Heliotropium pakistanicum sp. Nov. (Boraginaceae) from Pakistan

ABSTRACT - Heliotropium pakistanicum Shaheen sp. nov., has been described as new species to science. This taxon has been collected from Thal Desert, Punjab province, Pakistan. This species is closely associated with H. cabulicum Bunge. However, it differs from H. cabulicum in its leaf shape, inflorescence and glabrous corolla tube and bulbose base hairs. Taxonomic details of Heliotropium pakistanicum have been provided in this article.

Keywords: pakistani flora weed, Punjab, Thal Desert.

INTRODUCTION

Boraginaceae (Synonym: Lennoaceae, Hydrophyllaceae) family comprises about 135 genera and 2,600 species mostly distributed in tropical, subtropical and temperate regions of the world (Retief and Van Wyk, 2008). This family is characterized by a scorpioid cymose inflorescence (Buys and Hilger, 2003), a gynobasic style, and a two-parted ovary that breaks into four nutlets. This circumscription is equivalent to, and has in the past been referred to as, Boraginaceae s.s. or Boraginoideae (Small, 1903; Diane et al. 2002; Weigend et al. 2010). This broader circumscription has included four taxa treated as either subfamilies (Boraginoideae, Cordioideae, Ehretioideae, and Heliotropioideae) or families that are characterized by a scorpioid cyme and two-parted gynoecium (style position and fruit type vary) (Lawrence, 1937; Cronquist, 1981; Al-Shehbaz, 1991; Takhtadzhian, 1997).

From Pakistan, 32 genera and 135 species are so far identified for Boraginaceae family. Heliotropium (add authority) is a large and complex genus with about 270-300 species occurring in temperate and tropical regions of both the hemispheres in the world (Ali and Nasir 1989; Nasir, 1989; Forther, 1998). Heliotropium is known as the largest genus of the family for the Flora of Pakistan (Ali and Nasir, 1989). General characteristics of genus Heliotropium are annual or perennial, prostrate to erect herbs or undershrubs with usually vinous to...
scabrid indumentum, rarely glabrous. Leaves alternate, entire. Inflorescence usually of terminal or axillary scorpid cyme. Flowers small, white, bracteate or not. Calyx usually 5-partite into linear or lanceolate lobes, persistent. Corolla 5-lobed, tubular to infundibuliform, hairy on the outside and sometimes variably so within; lobes ± erect or inflexed, obtuse to linear, with dentations or lobed between them or not. Stamens 5, free, included and attached to the corolla tube; anthers elongated, subsessile, sometimes apiculate. Ovary 4-locular or incompletely 2-locular. Style erect. Stigma ± conical or elongated. Stigmatic disc usury present. Fruit comprising 2-4 nutlets.

In this paper, a new species *Heliotropium pakistanicum* Shaheen has been described for science from the Thal Desert, Punjab Province of Pakistan. It was collected in 2010-2015 during undertaking floristic surveys the area in question and this appears to be the first new species.

**MATERIALS AND METHODS**

The Thal Desert was explored for the floristic enumeration during 2010-2015 for collecting plant species. The collected specimens were pressed, dried and mounted on standard herbarium sheets along with liquid collection in Copenhagen mixture (Moore, 2010). Both the dried and liquid specimens were properly examined by using stereoscope (WILD M5) with a camera lucida attachment. Using the relevant characteristics, each specimen was identified with the Flora of Pakistan (Boraginaceae) and other relevant floras (add references other flora you have consulted).

**RESULTS AND DISCUSSION**

**Key to species**

This is key of only those species, which were collected and identified from Thal Desert:

1a. Calyx shallowly 5-lobed, completely enclosing the fruit ................................................................. *H. supinum*
1b. Calyx 5-partite; not completely enclosing the fruit: ................................................................. 2a
2a. Plants glabrous ...................................................................................................................................... *H. curassavicum*
2b. Plants vinous to scabrid: ....................................................................................................................... *H. ophioglossum*
3a. Stigmas 2, linear-recurved, exserted ........................................................................................................ *H. rariflorum*
3b. Stigma solitary, minutely 2-fid or capitate, included. ................................................................................ 4a
4a. Stigma capitate, entire ............................................................................................................................ *H. ophioglossum*
4b. Stigma conical, entire or not: ................................................................................................................. 5a
5a. Flowers bracteates: ..................................................................................................................................... *H. zeylanicum*
5b. Flowers ebracteate: ............................................................................................................................... *H. subulatum*
6a. Effect semi-shrubby herbs; leaves linear, 25-50 mm long ................................................................. *H. zeylanicum*
6b. Prostrate to decumbent herbs; leaves linear lanceolate to elliptic: .................................................. 7a
7a. Inflorescence compact, 20-40 mm long; leaves lanceolate to elliptic; flowers sessile ............... *H. marifolium*
7b. Inflorescence lax, 20-100 mm long; leaves linear-lanceolate ............................................................ *H. strigosum*
8a. Corolla lobes caudate-acuminate ........................................................................................................... *H. subulatum*
8b. Corolla lobes obtuse to ovate or caudate: ............................................................................................ 9a
9a. Corolla hairy within: .................................................................................................................................. *H. baluchistanicum*
9b. Corolla glabrous within: ........................................................................................................................ 11a
10a. Hairs within corolla in two distinct zones. .......................................................................................... *H. baluchistanicum*
10b. Hairs not present in zones: .................................................................................................................. 9b
11a. Corolla 4-8 mm long: .......................................................................................................................... 12b
12a. Corolla lobes linear, inflexed. Stigma 1.5-1.8 mm long ................................................................. *H. gillianum*
12b. Corolla lobes ± ovate, obtuse. Stigma 0.7-0.8 mm long: ................................................................. 11b
11b. Corolla 2-3 mm long: .......................................................................................................................... 13a
13a. Hairs-arising from a swollen base: ..................................................................................................... 14a
14a. Leaves ovate-lanceolate to lanceolate, margin entire to ± undulate; inflorescence up to 9 flowered; corolla uniformly hairy within ................................................................. *H. cabulicum*
14b. Leaves lanceolate, margin deeply undulate; inflorescence up to 15-flowered; corolla glabrous within... *H. pakistanicum*
Heliotropium pakistanicum Shaheen sp. nov. (Figure 1)

Perennial semi-erect herb about 60 cm tall. Stem much branched at the base, woody below, herbaceous above, circular, green, densely villous; internodes ca. 1.5-2.5 cm. Leaves alternate, spirally arranged, succulent, ca. 1.3 x 0.3-0.5 cm, linear-lanceolate or oblong; apex broadly acute; base cuneate, margin dentate-undulate; midrib prominent, diffusely strigose; hairs 1-celled,
bulbose based, 1mm long; petiole 1 mm, densely strigose. Inflorescence ca. 0.5-2.5 cm long, forked, 6-15 flowered; peduncle ca.0.5-1.5 cm, circular, green, villous. Flowers sessile, complete, campanulate, creamy. Sepals ca. 4 x 3 mm, green, persistent; lobes 5, elliptic; apex obtuse; margin entire, densely villous. Petals lobes 5, yellow, ovate-oblong; apex obtuse; margin undulate, ca. 1-1.5 mm long, abaxially sparsely hairy; tube ca. 3 mm. Stamens 5, epipetalous, ca. 3 mm; anthers elliptic-lanceolate, base rounded, apex subacute; filaments small. Ovary globose, ca. 1 mm across; style filiform, ca. 2 mm; stigma 4-fid, conical, glabrous. Nutlets 4, whitish grey, hairy, depression on the inner side, ca. 3 mm across.

**Etymology:** Pakistan: Punjab, Thal Desert

**Holotype:** Pakistan, Punjab, Thal desert, 03-04-2010, Humaira Shaheen, Collector No (1886-PMAS-AAUR)

**Other specimen examined:** Pakistan, Punjab, Thal desert, 31-03-2013, Humaira Shaheen, Collector No (2605-PMAS-AAUR); Pakistan, Punjab, Thal desert, 16-08-2014, Humaira Shaheen, Collector No (3319-PMAS-AAUR); Pakistan, Punjab, Thal desert, 02-04-2015, Humaira Shaheen, Collector No (4309-PMAS-AAUR).

**Flowering Period:** April.

**Collector Name:** Humaira Shaheen

**Distribution:** Currently endemic to Thal desert, Punjab Pakistan.

**Resemblance with other species (Affinities)**

*Heliotropium pakistanicum* Shaheen sp. nov., has been described as new species to science. The species is closely associated with *H. cabulicum* Bunge as close sympatric relative which occurs in Baluchistan, Pakistan. It differs from *H. cabulicum* in its leaf shape, inflorescence and glabrous within the corolla tube, however resembles it in bulbose base hairs. This species is widely distributed in Thal Desert (Punjab). This species differs from *H. cabulicum* in floral as well as vegetative characters. This is a perennial, semi-erect herb up to 60 cm tall. Leaves distinctly lanceolate, deeply undulate, villous. Anthers elliptic, apex subacute, 3 mm across. Ovary globose, style filiform, ca. 2 mm. Nutlets whitish grey, hairy, depression on the inner side. (Shown in Table 1).

### Table 1 - Diagnostic characters of *Heliotropium pakistanicum*

<table>
<thead>
<tr>
<th>Plant part</th>
<th>Character</th>
<th>Illustration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Habit</td>
<td>Semi-erect</td>
<td><img src="image" alt="Illustration" /></td>
</tr>
</tbody>
</table>

To be continued ...
<table>
<thead>
<tr>
<th>Plant part</th>
<th>Character</th>
<th>Illustration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leaves shape</td>
<td>Lanceolate</td>
<td><img src="image1" alt="Image" /></td>
</tr>
<tr>
<td>Leaves margin, texture</td>
<td>Deeply undulate and Villous</td>
<td><img src="image2" alt="Image" /></td>
</tr>
<tr>
<td>Inflorescence</td>
<td>Forked</td>
<td><img src="image3" alt="Image" /></td>
</tr>
<tr>
<td>Corolla</td>
<td>Glabrous inner side (bulbose base hairs)</td>
<td><img src="image4" alt="Image" /></td>
</tr>
<tr>
<td>Anthers</td>
<td>Elliptic, subacute apex</td>
<td><img src="image5" alt="Image" /></td>
</tr>
<tr>
<td>Style</td>
<td>Filiform at tip</td>
<td><img src="image6" alt="Image" /></td>
</tr>
<tr>
<td>Ovary</td>
<td>Globose</td>
<td><img src="image7" alt="Image" /></td>
</tr>
<tr>
<td>Nutlets</td>
<td>Hairy, depression on inner side</td>
<td><img src="image8" alt="Image" /></td>
</tr>
</tbody>
</table>
Heliotropium pakistanicum much resemble to Heliotropium cabulicum but have following distinguish characters (Table 2).

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Heliotropium pakistanicum</th>
<th>Heliotropium cabulicum</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Semi-erect herb about 60 cm high</td>
<td>Erect up to 40 cm</td>
</tr>
<tr>
<td>2</td>
<td>Stem densely Villous hairy</td>
<td>Stem antrosely hairy</td>
</tr>
<tr>
<td>3</td>
<td>Leaves succulent</td>
<td>Leaves not succulent</td>
</tr>
<tr>
<td>4</td>
<td>Diffusely strigose hairs at the midrib and densely strigose hairs at entire leave</td>
<td>Scabrid with short strigose Hairs on leaves</td>
</tr>
<tr>
<td>5</td>
<td>Leaves linear-lanceolate or obovate</td>
<td>Leaves ovate-lanceolate or lanceolate</td>
</tr>
<tr>
<td>6</td>
<td>Inflorescence fork shape</td>
<td>Inflorescence</td>
</tr>
<tr>
<td>7</td>
<td>Sessile flower</td>
<td>Pedicel from 2-5 mm long</td>
</tr>
<tr>
<td>8</td>
<td>6-15 flowered in each fork</td>
<td>3-9-flowered in a inflorescence</td>
</tr>
<tr>
<td>9</td>
<td>Petals lobes ovate-oblong</td>
<td>Petals lobes lanceolate</td>
</tr>
<tr>
<td>10</td>
<td>Style filiform</td>
<td>Style multifurcated</td>
</tr>
<tr>
<td>11</td>
<td>Ovary ovate</td>
<td>Ovary compressed</td>
</tr>
<tr>
<td>12</td>
<td>Nutlets whitish grey, depression on the inner side</td>
<td>Nutlets glabrous, dark brown</td>
</tr>
</tbody>
</table>

This species is common in plan sandy area of Thal Desert (Punjab). This plant is not reported before any area of the world we reviewed different literature such as Flora of China, Flora of Pakistan, Flora of America etc. This description is also verified by different taxonomist in Pakistan and USA (University of California Davis).

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REFERENCES


