Wild Useful Species of *Allium* in India – Key to Identification

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The present investigation elucidates systematic study on wild useful *Allium* species in India. It provides an artificial key primarily based on bulb and leaf morphological characters for identification of 26 species.

Key words: Artificial key, Bulb, Identification, Leaf, Vegetative characters

The genus *Allium* (family Alliaceae) is widely distributed in the temperate and alpine regions of Himalaya. Over 750 species are confined chiefly to northern temperate and alpine zones of the world (Jones and Mann, 1963; Stearn, 1992). Of about 30-35 species reported from India, majority of wild species are known to occur as semi-domesticated/ semi-protected and wild component of native flora confined to the temperate and alpine regions of India (Negi *et al.*, 1991, Sharma *et al.*, 1996). Among wild useful species *A. carolinianum, A. consanguineum, A. humile, A. prezewalskianum, A. rubellum, A. seminovii, A. stracheyi, A. victorialis* and *A. wallichii* are locally used for edible leaves, bulbs and tuberous roots (Shah and Joshi, 1970; Negi and Gaur, 1991; Chandel and Pandey, 1992; Chaurasia and Singh, 1996-2001). Indiscriminate harvest, large-scale use and commercialization of wild species from their natural habitat for edible, flavouring, ornamental and medicinal value has resulted in population decline in several wild *Allium* species (Negi and Gaur, 1991).

Wild *Allium* species exhibit significant diversity in morphological and reproductive characters. All species do not flower or produce seeds under unfavourable conditions. The vegetative propagules (bulb, rootstock, rhizomatous base, bulbils, etc.) remain persistent for longer period, survive under adverse conditions and are collected even after completion of the vegetative and reproductive phase.

Baker (1874) classified genus *Allium* into seven groups based on characters of bulb, filaments, spathe and direction of perianth-segments in the expanded flower. Hooker (1893) described wild species as the component of natural ecosystem and classified them under different sections and groups primarily based on leaf and floral morphology. Despite several valuable works published thereafter, the taxonomic confusion pertaining to classification, correct nomenclature and synonymy continued to exist and remained complicated (Baker, 1874; Hooker, 1893; Jones and Mann, 1963; Rabinowitch and Brewster, 1990; Gregory *et al.*, 1998).

While gathering wild species, the collector encounters difficulty in identification and authentication of species (Guiarino *et al.*, 1995). The germplasm identification in wild *Allium* species, primarily based on the vegetative parts is, difficult due to non-availability of characters in collected material. Lack of information on diagnostic characters, in collected material, in herbarium specimens and, in published literature, is the principal bottleneck for taxonomic studies. The present investigation elucidates systematic studies primarily based on bulb and leaf morphological characters and includes an artificial key for identification.

Materials and Methods

The bulb shape (if formed), scale characters (colour and texture) and leaf characters (flat or fistular) were regarded as important characters for identification in the present study. Data on scape (hollow or solid), flower colour, plant odour when crushed (onion or garlic type) and additional data on floristic records, published treaties, exploration and herbarium records, and field survey information have been used for further validation of species.

Studies were carried out using the material received for identification in the National Herbarium of Cultivated Plants (NHCP), for conservation in Tissue Culture and Cryopreservation Unit (TCCU), Field genebank and herbarium specimens available in NHCP, National Bureau of Plant Genetic Resources, New Delhi. The vegetative propagules were raised in the nethouse and observations on the bulb/ rhizome and leaf characters were recorded. The term bulb has been used in the key to denote true bulbs or under-developed structures formed as bulbous bases. The characters of leaf and bulb scale are recorded for a fully matured plant. An artificial key has been prepared as an aid in identification of 26 wild useful *Allium* species.

Key to wild useful species

Allium species were distinguishable on the basis of above characters. Based on the systematic work undertaken, an artificial key for identification has been developed and presented below:

1. Conspicuous rhizome/ rootstock present

2. Bulb well developed

3. Scale membranous

Lf- flat, stout, shorter than scape; Bl- solitary, oblong seated on creeping rootstock, Sc- membranous, lilac red — ***A. carolineanum***

Lf- flat, linear, keeled; Bl- larger, elongated, pear shaped, clustered on rhizomatous rootstock; Sc- thick, membranous, reddish- brown — ***A. consanguineum***

Lf- linear; Bl- solitary/clustered on short perpendicular rootstock; Sc- hyaline, membranous, dark coloured — ***A. platyspathum***

Lf- flat, narrowly linear, tip rounded; Bl- narrowly ovoid, small, clustered, seated on long neck; Sc- membranous, dark brown — ***A. stracheyi***

Lf- narrowly linear, hollow, trigonous (sharply angled); Bl- clustered on rootstock, ovoid-oblong; Sc-membranous, white-grey — ***A. chinense***

Lf- linear, fleshy; Bl- ovoid, clustered on rootstock; Sc-hard, membranous, chestnut brown — ***A. thomsonii***

3 Scale reticulate

4 Leaf fistular

Lf- fistular, round in section; Bl- clustered, cylindrical, elongated; Sc- finely reticulate, rusty brown — ***A. prezewalskianum***

4 Leaf flat

Lf- flat, narrowly linear, obtuse, stout; Bl- elongated, narrow, seated on oblique rootstock; Sc- reticulately fibrous, brown-red; bulbils present — ***A. auriculatum***

Lf- flat, narrow, minutely serrulate; Bl- clustered on rhizome, cylindrical, elongated, conical; Sc- leathery (rigid), coarsely reticulate — ***A. oreoprasum***

Lf- flat, linear; Bl- sub-cylindrical, inserted on a stout cylindrical rootstock; Sc- densely fibrous, reticulate, brown — ***A. schrenki***

2 Bulb poorly developed / not developed

5 Leaf fistular

Lf- filiform, fistular; Bl- small, ovoid, solitary, narrow, seated on narrow but distinct rhizome; Sc- membranous, red-brown — ***A. roylei***

Lf-thin, fistular, round in section; Bl-clustered, narrow, not well developed, seated on short, vertical rhizome; Sc-membranous; bulbils rarely present — ***A. schoenoprasum***

Lf-narrow, channeled; Bl-not developed, clustered, cylindrical, seated on root stock; Sc-paralleled fibre — ***A. sikkimense***

5 Leaf flat

6 Bulb scale membranous

Lf- ensiform, keeled; Bl- poorly developed, clustered on root stock, roots- thick, fibrous; Sc- torn membranous sheath — ***A. wallichii***

Lf-linear, membranous, turns reddish on drying; Bl-poorly developed on erect creeping rootstock, roots- thick, fleshy and edible; Sc-whitish-light brown, membranous — ***A. hookeri***

Lf- linear; Bl- poorly developed, elongated, clustered on rootstock; Sc-membranous, purple-pink — ***A. cernuum***

6 Bulb scale fibrous

Lf-petioled, elliptical-lanceolate, obtuse-acute; Bl-subconic-subcylindrical, clustered on oblique rootstock; Sc-reticulately fibrous — ***A. victorialis***

Lf-flat, linear; Bl-poorly developed, elongated, clustered on stout tuberous roots; Sc-fibrous — ***A. fasciculatum***

Lf-flat, obtuse, blunt tipped; Bl-cylindrical-subcylindrical; Sc-fibrous — ***A. humile***

Lf- keeled below, flat above; Bl- elongated, cylindrical seated on white fibrous root stock; Sc-reticulately fibrous, pale, grey, brown or white — ***A. tuberosum***

1 Conspicuous rhizome/ rootstock absent

7 Leaf flat, linear

8 Leaf keeled

Lf- linear, gradually acuminate, keeled; Bl- small, narrow; Sc-membranous (a beautiful species) — ***A. macranthum***

Lf-filiform, keeled from below, Bl-clustered/ solitary, ovoid-oblong, elongated, produced on longneck; Sc- finely reticulately fibrous, brown — ***A. griffithianum***

Lf- linear, keeled; Bl- well developed, ovoid-oblong, cloves as in garlic but of two sizes, bulbils on bulbs; Sc-membranous, white/ hyaline — ***A. ampeloprasum***

8 Leaf not keeled

Lf- linear-lanceolate, spear shaped; Bl:small, ovoid; Sc: membranous, grey; plant having garlic smell — ***A. loratum***

Lf- linear, oblong- lanceolate; Bl- narrow, subglosely ovoid; Sc-membranous — ***A. atropurpureum***

7 Leaf fistular

Lf- fistular, acute with long sheath; Bl- perennial, small, clustered, cylindrical, covered with old fibrous sheath; Sc- membranous, whitish purple-pink — ***A. semenovii***

(Lf- leaf; Bl- bulb; Sc- scale)

Conclusion

The collected germplasm of wild species lacks data on key identification features as characters of leaf, bulb, scape (hollow or solid) and flower. This becomes a major limitation in identification of germplasm of wild *Allium* species. The process of identification is further delayed due to the following reasons:

- While collecting the germplasm, it is not always possible for a collector to prepare an ideal herbarium specimen.
- Characters of leaf (hollow/ flat), bulbs, rhizomes, flower, plant odour etc. are generally lost or modified in collected material and herbarium specimens when it reaches the identifier.
- Germplasm collectors usually separate the bulbs from whole plant while assembling, sorting and indexing the material in the base camp.
- Generally many wild species do not produce flowers/ seed under unfavorable conditions. Lack of this data causes further difficulty in carrying out systematic work.
- Due to lack of ecological, distributional or agronomic data, authentication/ identification is difficult particularly in case of the wild/ related species.

To facilitate process of identification/ authentication, it is desirable that collector should furnish the following information:

- Special notes on passport information on perishable features of plant including bulb, leaf and scape characters.
- Accompanying data on ephemeral parts, especially flower, scale colour, etc.
- Range of variability of germplasm, even if not collected, must be mentioned in the accompanied data in order to have bird-eye view on the population.
- Photographic details of all parts (field view, fresh harvest, leaf, flowers, bulb scale colour, etc.).

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