; both surfaces puberulous with whip-shaped hairs and capitulate glands; lateral veins 7–12-paired; petioles up to 4 cm long. Capitulescences terminal, solitary or loosely paniculate. Capitula campanulate, 15–20 mm long, pedunculate. Receptacle flat, glabrous. Involucres campanulate, 7–10 mm long, 8–15
mm in diam. Phyllaries imbricate, in 6–7 series, light green or purple apex, margin entire, outer surface puberulous; the outer and the middle ones ovate to lanceolate, apex acuminate with reflexed, the inner ones lanceolate to oblong, apex caudate. Florets ca. 60; corollas funnelform, purple, pubescent with soft hairs and capitulate glands; corolla tubes 7–10 mm long; corolla lobes 2–3 mm long. Anthers 2.8–3 mm long, apical appendage acute, base obtuse. Styles purple. Achenes clavate, 3–3.5 mm long, 10-ribbed, sparsely glandular. Pappus in one series of bristles, 2–8 mm long, deciduous.

**Distribution.** Thailand: Lampang, Phetchabun, Kanchanaburi, Prachuap Khiri Khan, Saraburi, Pharthhalung, Trang, Satun, Songkla. India, Laos, Myanmar, Vietnam, Malay Peninsula, Malay islands.

**Specimens examined.** Thailand, Prachuap Khiri Khan, Kuiburi district, 12°3.44’N, 99°37.59’E, 19 Nov 1964, Adisai 965 (BK); Satun, Tarutao national park, 6°36.19’N; 99°39.15’E, 21 Apr 1969, C. Chermvisirivathana 1477 (BK, L); Lampang, Muang Ngao, 17 Jan 1931, Put 4019 (AAU, BK, BM, K, P); Muang Ngao, 30 Aug 1925, Win 757 (K); Kanchanaburi, Si Sa Wat, 10 Aug 1967, Kasem 548 (BK); Si Sa Wat, 30 Jul 1925, A. Marcan 2348 (BM, K, P); Si Sa Wat, 31 Jul 1928, Put 1780 (AAU, BK, K, L, P); Saraburi, Muak Lek, 4 Sep 1925; Muak Lek, Put 1877 (BK); Muak Lek, 4 Sep 1928, Put 1879 (AAU, BK, BM, E, K, P); Muak Lek, 4 Sep 1963, T. Smitinand & H. Sleumer 1372 (K, L); Trang, Kao Kao, 2 Aug 1929, Rabil 310 (BK, BM, K).

**Diagnostic characters.** *Koyamasia curtisii* is similar to *K. calcarea* in having solitary or loosely paniculate capitulescences and reflexed phyllaries but differs in having smaller capitula and a pappus. Both species are found in limestone mountains.

**Ecology.** Limestone mountain, alt. 100–500 m; flowering November to April.

**Vernacular name.** Chang Nga Pha (ช้างงาผา).


urn:lsid:ipni.org:names:77138506-1


**Type.** Thailand, Ratchaburi, A.F.G. Kerr 8997 (isotype: BK!, isotype: BM!, holotype: K!).

**Description.** Herbs 20–100 cm tall. Stems erect, conspicuously ribbed, tomentose or villose. Leaves 5–10 by 2–6 cm, ovate or elliptic, margin serrate, apex acute to acuminate, base attenuate, chartaceous; upper surface scabrous; lower surface tomentose; lateral veins 7–12-paired; petioles up to 4 cm long. Capitulescences terminal, solitary or paniculate. Capitula campanulate, 11–13 mm long, pedunculate. Receptacle flat, glabrous. Involucres campanulate, in 6–7 series, 7–8 mm long, 8–10 mm in diam. Phyllaries imbricate, green with purple apex, margin piliferous, outer surface puberulous; the outer and the middle ones ovate to lanceolate, caudate, upper half strongly reflexed; the inner ones lanceolate to oblong, apex acute to acuminate. Florets ca. 60; corollas funnelform, purple; corolla tubes 7–8 mm long; corolla lobes 2–2.5
mm long. Anthers 2.8–3 mm long, apical appendage acute, base obtuse. Styles purple. Achenes clavate, 3–3.5 mm long, 10-ribbed, sparsely glandular. Pappus in 2 series of bristles, the inner ones 5–6 mm long, deciduous.


**Diagnostic characters.** This plant differs from the typical variety by having tomentose hairs on the lower leaf surfaces.

**Ecology.** Limestone mountain, alt. 200–1600 m; flowering June to August.

**Vernacular name.** Hua Chai Wai Yarap (หัวใจไวยราพณ์).

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urn:lsid:ipni.org:names:77114714-1:1.2
http://species-id.net/wiki/Kurziella

**Type.** *Vernonia gymnoclada* Collett & Hemsl.


One species is recognized in Thailand.

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urn:lsid:ipni.org:names:77114715-1:1.2
http://species-id.net/wiki/Kurziella_gymnoclada

**Vernonia gymnoclada** Collett & Hemsl., *J. Linn. Soc., Bot.* 28: 70. 1890.


**Type.** Myanmar, Meiktila, *H. Collet* 515 (holotype: K!). Fig. 9G.

**Description.** Perennial herbs, up to 1 m tall. Stems erect, conspicuously ribbed, puberulous. Leaves 1–3 by 1–2 cm, obovate, margin serrate, apex obtuse or truncate, base
cuneate, subcoriaceous, both surfaces scabrous with whip-shaped hairs and capitule glands, lateral veins 2–3-paired; petioles up to 5 mm long. Capitulescences terminal and axillary, spicate or solitary. Capitula campanulate, 10–13 mm long, subsessile or shortly pedunculate. Receptacle flat, 1.5–2 mm in diam. Involucres campanulate. Phyllaries imbricate, in 5–6 series, 8–10 mm long, 4–5 mm in diam., green or purple apically, margin piliferous, outer surface puberulous without glands; the outer and the middle ones ovate or lanceolate, acute; the inner ones lanceolate to oblanceolate or oblong, apex acute. Flores 15–20; corollas funnelform, purple, glabrous, corolla tubes 8–10 mm long; corolla lobes 3–3.5 mm long. Anthers 2–2.5 mm long, apical appendage acute, base obtuse. Styles purple, 7–8 mm long, branches 2–2.5 mm long. Achenes 2–3 mm long, ca. 5-ribbed, covered with dense hairs. Pappus in 1 series of bristles, 9–10 mm long.


**Specimens examined.** Thailand, Khon Kaen, Phon district, 15°48.96’N, 102°35.91’E, 28 Feb 2008, S. Bunwong 391 (KKU, US); Nakhon Ratchasima, 21 Jan 1931, 21 Jan 1931, A.F.G. Kerr 19911 (AAU, BK, BM, E, K); Nakhon Ratchasima, 3 Mar 1958, Th. Sørensen, K. Larsen & B. Hansen 2166 (BKF, C, K); Kanchanaburi, 13 Mar 1926, A.F.G. Kerr 10618 (BK, BM, C, E, K); Kanchanaburi, 18 Jan 1929, Put 2273 (AAU, BK, BM, E, K); Kanchanaburi, 21 Dec 1970, T. Smitinand 11398 (BKF); Chai Nat, 8 Jan 1980, Put 2654 (BK, BM, E, L, K); Saraburi, Minam Sak, 3 May 1923, A.F.G. Kerr 7029 (AAU, BK, BM, E, K); Ratchaburi, Kao Tum Pha, 15 Mar 1965, S. Suteesorn 479 (BK); Phetchaburi, Kao Ec San, 8 Mar 1965, S. Suteesorn 478 (BK).

**Diagnostic characters.** *Kurziella gymnoclada* is distinguished by a single row of persistent pappus, deciduous leaves and sessile or subsessile capitula in axillary leaves.

**Ecology.** Dipterocarp forest, alt. 40–200 m; flowering November to March.

**Vernacular name.** Yoong Pad Maa Mai (ยู้งปัดแม่หม้าย).

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**Monosis DC. in Wight, Contrib. Bot. Ind. 5. 1834.**

urn:lsid:ipni.org:names:30071981-2:1.1.2.1

http://species-id.net/wiki/Monosis


**Description.** Perennial plants. Stems small trees or shrubs, young branches terete, tomentose. Leaves simple, alternate, petiolate, pubescent with flagellate hairs, lamina ovate, obovate, oblanceolate or elliptic, margin serrate, apex acute, base attenuate or cuneate, subcoriaceous. Capitulescences terminal, thyrsoid paniculate. Capitula discoid, homogamous, pedunculate, florets bisexual and fertile. Involucre campanulate, in 4–5 series, 4–5 mm long. Phyllaries imbricate, persistent, without glands. Corollas funnelform, purple, actinomorphic, corolla lobes 5. Anthers 5, syngenesious. Styles 2-branched, inner surface covered with stigmatic papillae, outer surface covered with
sweeping hairs on the outer surface reaching below style bifurcation. Achenes turbinate, 10-ribbed, carpopodium present, hairy with glands. Pappus in 2 series of bristles, persistent, the outer ones are shorter than the inner ones. Pollen lophate with high muri.

Two species are recognized in Thailand.

**Key to the species**

1 Shrubs; lower leaf surface and young shoot ferruginous tomentose; Achenes 2.5–3.5 mm long............................... *Monosis parishii*

– Small tree; lower leaf surface and young shoot whitish puberulous; Achenes 4–5 mm long............................... *Monosis volkameriifolia*

urn:lsid:ipni.org:names:60452500-2:1.1
http://species-id.net/wiki/Monosis_parishii


**Type.** Myanmar, Attran, Parish 103 (holotype: K!). Fig. 9H.

**Description.** Shrubs or subshrubs, 1–3 m tall. Stems erect, young branches inconspicuously ribbed, ferruginous tomentose. Leaves 10–26 by 3–11 cm, ovate or elliptic, margin serrate, apex acute, base attenuate, coriaceous; upper surface ferruginous puberulous without glands; lower surface ferruginous tomentose with flagellate hairs and capitate glands; lateral veins 11–13-paired; petioles up to 3 cm long. Capitulescences terminal, thyrsoid paniculate. Capitula narrowly campanulate or slightly oblong-cylindrical, 6–7 mm long, subsessile or pedunculate. Receptacle flat, 2–3 mm in diam., glabrous. Involucres narrowly campanulate, in 4–5 series, 4–5 mm long, 2.5–3 mm in diam. Phyllaries imbricate, purple or green with purple apex, margin piliferous, outer surface arachnoid without glands; the outer and the middle ones ovate, apex acute or obtuse; the inner ones lanceolate or oblong, apex acute. Florets 7–9; corollas funnelform, purple, glandular, corolla tubes 4–5 mm long; corolla lobes 2–2.5 mm long. Anthers 3–3.5 mm long, apical appendage acute, base obtuse. Styles purple, 4–5.5 mm long, branches 2, 2–2.5 mm long. Achenes turbinate, 2.5–3.5 mm long, 10-ribbed, covered with sparse hairs and capitate glands. Pappus in 2 series of bristles, the inner ones 5–6 mm long, persistent.

**Distribution.** Thailand: Mae Hong Son, Chiang Mai, Chiang Rai, Lampang, Sukhothai, Kanchanaburi. China (Yunnan), India, Myanmar, Laos.


Diagnostic characters. Monosis parishii is recognized by its ferruginous tomentose leaf surface and the shrubby habit.

Ecology. Hill evergreen or pine-oak forest, alt. 250–800 m; flowering December to April.

Vernacular name. Khang Hang Lek (ข้างหางเล็ก), Tree Cha Wa (ตรีชะวา), Nat Ngern (หน้าดเงิน).

urn:lsid:ipni.org:names:60452504-2:1.1
http://species-id.net/wiki/Monosis_volkameriifolia


Type. Nepal, Wallich 3001 (holotype: K!). Fig. 91.

Description. Small tree, 3–6 m tall. Stems erect, bark grey, young branches inconspicuously ribbed, white tomentose. Leaves alternate, 10–50 by 5–20 cm, obovate or oblanceolate, margin serrate, apex acute, base cuneate, coriaceous; upper surface whitish puberulous, without glands; lower surface whitish puberulous with flagellate hairs and capitate glands; lateral veins 10–20-paired; petioles up to 3 cm long. Capitulescences terminal, thyrsoid paniculate. Capitula campanulate, 9–10 mm long, subsessile or shortly pedunculate. Receptacle flat, 1.5–2 mm in diam., glabrous. Involucres narrowly campanulate or slightly oblong-cylindrical, in 4–5 series. Phyllaries imbricate, light green or purple apically, 4–5 mm long, 2–3 mm in diam., margin piliferous or entire, outer surface white arachnoid without glands; the outer and the middle ones ovate, apex acute; the inner ones ovate or lanceolate, apex acute. Florets 8–10; corollas
funnelform, purple, glandular; corolla tubes 5.5–6 mm long; corolla lobes 2–3 mm long. Anthers 3–3.5 mm long, apical appendage acute, base acute. Styles purple, 5–7 mm long, branches 2, 3–4 mm long. Achenes turbinate, 4–5 mm long, 10-ribbed, covered with dense twin hairs and capitulate glands. Pappus in 2 series of bristles, the inner ones 7–8 mm long.

**Distribution.** Thailand: Mae Hong Son, Chiang Mai, Lamphun, Lampang, China (Yunnan), India, Bhutan, Myanmar, Vietnam.


**Diagnostic characters.** *Monosis volkameriifolia* is similar to *M. parishii* in capitula and leaf shape but differs in tree habits and whitish puberulous leaf surfaces.

**Ecology.** Hill evergreen or pine-oak forest, alt. 500–1750 m; flowering November to March.

**Vernacular name.** Kla Po Pha Du (คละปอพะดุ), Ya Kaa (หญ้าแก้), Ma Hok Ton (มะโหกต้น), Yarn (หยาน).

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**Type.** *Cacalia birmanica* Kuntze.

**Description.** Annual herbs. Stems erect, inconspicuously ribbed, puberulous. Leaves cauline, lanceolate, margin serrate. Capitulescences terminal, loosely paniculate. Capitula campanulate, peduncles fistulose. Phyllaries imbricate, subglobular. Florets 20–55; corollas funnelform, white or purple. Achenes subterete, 10-ribbed, aculeate between ribs, carpopodium present. Pappus in 2 series of bristles, persistent, the outer ones are shorter than the inner ones. Pollen lophate, 3-porate, without micropuncta.
Two species are recognized in Thailand.

**Key to the species**

1. Capitula 10–12 mm long, florets ca. 55, inner pappus ca. 7 mm long ..........
   ................................................................................................................. **Okia birmanica**

   – Capitula 5–6 mm long, florets ca. 20, inner pappus ca. 5 mm long ............
   ................................................................................................................. **Okia pseudobirmanica**

urn:lsid:ipni.org:names:77114255-1:1.2
http://species-id.net/wiki/Okia_birmanica

**Cacalia birmanica** Kuntze, Rev. Gen. Pl.: 323. 1891.

**Type.** Myanmar, Moulmein, *O. Kuntze* 6271 (holotype: K!). Fig. 10A.

**Description.** Annual herbs, 1–2 m tall. Stems erect, inconspicuously ribbed, puberulous. Leaves cauline, 5–20 by 1–5 cm, lanceolate, margin serrate, apex acuminate, base attenuate, chartaceous; upper surface scabrous, lower surface puberulous, lateral veins 8–12-paired; petioles up to 2 cm long. Capitulescences terminal, loosely paniculate. Capitula campanulate, 10–12 mm long, pedunculate. Receptacle convex, glabrous. Involucre subglobular, in 4–5 series, ca. 7 mm long. Phyllaries imbricate, green with purple apex, outer surface arachnoid; the outer and the middle ones ovate or elliptic, apex obtuse; the inner ones broadly oblong, apex obtuse. Florets ca. 55; corollas funnelform, white or purple, puberulous without glands. Achenes subterete, ca. 4 mm long, 10-ribbed, aculeate between ribs. Pappus in 2 series of bristles, the inner ones ca. 7 mm long, persistent.

**Distribution.** Thailand: Lampang, Kanchanaburi. Myanmar.

**Specimens examined.** Thailand, Kanchanaburi, Sai Yok national park, 14°22.29’N, 98°51.07’E, 4 Dec 1961, *K. Larsen* 8492 (K); Lampang, Jae Son national park, 4 Nov 1996, *J.F. Maxwell* 96-1490 (BKF).

**Diagnostic characters.** *Okia birmanica* is distinguished by its long and slender pedicel in a loose panicle, phyllaries mostly obtuse with thickened tips, and cup-shaped involucre.

**Ecology.** Under dense canopy on the top of limestone mountain, alt. 650–1000 m; flowering September to December.

**Vernacular name.** Tum Doi (ตุ้มดอย).
Okia pseudobirmanica (H.Koyama) Bunwong, Chantar. & S.C.Keeley, comb. nov.
urn:lsid:ipni.org:names:77138475-1
http://species-id.net/wiki/Okia_pseudobirmanica


Type. Thailand, Tak, Khao Pha War, T. Shimizu, H. Toyokuni, H. Koyama, T. Yahara & T. Santisuk T-18505-bis (holotype: KYO!). Fig. 10B.

Description. Perennial herbs, 20–40 cm tall. Stems erect, conspicuously ribbed, puberulous. Leaves cauline, 3–12 by 1–3 cm, elliptic or ovate, margin serrate, apex acuminate, base attenuate, chartaceous; upper surface glabrate or scabrous; lower surface glabrate or pubescent; lateral veins 7–12-paired; petioles up to 1 cm long. Capitulescences terminal, loosely corymbose. Capitula broadly campanulate, 5–6 mm long, pedunculate. Receptacle glabrous. Involucres broadly campanulate, in 4–5 series, ca. 5 mm long. Phyllaries imbricate, green, margin piliferous, outer surface nearly glabrous; the outer and the middle ones linear-oblong, apex acute; the inner ones ovate-lanceolate to oblong, apex obtuse. Florets ca. 20; corollas funnelform, purple, glabrous. Achenes fusiform, ca. 3 mm long, 10-ribbed, glabrous. Pappus in 2 series of bristles, the inner ones ca. 5 mm long.


Diagnostic characters. Okia pseudobirmanica differs from O. birmanica by its smaller capitula.

Ecology. Rare on limestone, alt. 700–900 m; flowering November to December.

Vernacular name. Tum Doi (ตุ้มดอย).

urn:lsid:ipni.org:names:10701-1:1.1
http://species-id.net/wiki/Pseudelephantopus

Type. Pseudelephantopus spicatus (Aubl.) C.F. Baker.

Description. Perennial herbs. Stems erect, surface pilose-villose. Leaves simple, alternate or in rosette, sessile or petiolate; lamina obovate, oblanceolate, puberulous glandular; margin crenate, slightly serrate, dentate to entire; apex acute or obtuse, base cuneate to attenuate, chartaceous. Capitulescences terminal and axillary, spicate. Capitula discoid, tubular, clusters supported by foliaceous bracts, homogamous, florets bisexual and fertile. Phyllaries 8, in 2 series, decussate, persistent, oblong, outer surface puberulous. Florets 4; corollas white, glabrous, lobes 5, zygomorphic. Anthers
5, syngenesious, apical appendages acute, anther bases not calcarate. Styles white, 2-branched, inner surface covered with stigmatic papillae, outer surface covered with sweeping hairs reaching to below style bifurcation. Achenes usually clavate, 10-ribbed,
pubescent, carpopodium present. Pappus with 2 unequal contorted bristles. Pollen lophate, 3-porate, without micropuncta.

One species is recognized in Thailand.

urn:lsid:ipni.org:names:60438009-2:1.1.2.1
http://species-id.net/wiki/Pseudelephantopus_spicatus


**Type.** not ascertained. Figs 8E–F.

**Description.** Perennial herbs, 10–40 cm tall. Stems erect, inconspicuously ribbed, puberulous. Leaves simple, rosulate or alternate at base, 5–15 by 1.5–5 cm, obovate or oblanceolate, margin slightly serrate to entire, apex obtuse or rounded, base cuneate or attenuate, subcoriaceous; upper surface puberulous without glands, lower surface puberulous with filiform hairs and capitate glands; lateral veins 9–15-paired; petioles up to 2 cm long. Capitulescences terminal and axillary, capitula 1-4 aggregated in clusters supported by foliaceous bracts, clusters arranged in a spike. Capitula tubular, 14–17 mm long. Receptacle flat, 1–1.5 mm in diam., glabrous. Florets bisexual and fertile. Involucres oblong, in 2 series, 10–11 mm long. Phyllaries 8, decussate, light green, margin entire or piliferous, outer surface pilose without glands; the outer lanceolate, apicies acute; the inner ones obovate-lanceolate or oblong, apices acute. Florets 4; corollas salverform, white, zygomorphic, glabrous; corolla tubes 5–9 mm long; corolla lobes 2.5–2.8 mm long. Anthers 1.5–2 mm long, apical appendage acute, base acute. Styles white, 5–9 mm long, branches ca. 2 mm long, inner surface covered with stigmatic papillae. Achenes clavate, 4–5 mm long, pubescent with densely twin hairs, without glands, 10-ribbed. Pappus in 1 series, often of 2 sizes and bent at the tip, bristles 6–9, 2–6 mm long.

**Distribution.** Thailand: Chiang Rai, Nakhon Phanom, Ubon Ratchathani. Tropics.


**Diagnostic characters.** *Pseudelephantopus spicatus* is distinguished from *Elephantopus* by having spicate capitulescences and contorted pappus.

**Ecology.** Open areas in dipterocarp forest or river bank, alt. 100–400 m; flowering October to December.

**Vernacular name.** Doo La Doo (โด่ลาโด่), Ton Tai Din (ต้นใต้ดิน).
**Pulicarioidea** Bunwong, Chantar. & S.C.Keeley, gen. nov.
urn:lsid:ipni.org:names:77138472-1
http://species-id.net/wiki/Pulicarioidea


**Description.** Perennial herbs. Stems erect, conspicuously ribbed, villose. Leaves oblong or oblanceolate, margin subentire, apex acute or truncate, base cuneate, subcoriaceous; petioles sessile. Capitulaces terminal, solitary or few. Capitula hemispherical, pedunculate. Receptacle glabrous. Involucres hemispherical, phyllaries imbricate, green with purple apically. Florets ca. 70; corollas narrowly funnelliform, purple, pubescent with hairs and glands. Anthers with apical appendage acute, base acute. Styles purple. Achenes subterete or oblong, 3–5 ribbed, pubescent with dense twin hairs without glands, carpopodium present. Pappus in 2 series of bristles, persistent, the outer ones are shorter than the inner ones. Pollen lophate, without micropuncta.

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**Pulicarioidea annamica** (Gagnep.) Bunwong, Chantar. & S.C.Keeley, comb. nov.
urn:lsid:ipni.org:names:77138476-1
http://species-id.net/wiki/Pulicarioidea_annamica

*Vernonia pulicarioides* Gagnep., Fl. Indo-Chine 3: 482. 1924.

**Type.** Vietnam, Annam, Da Lat plateau, Langbian mountain, *A. Chevalier* 30672 (P!, lectotype designated here). Fig. 10C.

**Description.** Perennial herbs, 20–40 cm tall. Stems erect, conspicuously ribbed, villose. Leaves 5–10 cm by 1.5–2 cm, oblong or oblanceolate, margin subentire, apex acute or truncate, base cuneate, subcoriaceous; upper surface scabrous without glands; lower surface scabrous with whip-shaped hairs and capitulate glands; lateral veins 4–8-paired; petioles sessile. Capitulaces terminal, solitary or few. Capitula hemispherical, 10–15 mm long, pedunculate. Receptacle glabrous. Involucres hemispherical, in 5–6 series, 10–15 mm long, 10–15 mm in diam., phyllaries imbricate, green with purple apically, margin piliferous, outer surface sericeous without glands; the outer and the middle ones lanceolate, apex acuminate; the inner ones lanceolate, apex acuminate or aristate. Florets ca. 70; corollas narrowly funnelliform, purple, pubescent with hairs and glands; corolla tubes 6–7 mm long; corolla lobes 2–2.5 mm long. Anthers 3.5–4 mm long, apical appendage acute, base acute. Styles purple, 6–6.5 mm long, branches 2–2.5 mm long. Achenes subterete or oblong, 2–2.5 mm long, 3–5 ribbed, pubescent with dense twin hairs without glands, carpopodium present. Pappus in 2 series of bristles, persistent, the outer ones shorter than the inner ones, the inner ones 8–9 mm long. Pollen lophate, without micropuncta.

**Distribution.** Thailand: Mae Hong Son, Chiang Mai. Myanmar, Laos, Vietnam.
Specimens examined. Thailand, Chiang Mai, Doi Sutep Pui national park, 18°48.39’N, 98°54.90’E, 20 Oct 1999, P. Suk sphathan 1932 (QBG); Laos, M. Poilane 2038 (P); Laos, 4 Feb 1932, M. Poilane 20073 (P); Vietnam, Annam, Da Lat plateau, Langbian mountain, 10 Feb 1914, A. Chevalier 30672 (P); Langbian mountain, 15 Feb 1914, A. Chevalier 30847 (P); Langbian mountain, Eberhardt 1747 (P); Langbian mountain, 27 Oct 1920, E. Evrard 406 (E, P); Langbian mountain, 19 Jan 1924, E. Evrard 1057 (P); Langbian mountain, E. Evrard 1446 (P); Langbian mountain, 20 Feb 1952, Schmid 1237 (P).

Diagnostic characters. This species is distinguished by having hemispherical capitula, sericeous phyllaries without glands, 3–5 ribed achenes, whitish flattened pappus and lophate pollen with small lacuna.

Ecology. Evergreen and pine-oak forest, alt. 780–1600 m; flowering October to February.

Vernacular name. Pha Ya Muang Doi (พญาแม่วงดอย).

urn:lsid:ipni.org:names:11179-1:1.2.1.2
http://species-id.net/wiki/Strobocalyx


Description. Perennial plants. Stems arborescent or scandent. Leaves simple, alternate, usually petiolate, lamina elliptic or oblong, pubescent with uniseriate or flagellate hairs, margin serrate or entire, apex acute or acuminate, base cuneate, coriaceous. Capitulescences terminal or axillary. Capitula discoid, homogamous, pedunculate or sessile, florets bisexual and fertile. Involucre campanulate, in 2–4 series, 2–4 mm long. Phyllaries imbricate, hairy without glands. Corollas purple to white, actinomorphic, lobes 5. Anthers 5, syngenesious. Styles purple, 2-branched, inner surface covered with stigmatic papillae, outer surface covered with sweeping hairs on the outer surface reaching below style bifurcation. Achenes turbinate, usually 10-ribbed, ca. 2 mm long, hairy with glands, carpopodium present. Pappus in 2 series of bristles, persistent, the outer ones are shorter than the inner ones. Pollen echinate, subechinolophate or echinolophate, 3-colporate, with micropuncta.

Two species are recognized in Thailand.

Key to the species

1 Plants arborescent; capitulescences thyrsoid-paniculate; achenes 3–4-angled...
                   ..............................................................................................Strobocalyx arborea
– Plants scandent or shrubby; capitulescences corymbose; achenes 10 ribs.......
                   ..............................................................................................Strobocalyx solanifolia
**Strobocalyx arborea** (Buch.-Ham.) Sch.Bip., Jahresber. Pollichia 18: 171. 1861.
urn:lsid:ipni.org:names:251873-1:1.2.1.2
http://species-id.net/wiki/Strobocalyx_arborea

*Conyza arborea* Wall., List [Wallich] no. 2. nom. nud.

Type. Nepal, S.N. (holotype: E!). Figs 10D–E.


*Vernonia javanica* (Blume) DC., Prodr. 5: 22. 1836.
Type. Indonesia. Java, Blume s.n. (holotype: L).

**Description.** Trees, 5–20 m tall. Stems arborescent, terete, inconspicuously ribbed, branches ferruginous pubescent. Leaves 8–20 by 4–10 cm, elliptic to oblong, margin entire, apex acuminate or caudate, base cuneate or oblique, coriaceous; both surfaces puberulous with filiform hairs and capitate glands; lateral veins 10–15-paired; petioles up to 3 cm long. Capitulescences terminal or axillary, thyrsoid paniculate. Capitula narrowly campanulate, shortly pedunculate. Receptacle flat, glabrous. Involucres narrowly campanulate or slightly oblong-cylindrical, in 3–4 series, 2–3 mm long. Phyllaries imbricate, green or purple, margin piliferous, outer surface puberulous without glands; the outer ovate, apex obtuse or rounded; the inner ones ovate-lanceolate or oblong, apex obtuse. Florets 3–6; corollas funnelform, purple to white, glandular; corolla tubes 6–7 mm long; corolla lobes ca. 2 mm long. Anthers ca. 2.5 mm long, apical appendage acute, base obtuse. Styles purple. Achenes turbinate, ca. 2 mm long, 3–4-angled and inconspicuously ribbed, pubescent with twin hairs and capitate glands. Pappus in 2 series of bristles, the inner ones 6–7 mm long. Pollen subechinolophate, 3-colporate, with micropuncta.


**Diagnostic characters.** *Strobocalyx arborea* is distinguished by its large size, 3–4-angled achenes and obtuse phyllaries.

**Ecology.** Evergreen forest, alt. 50–300 m; flowering July to February.

**Vernacular name.** Ka Ton Rok (กะท้อนรอก), Ka Puam Ma Prao (กะพวมมะพร้าว), Kra Phee Kao (กระพีขาว), Ko Ta Ba Ru (โคตาบารู), Kee Aon (ขี้อ้น),
Torn Lor (ตอนเลาะ), Baa Hor (แบหอ), Smong Kung (สมองกุง), Ai Nieaw Maa (อ้ายเหนียวหมา), Ta Kuam (ตะกวม), Nuang Chang (งวงช้าง).

http://species-id.net/wiki/Strobocalyx_solanifolia


**Type:** Hong Kong: *Hinds* s.n. (holotype: K!). Fig. 10F.

**Description.** Scandent or climbing shrubs, 2–10 m tall. Stems caulescent, becoming woody with age, young branches inconspicuously ribbed, ferruginous tomentose. Leaves 8–20 by 4–10 cm, ovate or elliptic, margin serrate or entire, apex acute or acuminate, base cuneate, subcoriaceous; upper surface puberulous without glands; lower surface tomentose with filiform hairs, flagellate hairs and capitulate glands; lateral veins 5–7-paired; petioles up to 3.5 cm long. Capitulescences terminal and axillary, thyrsoid paniculate. Capitula narrowly campanulate, 8–10 mm long, pedunculate. Receptacle flat, 2–2.5 mm in diam., hairy. Involutecampanulate or slightly cylindrical, 2–3 series, 3.5–4 mm long, 3–4 mm in diam. Phyllaries imbricate, light green, margin piliferous, outer surface tomentose without glands; the outer and the middle ones ovate, apex obtuse; the inner ones obovate, apex obtuse. Florets 5–7; corollas funnelform, purple, puberulous, glands capitately; corolla tubes 4.5–6 mm long; corolla lobes 1.5–2.5 mm long. Anthers 2–2.5 mm long, apical appendage acute, base acute. Styles purple, 5–6.5 mm long, branches 2–2.5 mm long. Achenes turbinate, ca. 2 mm long, 10-ribbed, covered with sparse hairs and capitulate glands. Pappus in 2 series of bristles, the inner ones 5–6 mm long. Pollen echinate, 3-colorate, with prominent micropuncta.


**Specimens examined.** Thailand, Loei, Phu Kradung national park, 16°52.25’N, 101°50.74’E, S. Bunwong 68 (KKU); Mae Hong Son, Khun Yuan, 8 Apr 1977, B. Nimanong & S. Phusomsaeng 1813 (BKF, PSU); Lampang, Metud, 1 Mar 1925, Winit 1262 (BK, BKF, K); Phitsanulok, Thung Salang Luang, 22 Apr 1964, Pradit 846 (BK); Phetchabun, Lom Kao, 5 May 1955, T. Smitinand 2639 (BKF); Loei, Phu Kra Dung, 12 Feb 1931, A.F.G. Kerr 20129 (BK, BM, K, L); Dan Sai, 26 Mar 1965, A.F.G. Kerr 8816 (BK, BM, E, K); Phu Rue, 5 Mar 1993, P. Chantaranothai, J. Parnell, D. Middleton & D. Simpson 1079 (BKF); Chaiyaphum, Paa Hin Ngam, 22 Feb 1963, Adisai 382 (BK); Khaokiew, 23 Feb 1931, A.F.G. Kerr 20226 (BK, BM, K); Khaokiew, 6 Mar 1984, W. Nanakorn 391 (BKF); Nakhon Ratchasima; Kanchanaburi, Ban Tun, 2 Mar 1921, A.F.G. Kerr 4982 (BK, BM, K).

**Diagnostic characters.** *Strobocalyx solanifolia* is distinguished by its scandent habit, corymbose capitulescences and tomentose leaf surfaces.

**Ecology.** Hill evergreen or pine-oak forest, alt. 900–1250 m; flowering February to May.

**Vernacular name.** Cha Kua (ชะเคือ จ้าเขือ).
urn:lsid:ipni.org:names:11185-1:1.3
http://species-id.net/wiki/Struchium

Type. Struchium herbaceum J. St.-Hil.


One species is recognized in Thailand.

urn:lsid:ipni.org:names:251901-1:1.1.2.1.1.3
http://species-id.net/wiki/Struchium_sparganophorum

Ethulia struchium Sw., Prodr. 111. 1788.

Type. Jamaica (not seen). Figs 10G–H.

Description. Annual, 20–50 cm tall. Stems erect, inconspicuously ribbed, puberulous. Leaves 4–12 by 2–15 cm, elliptic, pubescent, margin serrate, apex acute, base attenuate, chartaceous; both surfaces puberulous with cylindrical hairs and capitate glands; lateral veins 7–11-paired; petioles up to 12 mm long. Capitulescences axillary, solitary or clustered. Capitula hemispherical, sessile, 4–6 mm in diam. Receptacle convex, 2–2.5 mm in diam., glabrous. Involucres 3–4 series, 3–4 mm long, imbricate, hemispherical. Phyllaries light green, margin piliferous, outer surface puberulous without glands; the outer ovate to lanceolate, apex acute to acuminate; the inner ones obovate-lanceolate, apex acuminate. Florets 50–70; corollas funnelform, white, glandular; corolla tubes 1–1.5 mm long; corolla lobes 3–4, 0.5–1 mm long. Anthers ca. 1 mm long, apical appendage acute, base acute. Styles purple, ca. 2 mm long, branches 1–1.5 mm long, inner surface covered with stigmatic papillae. Achenes turbinate, 3–4-angular, 1–1.5 mm long, 3–5-ribbed, glandular. Pappus of 3–4 parts, coroniform, ca. 1 mm long, whitish.


Diagnostic characters. Distinct characters of Struchium sparganophorum are the sessile capitula in axillary head, achenes with coroniform pappus, and florets with 3–4 corolla lobes.

Ecology. Open sandy grassland or secondary evergreen forest, alt. 50–400 m; flowering August to April.

Vernacular name. Muk Din (มุกดิน).

urn:lsid:ipni.org:names:77094699-1:1.1
http://species-id.net/wiki/Tarlmounia

Type. Vernonia elliptica DC. in Wight, Contrib. Bot. Ind. 5. 1834.

Description. Perennial plants. Stems scandent, young branches terete, white, sericeous. Leaves simple, alternate, petiolate, sericeous with horn-shaped hairs, lamina elliptic, margin entire or serrate, apex acute rounded, base rounded, subcoriaceous. Capitulescences terminal or axillary. Capitula discoid, homogamous, pedunculate, florets bisexual and fertile. Involucres imbricate, in 3–4 series, 3–4 mm long, glandular without hairs. Corollas purple to white, actinomorphic, corolla lobes 5. Anthers 5, syngenesious. Styles 2-branched, inner surface covered with stigmatic papillae, outer surface covered with sweeping hairs on the outer surface reaching below style bifurcation. Achenes turbinate, 4–7-ribbed, ca. 2 mm long, glandular without hair, carpodium present. Pappus in 2 series of bristles, persistent, the outer ones are shorter than the inner ones. Pollen echinate, 3-colporate, with micropuncta.

One species is recognized in Thailand.

urn:lsid:ipni.org:names:77094700-1:1.1
http://species-id.net/wiki/Tarlmounia_elliptica

Vernonia elliptica DC. in Wight, Contrib. Bot. Ind. 5. 1834.
**Type.** India, Nilgherry, *Wight* 1377 (holotype: E!). Fig. 10I.

**Description.** Climbing shrubs or scandents. Stems caulescent, young branches inconspicuously ribbed, white sericeous. Leaves 5–12 by 3–6 cm, elliptic, margin entire or serrate, apex acute or obtuse, base rounded, subcoriaceous; upper surface puberulous without glands; lower surface sericeous with T-shaped hairs; lateral veins 7–11-paired; petioles up to 1 cm long. Capitulescences terminal and axillary, thyroid panicle. Capitula narrowly campanulate, 10–15 mm long. Receptacle convex, ca. 1 mm in diam., glabrous. Involucres narrowly campanulate or slightly oblong-cylindrical, in 3–4 series, 3–4 mm long, ca. 3 mm in diam. Phyllaries imbricate, green or purple apically, margin piliferous, outer surface arachnoid glandular; the outer and the middle ones ovate, obtuse to rounded; the inner ones obovate, apex acute or obtuse. Florets 4–5; corollas funnelform, purple or white, glandular, corolla tubes 4.5–5.5 mm long; corolla lobes 2–3 mm long. Anthers 3–3.5 mm long, apical appendage acute, base obtuse. Styles purple, 5.5–7 mm long, branches ca. 2 mm long. Achenes turbinate, ca. 2 mm long, 4–7-ribbed, covered with sparse hairs and capitate glands. Pappus in 2 series of bristles, the inner ones 5–6 mm long, persistent.

**Distribution.** Thailand: Mae Hong Son, Chiang Mai, Phitsanulok, Loei, Nong Bua Lum Phu, Udon Thani, Chaiyaphum, Mahasarakam, Nakron Ratchasima, Roi Et, Si Sa Ket, Phetchaburi, Saraburi, Phra Nakhon Si Ayutthaya, Nakhon Nayok, Nonthaburi, Bangkok, Prachin Buri, Chon Buri, Rayong, Chanthaburi, Trat, Chumphon, Surat Thani, Nakhon Si Thammarat. America, Africa, Asia.


**Diagnostic characters.** *Tarlmounia elliptica* is characterized by having appressed T-shaped hairs on leaf surfaces, scandent habits and involucre without glands.

**Ecology.** Open area in wetland or saline land, alt. 0–100 m; flowering October to May.
Vernacular name. Kiew Darn (เขี้ยวดาน), Sar Muk Lord (ซาร์หมักหลอด), Tanmon (ตานโมน), Tao Kee Tao (เท้าขี้เถ้า), Lee Kuan Yuu (ลีกวนยู), Tao Wan Lek (เทาวัลย์เหล็ก), Khud Mon (คัดมอญ), Tarlmoun (ตาลหม่น).

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References


