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Conspectus of the genus *Veronica* Linnaeus (Plantaginaceae) in India

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Abstract

This paper deals with the enumeration of the genus *Veronica* Linnaeus (Plantaginaceae) in India, a total of 35 taxa have been recorded from India, out of which 32 species are confined to Indian Himalayan Region, while 3 species have extended distribution in the plains of Indian states. Western Himalaya is enriched with 19 species, Eastern Himalaya with 3 species, while other 13 species are common in both. Maximum diversity is observed between 2000 – 2500 m *amsl*. *Veronica* is a complex genus having 13 sub-generic taxa widely distributed chiefly in temperate and alpine zones across the world. The group is of high medicinal potential and needs taxonomic and conservation status assessment urgently.

***Key words*:** *Veronica*, Distribution, India, Indian Himalayan Region

INTRODUCTION

The genus *Veronica* Linnaeus, the largest genus of Plantaginaceae sensu APG 2003, was formerly placed in Scrophulariaceae. The genus comprises of *ca*. 500 species (Albach *et al*. 2004b) mainly distributed in temperate regions of Northern hemisphere, but some species are also present in the Southern hemisphere. It is commonly known as Speedwell and derives its name from the term Speed "Thrive". However, the generic name '*Veronica*' is attributed to name of St. Veronica since the flowers of this herb reportedly have resemblance to the stains that remained on the cloth, which was used to wipe the face of Jesus in Calvary. Taxa of the genus *Veronica* are herbs, shrubs or small trees, annual or perennial and native to a wide variety of habitats from moist meadows, dry, sunny meadows, rocky hill side to scree, grassland and woodland. *Veronica* is comparatively a very complex genus in the family, in which 13 sub-genera has been recognized (Albach *et al*. 2004a). The extreme variability in morphology, life forms and habitats has led many confusion regarding evolution and biogeography of the genus. Difficulties arise from parallel syndromes, wide spread among alpine annuals and lowland perennials. Based on phylogenetic data it is revealed that the species from European mountains have affinities to those in Himalayan region (Albach *et al*. 2004c). Several taxa of *Veronica* possess high medicinal potential and have been used in several ailments including such as stomach and intestinal diseases, renal disorders, rheumatoid arthritis and pulmonary diseases since 16th century (Pullaih 2006). For several centuries, people of different cultures have been using *Veronica* species in the form of panacea for almost all types of health problems. Traditionally, green part of these plants have been employed therapeutically to treat cough, gastrointestinal discomfort, otitis media, sinusitits, nephristic problems, skin ailments, haemorrhages and wounds. Extracts obtained from herbs of *Veronica*

are used as folk remedy worldwide for the treatment of various inflammatory ailments including rheumatism (Kuepeli *et al*. 2005; Harput *et al*. 2002), lung diseases (Hager *et al*. 1999; Craciun *et al*. 1977).

In India, *Veronica* is represented by 35 taxa including 8 infra-specific taxa, which are chiefly distributed in temperate and alpine zones of Indian Himalaya, although, very few taxa (*V. anagallis-aqautica, V. agrestis*) find their way towards lower reaches in the tropical regions (Bamber 1916; Bora & Kumar 2003; Cooke 1904; Haines 1924; Oomachan 1977; Shah 1978; Sharma & Dhakre 1995; Sharma & Kachroo 1981; Sharma & Tiagi 1976; Singh & Khanuja 2006; Singh 1986; Ugemuge 1986). These taxa have been enumerated from different regions of Himalayas from Western to Eastern in floristic inventories by several workers (Hooker 1885; Collett 1921; Hara 1966; Gupta 1968; Raizada 1978; Polunin & Stainton 1984; Aman *et al*. 2003; Naithani 1985; Das & Chanda 1987; Chaudhary 1993; Singh & Kachroo 1994; Hajra & Balodi 1995; Nair, 1977; Gaur 1999; Aswal & Mehrotra 1999; Dhaliwal & Sharma 1999; Singh & Rawat 2000; Kaur & Sharma 2004; Uniyal *et al*. 2007; Pusalkar & Singh 2012).

METHODOLOGY

The present study on the genus *Veronica* is based on general literature surveys, which was published from different states of India, especially from Himalayan regions. All the species have been enlisted alphabetically with altitude, distribution, other regions and threat categories. The species of *Veronica* are calculated and enumerated in state wise representation. For analysis of distribution pattern in Indian Himalayan Region, the study area was divided into two flanks, the Western Himalaya and the Eastern Himalaya. The Eastern Himalaya includes states of West Bengal (Darjeeling district), Sikkim, Assam, in the same way the Western Himalaya covers Himachal Pradesh (H.P.), Jammu & Kashmir (J.&K.), and Uttarakhand.

RESULT AND DISCUSSION

A total of 35 taxa of the genus *Veronica* including eight subspecies (*V. alpina* subsp. *alpina, V. alpina* subsp. *pumila, V. ciliata* subsp. *ciliata, V. ciliata* subsp. *cephaloides, V. serpyllifolia* subsp. *serpyllifolia, V. serpyllifolia* subsp. *humifusa, V. szechuanica* subsp. *szechuanica, V. szechuanica* subsp. *sikkimensis*) have been reported from India (Table 1). The genus *Veronica* has wide altitudinal distribution range and is found from 150 m *amsl* in the tropics to 5300 m *asl* in the alpine regions of the Himalaya. Although, very few taxa have been reported from the tropics and most of the taxa are inhabitants of high reaches in Western and Eastern Himalaya. Western Himalaya has great diversity of *Veronica*, as there are 19 taxa in Western Himalaya only, and 3 taxa are found in Eastern Himalaya, while 13 taxa are commonly distributed in both flanks of Indian Himalaya (Figure 1). The genus *Veronica* has wide distribution range and taxa are equally found in Europe and America continents also, besides Asian continent. The maximum concentration of the species is observed in Kashmir (68 %), out of which only one species *V. cachmerica* is endemic at global level which is found in alpine regions of Kashmir, while 3 species namely *V. alpina, V. campylopoda, V. micharxii* are endemic for India. After Jammu & Kashmir, Uttarakhand is identified as having most favorable habitat for speedwells where 65 % taxa are found distributed in temperate to alpine regions and 3 species namely *V. ciliata, V. didyma* and *V. serpyllifolia* subsp. *humifusa* are endemic to India and share their distribution with Europe, Australia, N.& S. America, Africa and other countries of the Asian continent. Further, 11 species find their way to Sikkim, out of which 3 taxa namely *V. robusta, V. schezuanica*

subsp. *schezuanica*, *V. schezuanica* subsp. *sikkimensis* are endemic to Sikkim for India, but they share their distribution with the adjacent countries like Bhutan, China, Myanmar and Nepal. Two species *V. agrestis* and *V. anagalis-aquatica* are widely distributed in the plains and are found in Uttar Pradesh, Madhya Pradesh, Maharashtra, Gujarat, Rajasthan, Bihar, Orissa, Assam, West Bengal, Jammu & Kashmir, Himachal Pradesh and Uttarakhand (Figure 2).

Table 1. Distribution of the genus *Veronica* Linnaeus in India and in other countries [*Abbreviations for Indian state names*: Guj = Gujrat; H.P. = Himachal Pradesh; J.&K. = Jammu & Kashmir; Raj = Rajasthan; MH = Maharashtra; MP = Madhya Pradesh; UK = Uttarakhand; UP = Uttar Pradesh; WB = West Bengal]

Name of taxa	Altitude (in meter)	Flowers & Fruits	Distribution in	
			India	Other Countries
V. agrestis Linnaeus	150 – 2900	May - September	UK, Raj, UP, Bihar, Orissa, J&K, HP	Europe, N. Africa
V. alpina Linnaeus, subsp. ***alpina***	2300 – 3700	July - August	J&K	Europe, N. America, Pakistan, China
V. alpina subsp. ***pumila*** (Allioni) Dostál	2100 – 3500	July - August	J&K, UK	Pakistan, Russia, Europe
V. anagallis-aquatica Linnaeus	150 – 3400	May – August	J&K, HP, Assam, Guj, WB, MH, UK, UP, Raj, Bihar, Orissa, MP	Europe, S. Africa, N. America, Pakistan, Bhutan, Nepal, China, Russia
V. arvensis Linnaeus	2000 – 2700	April – May	J&K, HP, UK	Africa, Europe, China, Japan, Korea, Taiwan
V. beccabunga Linnaeus	2100 – 4000	May - September	J&K, HP,	Pakistan, Afghanistan, Europe, N. America, Japan
V. biloba Linnaeus	2600 – 3350	April - September	J&K, UK, HP	Tibet, China, Nepal, Pakistan, Russia
V. cachemirica Gandoger	3300 – 4000	June – August	J&K	India; endemic
V. campylopoda Boisser	2100 – 3600	March – June	J&K	Baluchistan, Afghanistan, Iran, Arabia
V. cana Wallich *ex* Bentham	2500 – 3000	May - August	Sikkim, J&K, HP, UK	China, Japan, Bhutan, Nepal
V. capitata Royle *ex* Bentham	3400 – 4800	May - September	Sikkim, J&K	China, Nepal, Pakistan
V. ciliata Fischer, subsp. ***ciliata***	2700 – 4700	April – June	Sikkim	China, Tajikistan, Nepal, Pakistan, Russia
V. ciliate subsp. ***cephaloides*** (Pennell) D.Y. Hong	3000 – 4500	July - September	J&K, UK	Nepal, Bhutan
V. deltigera Wallich *ex* Bentham	2400 – 3200	May - August	UK, HP	China
V. hederifolia Linnaeus	1500 – 2500	June - August	J&K, Sikkim	N. America
V. himalensis D. Don	3000 – 4000	June – August	UK, Sikkim	Burma, Tibet, Nepal, China
V. javanica Blume	1000 – 2100	June – July	HP, Sikkim, UK, W**B**	Bhutan, Indonesia, China , Japan, Africa, Malaysia, S. America

Name of taxa	Altitude (in meter)	Flowers & Fruits	Distribution in	
			India	Other Countries
V. lanosa Royle *ex* Bentham	2400 – 3600	June – August	J&K, HP, UK, Sikkim	Afghanistan, Pakistan, Nepal
V. lanuginosa Bentham *ex* Hooker *f.*	4500 – 5200	June - August	UK, J&K, Sikkim	Nepal, Tibet, China, Afganistan, Pakistan
V. laxa Bentham	2100 – 3400	May - August	J&K, HP, UK	Tibet, China, Japan, Nepal, Pakistan
V. macrostemon Bunge	4800 – 5000	July - August	J&K, UK	Afghanistan
V. michauxii Lamarck	1800 – 2500	July - August	J&K	Baltistan
V. micrantha Hoffman & Link	2100 – 3400	May - August	J&K, UK	Pakistan, Nepal, Tibet, Japan, China
V. persica Poiret	2000 – 3650	March – July	J&K, HP, UK	Europe, N. Africa, N. America & S. America, Pakistan, Nepal
V. polita Fries	500 – 2000	March – August	J&K, UK	N. Africa, Norway, S & N. Europe, England, Tajikistan, Uzbekistan
V. punctata Buchanan-Hamilton *ex* D. Don	4200 – 5300	May - August	J&K, Bihar, Orissa	Bhutan, Tibet, Europe, N. & S. Africa, N. America
V. robusta (Prain) T. Yamazaki	2100 – 3000	May - August	Sikkim	Nepal
V. salina Schur	2100 – 4000	May - August	J&K, Assam, UK	Bhutan, Europe, N. & E. Africa, N. America
V. serpyllifolia Linnaeus, subsp. ***serpyllifolia***	2400 – 4000	May - August	J&K, UK, HP, WB	Afghanistan, Europe, Australia, China, Japan, Africa, N. & S. America
V. serpyllifolia subsp. ***humifusa*** (Dickson *ex* Withering) Vahl	2100 – 4000	May – August	UK	Europe, Australia, N. & S. America, China, Japan, Russia
V. stewartii Pennell	1200 – 2000	March – May	J&K, UK	Pakistan
V. szechuanica Batalin, subsp. ***szechuanica***	1600 – 4400	June – July	Sikkim	Bhutan, Nepal, China, Myanmar
V. szechuanica subsp. ***sikkimensis*** (Hooker *f.*) D.Y. Hong	1500 – 2900	March – August	Sikkim	Bhutan, China
V. undulata Wallich	1500 – 3000	March – May	J&K, UK	China, Bhutan, Japan, Afghanistan, Thailand, Taiwan, Vietnam, Korea, Nepal
V. verna Linnaeus	1500 – 2500	April – June	J&K, HP	Europe, Pakistan, Russia, Afghanistan

The distribution of *Veronica* in relation to altitude is depicted in Figure 3, as evident most of the taxa are found in temperate zones of the Himalaya and the altitudinal range from 2000 – 3000 m. *asl* seems to be most suitable habitats for the genus *Veronica* as maximum taxa of *Veronica* are found between 2000 – 3000 m *asl*. Few taxa like *V. lanuginosa*, *V. macrostemon* and *V. punctata* are present at 4500 – 5500 m *asl* and forms the group of high altitude flowering plants. Few species such as *V. cana*, *V. didyma* and *V. macrostemon* have very narrow range of altitudinal distribution and prefers a specific micro-habitat, while

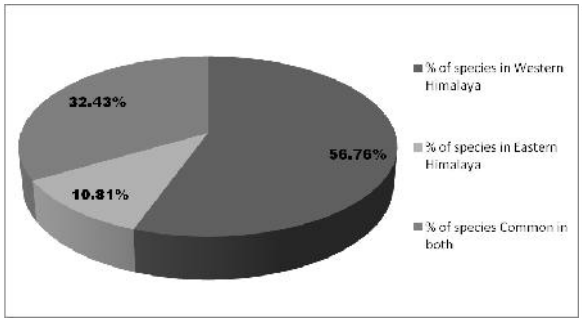

Figure 1. Distribution of infrageneric taxa of *Veronica* Linnaeus in Indian Himalayan region

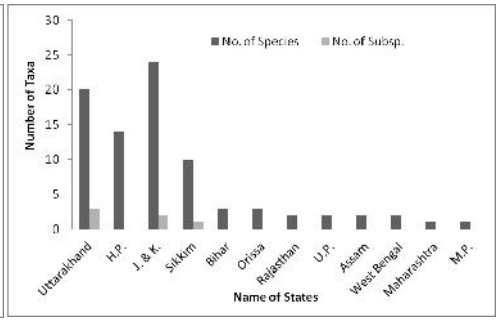

Figure 2. Distribution of infrageneric taxa of *Veronica* Linnaeus in India

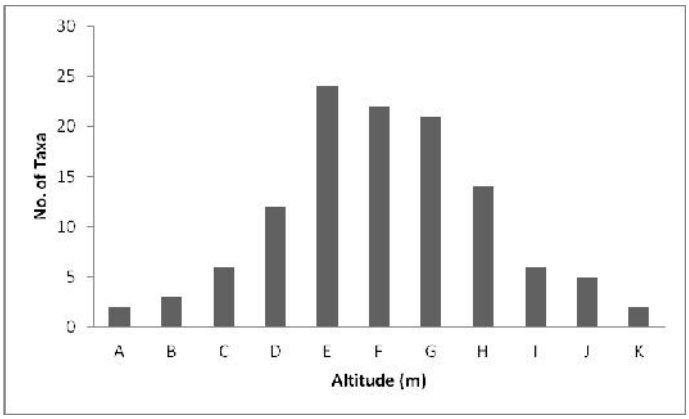

Figure 3. Altitudinal distribution of the taxa of *Veronica* Linnaeus in India

A	B	C	D	E	F	G	H	I	J	K
0-500	500-1000	1000-1500	1500-2000	2000-2500	2500-3000	3000-3500	3500-4000	4000-4500	4500-5000	5000-5500

other taxa such as *V. agrestis*, *V. anagalis-aquatica*, *V. buccabunga*, *P. polita*, *V. serpyllifolia* subsp. *humifusa* have long altitudinal range of distributional and covers various altitudinal gradients. Among the taxa *V. anagalis-aquatica* is distributed from 150 m *asl* in tropical region to 3400 m *asl* in the cold desert of Lahaul-Spiti in H.P. Globally, *ca* 500 species of *Veronica* are widely distributed in tropical to alpine regions of Asia, Africa, S. & N. America, Australia and Europe. In the context of Asian continent, maximum diversity of *Veronica* (53 sp.) is found in China, of which 18 species are endemic to the region, while in Bhutan, Nepal and Pakistan the diversity of *Veronica* is low. The species of *Veronica* exhibit significant diversity in habitat and attain a broad range of altitude from 150 m to 5500 m *asl*. Although, temperate to sub-alpine zone provide the most suitable habitat for the survival and multiplication of *Veronica* species, every altitudinal rise in the Himalayas generates different conditions, supporting unique and isolated ecosystems with maximum plant diversity (Mountain partnership, 2008). Different taxa of *Veronica* are widely distributed and are found equally across several continents and endemism is poor in the group. The genus is a big complex and is being divided into sub-generic groups, but most of the species are clear cut without any infra-specific taxa. The different and unique climatic conditions across the world are sufficient enough to bring variations in the plant species at both morphological and molecular level. Although, several studies have been carried out on the medicinal and therapeutic potential of

different taxa of the genus *Veronica* across the world, but the group lacks in-depth taxonomic studies, which are urgently needed to determine the exact number of taxa and their population status in nature.

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