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Research Article

Taxonomic description and annotation of *Poa albertii* Regel (Poaceae: Pooideae, Poeae, Poinae) from North Western Himalayas, India.

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Abstract: *Poa albertii* Regel, a native to Central Asia, has been described from North-Western Himalayan region and annotated to the latest system of grass classification. A detailed taxonomic description in the latest format, along with illustrations and Scanning Electron Micrograph of diagnostic features is provided to diagnose *P. albertii* Regel from allied species.

Keywords: Grasses, Poa, Himalayas, Taxonomy.

Introduction

Poa L. Salkimotu Cabi and Dogan, 2012) is the type genus of the grass family Poaceae Barnhart. The genus includes more than 550 species distributed worldwide (Gillespie and Soreng, 2005). A majority of species occur in temperate to alpine regions. Species identification in the genus is rendered difficult by the existence of polymorphism and high incidence of polyploidy, apomixis and hybridization (Stebbins, 1950; Clausen, 1961; Tzvelev, 1983; Hunziker and Stebbins, 1987; Kavousi et al., 2015). Clayton and Renvoize (1986) concluded that Poa was an extremely uniform genus for which infrageneric classification was difficult to achieve. The affinities of nearly half of the species are unknown while rest of the species has been put in informal groups (Soreng et al., 2009).

Despite difficulties mentioned in the preceding part, *Poa* has attracted the attention of several agrostologists including Bor (1970) who reported 13 species of the genus from Iran. Other reports include Cope (1982) from Pakistan (33), Chen *et al.*, (2006) from China (156), Press *et al.*, (2000) from Nepal (32), Noltie (2000) from Bhutan including some parts of Sikkim and Darjeeling (29) with the species number given in the parenthesis. More recently, Soreng and Peterson (2012), provided a revisionary account of the genus from Mexico with new reports resulting from latest delimitation of species within the genus.

Despite wide distribution in the Himalayas, taxonomic works in the genus have been marked by unusually long intermissions. Stapf (1896) studied the genus for Hooker's 'Flora of British India' followed by Duthie (1883, 1906), Bor (1941, 1960), Stewart (1945), Raizada *et al.,* (1983), Babu (1977) and Naithani (1985). Rajbhandari (1991) published a taxonomic monograph of the genus *Poa* from the Himalayan region. The author included fifty two species with a key for their identification. Recently, Nautiyal and Gaur (2017) reported 45 species (and 2 subspecies) of the genus *Poa* spp. from Uttarakhand (India) with a key based on morphological characters. Olonova, *et al* (2017) has scrutinized the dwarf species of *Poa* section *Stenopoa* of the Himalayan region and demarcated ten species of which *Poa attenuata* Trin., *Poa glauca* Vahl and *Poa. albertii* Regel were put in a closely related group within the section.

The present paper validates P. *albertii* Regel through detailed taxonomic description supported by illustrations of diagnostic parts and a key to taxonomic demarcation.

Materials and Methods

Occurrence and Type Location: The species is common in alpine grazing meadows (3000-5200 m asl.) of the north-western Himalayan region. The species was collected from Nyoma (district Leh) in the cold desert of Ladakh. The site of collection is located at 33°12'197"N to 78°39'243"E at an elevation of 4203m asl and experiences a cold temperate climate. The species was collected on July 4, 2014 (Fig. 1) during explorations of the north-western Himalayan region for diversity of grasses. Herbarium sheets of preserved specimens have been deposited in the Herbarium of the Department of Botanical & Environmental

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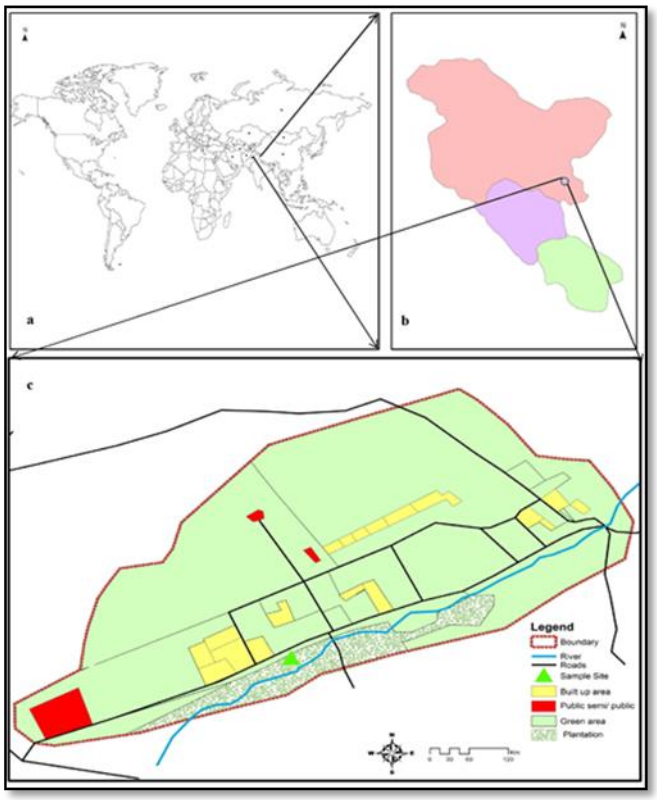

Fig. 1. a) Distribution of *Poa albertii* Regel b) North- Western Himalayan region c) Collection site of *Poa albertii* Regel.

Methodology: Stereoscopic examination of the specimens was followed by taxonomic description and identification with the help of taxonomic literature (Bor 1960) and online sources viz., e-floras of China, Pakistan, and Online Grass Flora of the world. Illustrations were prepared manually by drawing the vegetative and floral parts, tracing and inking the drawings followed by scanning with HP Scanjet G3110 scanner. Information on the distribution in temperate and tropical Asia has been included to indicate the places and areas that show a sizeable occurrence of the species (e-flora of China). Spikelet formula has been written in the format proposed by Allred and Columbus (1988) with some modifications. The spikelet diagram has been prepared in the software (Adobe Photoshop 7.0) by employing symbols improvised from time to time (Schaffner 1916, Arber 1934, Singh 1999, Subrahmanyam 2004, Craene 2010, Kumar 2014). In the diagram, lateral compression of the spikelets has been shown by drawing wedge shaped glumes followed by fertile florets indicated by horizontal solid lines and dashed lines represent reduced florets. Essential whorls have been indicated by three anthers with a unilocular ovary in the centre. A bifid style is also indicated. Surface features of caryopses were visualised and imaged through stereoscopic examination and Scanning Electron Microscopy (ZEISS-EVO LS10) operated at an accelerating voltage of 15 kv at appropriate magnifications.

Taxonomic account

Etymology: The generic name is a direct adoption of the feminine Greek noun, 'poa (πόα)= grass, fodder'. With no change of spelling, generic name ' Poa' is treated as a feminine noun even after adaption as a generic name because it has an established gender in the source language. Specific epithet is commemorative of the Swiss botanist, Albert Regel. The first name of the author has been put in the genitive case of a Latin noun employing the inflectional termination 'i' of the genitive case. As specific epithet commemorates a gentleman (not a woman), it is treated as a masculine epithet which, consequently, does not show gender accord with the feminine generic name.

Synonyms: *Poa albertii* var. *triflora* Regel Gamayunova, A. P. 1956. Poa. 1: 221–238. In Fl. Kazakstana. *Poa crymophila* Keng Tzvelev, N. N. 2001. Poa IN: Pl. Cent. Asia 4: 156–177. *Poa roshevitzii* Golosk. Filatova, N. S. 1969. Poa. 92–97. In N. S. Filatova Ill. Oprd. Rast. Kazakh. *Poa mustangensis* K.R. Rajbhandari, 1880. Act. Hort. Petrop. 7: 611. *Poa arnoldii* A. Melderis, 1978. Enum. Fl. Pl. Nepal, 1: 142. *Poa rangkulensis* Ovchinnikov &

Chukavina, lzvest. 1956. Otdel. Estestven. Nauk Akad. Nauk Tadzhik. SSR. 17: 41.

Taxonomic description: Perennial; Culm erect, 10-30 cm long. (Fig. 2a) Leaf blades 2.0-5.0 cm long, 1.0-1.5 mm wide. Ligule membranous, 1.5-2.0 mm long (Fig.2b). Inflorescence an open panicle, 4-8 cm long. Spikelets solitary, tinged with purple, 2-3 floreted, pedicelled, laterally compressed, 4.0-5.0 mm long (Fig. 2c). Disarticulation of spikelets above the glumes. Glumes unequal, (Fig.2d) lower glume lanceolate, 2.5-3.5 mm long, 1 keeled, 3 veined, apex acute (Fig. 2e). Upper glume, 3.0- 4.0 mm long, 1 keeled, 3 veined, 1.1-1.2 length of lower glume, 0.9-1.0 length of the fertile lemma (Fig.2f). Fertile lemma lanceolate, 3.0-4.5 mm long, lemma bigger than the glumes, 5 veined, keel shortly pubescent for half of its length, marginal veins for one third, other parts glabrous (Fig. 2g). Palea shorter than the lemma, keels scabrid (Fig. 2h). Lodicules 2, anthers 3, 1.2-1.5 mm long, stigmas 2. (Fig. 2i). A single fertile floret (enclosing the caryopsis) with rachilla segment and occasionally by a reduced floret as well is the dispersal unit (the diaspore). The diaspore is light yellow to purple in colour (Fig. 2 j-l). Caryopsis 1.0-1.5 mm long, reddish-brown, adherent pericarp, ovate to obovate with a slight lateral compression, hilum punctiform, stylopodium present(Fig. 2 m-n), surface reticulate with undulating striations (Fig. 2o-r). Common, in alpine grazing meadows, between 3000–5200 m elevation.

Flowering & Fruiting: June-September

Asia-Temperate: China; China North-Central, China South-Central, Inner Mongolia, Tibet, Xinjiang, Qinghai. Middle Asia; Kirgizistan, Tadzhikistan, Kazakhstan, Uzbekistan. Mongolia; Mongolia. Russia, Iran West Asia; Afghanistan.

Asia-Tropical: Indian Subcontinent; Eastern Himalaya, Nepal, Pakistan.

Spikelet formula:

R^1 : Reduced floret 1
F_5 : 2-3 fertile florets, lemma 5 veined
--- : Disarticulation above the glumes
G_3 : Lower glume 3 veined
G_3 : Upper glume 3 veined
Pan: Inflorescence, a panicle

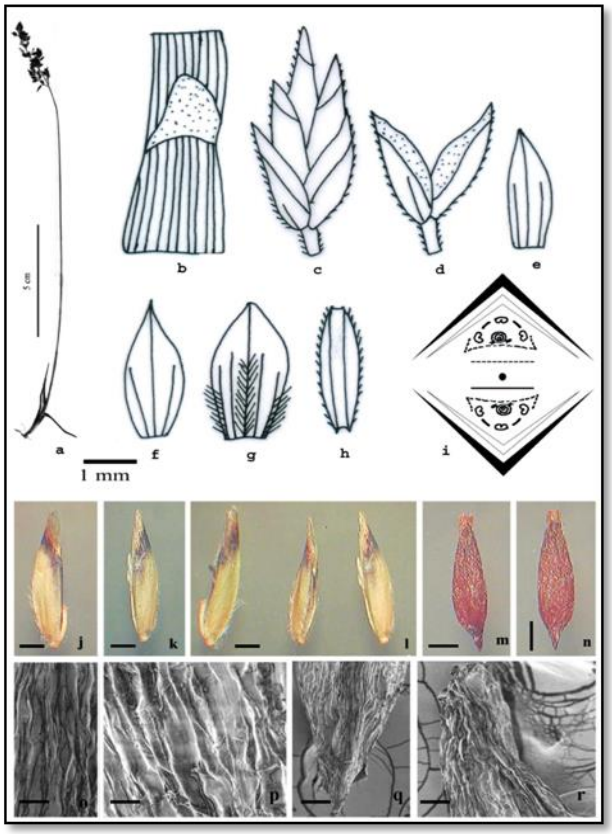

Fig. 2. ***Poa albertii*****:** a) habit; b) ligule; c) spikelet; d) glumes; e) lower glume, dorsal view; f) upper glume, dorsal view; g) lemma, dorsal view; h) palea; I) spikelet diagram; j-l) diaspore; m-n) caryopsis; o-r) SEM Micrographs of caryopsis [Bar: 5cm (a) 1mm (b-h) 0.7mm (j-l) 0.3mm (m-n) 50µm (o-p) 300µm (q-r)].

Table 1. Diagnosis of *Poa albertii* Regel from related species

Species	Ligule length (mm)	Spikelet length (mm)	Number of fertile florets	Callus surface	Surface between lemma veins
Poa albertii Regel	1.0-3.5	3.0-6.0	2-3	Glabrous	Glabrous
Poa attenuata Trin.	1.0-2.5	2.5-4.5	2-5	Webbed	Moderatly pubescent
Poa glauca Vahl	1.0-2.0	3.8-7.0	2-4	Glabrous or webbed	Glabrous or pubescent
Poa koelzii Bor	1.0-3.0	4.0-6.0	2-5	Glabrous	Densely pubescent
Poa lahulensis Bor	2.0-4.0	5.0-7.2	2-4	Glabrous or sometimes hairy	Sparsely pubescent

Identification key:

1. Plants densely tufted ……*Poa attenuata*
1b. Plants tufted moderately ……..2
2a. Lemma glabrous between the veins……..*Poa albertii*
2b. Lemma pubescent between the veins……3
3a. Callus glabrous or webbed…….*Poa gluaca*
3b. Callus usually glabrous ……4
4a. Ligule 1-3 mm long ……..*Poa koelzii*
4b. Ligule 2-4 mm long…….....*Poa lahulensis*

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