

## The Valley of Flowers – A newly declared World Heritage Site

The Valley of Flowers (VOF), a most spectacular flowering bonanza from the depths of the earth to the tops of the Himalaya (Figure 1), is included in the list of eight World Heritage Sites by UNESCO on the recommendations of the Government of India and the World Conservation Union (IUCN) with effect from 14 July 2005.

VOF is situated in the Uttarakhand state, about 500 km northeast of Delhi, between 30°41'–30°48'N and 9°33'–79°46'E. Earlier in 1982, the VOF was notified as a National Park in order to conserve a representative area of alpine meadows in the high altitudes (ranges from 3200 to 6675 m) of the Himalaya. Such a variation in altitude provides a great diversity of landscape and microhabitats<sup>1</sup>. VOF is nestled in various

snowy mountain peaks such as Gauri Parvat (6590 m) and Rataban (6126 m) in the east, Kunt Khal (4430 m) in the west, Sapsring (ca 5038 m) in the south and Nilgiri Parvat (6479 m) in the north.

The mountain system of VOF can best be regarded as a series of spurs all around the valley. There are many rivulets that cut across the valley and meet river Pushpawati, which originates from the left of the Tipra glacier near Bhyundar Khal, flows down through the VOF, and joins Lakshman Ganga at Ghangaria. Onwards from Ghangaria, this river is called Bhyundar, and drains into Alaknanda, a tributary of Ganga at Govindghat, about 12 km downstream. The valley portion of the park runs in an east-west direction, along the banks of the Pushpawati. The most picturesque and

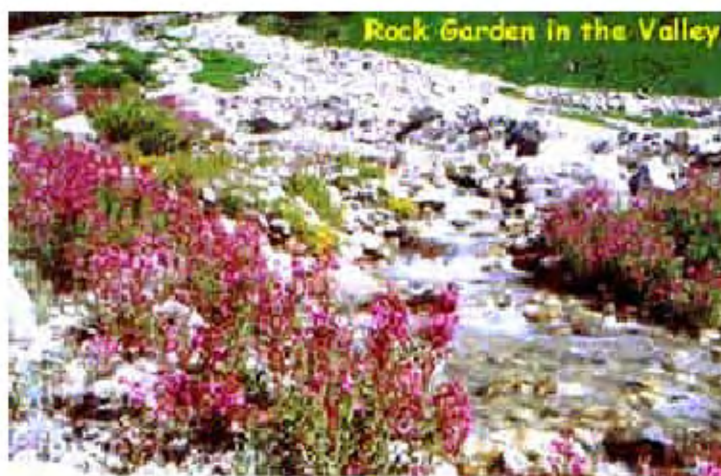
species-rich meadows are located on the south-facing slopes of the VOF. The central valley is about 10 km<sup>2</sup> in area. The elevated flanks of the central valley exhibit a high degree of folds, creating passages for the movement of glacial melt from the mountaintop to the Pushpawati at the base. The elevation of the central valley, which obtains a rich flowering diversity, is approximately 3500 m above mean sea level.

VOF has a highly heterogeneous landscape, ranging from low-lying flat and gentle slopes, to steep slopes, unstable glacial moraines, stream banks, forest-meadow edges and snow-bound areas. Such a geomorphological heterogeneity has resulted in a rich diversity of flowering plants, which attracts a number of botanists and tourists across the world. There are reports on collection of plant species from the VOF during 1846–49 by R. Strachey and J. E. Winterbottom<sup>1</sup>, yet first of all, Smythe<sup>2</sup> is well-known to report 262 plant species from the VOF, which are distributed over 150 genera and 45 families. In 1957, Ghildiyal<sup>3</sup> mentioned in his botanical trip about 96 plant species found in the VOF.

During my long studies in the VOF from 1993 onwards, I recorded a total of 520 species of vascular plants (Angiosperms, Gymnosperms and Pteridophytes). These species belong to 72 families and 248 gen-



**Figure 1.** *Epilobium latifolium* and snowy peaks of Rataban in the Valley of Flowers. Photo: Chandra Prakash Kala.



**Figure 2.** Rock garden in the valley. Photo: Chandra Prakash Kala.



**Figure 3.** *Primula macrophylla* in the Valley of Flowers. Photo: Chandra Prakash Kala.

era<sup>4</sup>. Of 520 species, 498 belong to angiosperms or flowering plants (61 families and 234 genera), 18 pteridophytes or fern species and 4 gymnosperms or conifers. The VOF harbours 472 species of herbs, 41 species of shrubs and 8 species of trees. Asteraceae is the most dominant family (29 genera, 60 species) in the VOF, followed by Rosaceae (13 genera, 33 species), Ranunculaceae (13 genera, 33 species) and Orchidaceae (15 genera, 24 species). Gymnosperms have three families, viz. Cupressaceae, Pinaceae, and Taxaceae. I have also recorded 60 new species for the first time from the VOF, of which 4 species, viz. *Saussurea atkinsonii*, *Duthiea bromoides*, *Lycopodium selago*, and *Salix calyculata* have been recorded from Uttaranchal Himalaya<sup>5</sup>. Of the 520 species of vascular plants in the VOF, 16 species are endemic to Indian Himalaya and 31 species are of rare and endangered

categories<sup>4</sup>. Of the 7 major protected areas across the Indian Himalaya, the VOF possesses highest number of threatened medicinal plant species<sup>6</sup>.

To assess VOF as a World Heritage Site, three major criteria were taken into account by the IUCN to place before the World Heritage Committee. These criteria were: (i) exceptional natural beauty, (ii) population of rare, endangered and high altitude flora and fauna, and (iii) status of conservation and management. VOF fulfilled all the required conditions laid by the IUCN. I was one of the independent reviewers and evaluators as nominated by the IUCN to assess the VOF. Fortunately, I had collected sufficient data on all these aspects; apart from this, I have a website on the VOF <http://www.geocities.com/cpkala> and 2 dozens of publications exclusively on the various aspects of the VOF that helped in strengthening the VOF nomination.

1. Kala, C. P., *The Valley of Flowers: Myth and Reality*, International Book Distributors, Dehradun, 2004.
2. Smythe, F. S., *The Valley of Flowers*, Natraj Publishers, 1938.
3. Ghildiyal, B. N., *J. Bombay Nat. Hist. Soc.*, 1957, **54**, 365–368.
4. Kala, C. P., *Int. J. Biodiversity Sci. Manage.*, 2005, **1**, 25–32.
5. Kala, C. P., Ph D thesis, Forest Research Institute, Dehradun, 1998.
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## Antidiabetic effect of *Annona squamosa* (L.)

Gupta *et al.*<sup>1</sup> state that there have been no previous publications on the antidiabetic activity of the plant *Annona squamosa*. A similar but not an identical study on the same plant, carried out in our laboratory was published as: (a) Antidiabetic activity .... diabetic rats. *J. Ethnopharmacol.*, 2004, **91**, 171–175. (b) Oral antidiabetic activity ... in NIDDM rats. *Pharm. Biol.*, 2004, **42**, 30–35.

1. Gupta, R. K., Kesari, A. N., Watal, G., Murthy, P. S., Ramesh Chandra Maithal, K. and Tandon, V., *Curr. Sci.*, 2005, **88**, 1244.

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### Response:

We started animal testing in 2000 in our laboratory for scientific explanation of leaves extract of *Annona squamosa* and applied for patent in 2002 for protecting the work. The Indian patent (Patent no. 21/DEL/2003) and international patent (Patent no. PCT/IN03/0228) were filed in 2003 by the Department of Science and Technology, New Delhi. This was published in *Chemical Abstracts* in 2004 (63-Pharmaceuticals, vol. 141, No. 7, 111536d).

Shirwaikar and coworkers published a similar but not an identical work in 2004. We were not aware of the publication, as we

communicated the manuscript to *Current Science* on 2 September 2004. I apologize for missing their work. However, there are differences in details, when we compare our work with that by Shirwaikar and coworkers. We also tried publication of our results in various journals beginning 2003 but could not publish the work.

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