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PGR NOTE

Tubocapsicum anomalum (Franch. & Sav.) Makino: A New Record to the Flora of Arunachal Pradesh, India

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Tubocapsicum anomalum (Franch. & Sav.) Makino (Solanaceae) is reported as a new record for the flora of Arunachal Pradesh, India. Plants of this species were found wild in East Kameng and Upper Siang districts of Arunachal Pradesh, India. Its prolific fruit-bearing nature, high seed number per fruit and fruit flavour like chilli deserve further study as a potential genetic resource in India. A detailed description of the species along with distribution has been provided to facilitate identification and collection.

Key Words: New distribution record, North-eastern India, Plant genetic resources, *Tubocapsicum anomalum*

Introduction

Tubocapsicum anomalum (Franch. & Savat.) Makino (Solanaceae), commonly called as 'wild Japanese pepper', is native to tropical and temperate Asia (Makino, 1908) and widely distributed in southern China, Japan, Korea, Taiwan and the Philippines (Olmstead *et al.,* 1999). The genus *Tubocapsicum* Makino was formerly included in the genus *Capsicum* L. but it is taxonomically distinct and appears more closely related to the genera – *Aureliana* Lafit. ex Catesby and *Withania* Pauquy (Bosland and Votava, 2000). Phytochemical investigations have also proven its medicinal value due to presence of withanolides and withanolide glycosides in fruits (Kenji *et al.,* 1988 and Hsieh *et al.,* 2007).

North-eastern India is considered as one of the hot-spots of biodiversity including wild and cultivated plants of family Solanaceae. In an exploration conducted for multi-crop germplasm collection in Upper Siang district of Arunachal Pradesh during December 2018, the first and sixth authors came across with a few wild plants apparently resembling to 'chilli plant' in some localities. The fourth author has also observed the occurrence of *T. anomalum* in East Kameng district of Arunachal Pradesh during June 2015 but could not collect herbarium specimen and seed material as the plants were in vegetative stage. However, plants laden with fruits were located in Chiyang Taja Forest (27º40'21.8" N, 93º09'39.4" E, 2003 m) of East Kameng district of Arunachal Pradesh during November 2018. This species was also spotted by the fifth author in the mountainous slopes near Railing (28°09.203' N 96°31.149'E, 809 m) in the Metengliang block of Anjaw district of this state during October 2016. Information on morphological description and distribution is provided with photographs to facilitate the identification.

For confirming the identity, the plant characters were matched with digital images of herbarium available at online Herbarium, National Taiwan University, Taiwan (TAI; accessible through http://tai2.ntu.edu.tw) – herbarium nos. 098445, 196603, 250465 and 152453. After critical examination of the plant characters, herbarium specimens as well as through consultation with experts, the species was confirmed as *Tubocapsicum anomalum.* The Indian herbaria (Botanical Survey of India, Kolkata; National Herbarium of Cultivated Plants, ICAR-National Bureau of Plant Genetic Resources, New Delhi), floras of adjacent countries (Makino, 1963; Franchet and Savatier, 1878-1879; Wu and Raven, 1998) were also consulted for the confirmation of the identity. None of the Indian floras has reported the occurrence of *T. anomalum* in Arunachal Pradesh,

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hence the taxon is reported here as a new record for Arunachal Pradesh. Though, D'Arcy *et al.* (2001) has mentioned its occurrence from Assam, north-eastern region of India, herbarium specimen could not be traced out in any of the herbarium of the region by the authors.

Materials and Methods

An exploration was undertaken by the first and fifth authors in remote localities of Upper Siang district of Arunachal Pradesh for multi-crop germplasm collection as per National Exploration Plan 2018-19. During exploration, plants with matured fruits were seen to occur on the roadsides along the forest margin around Janbo village in Upper Siang district of Arunachal Pradesh, India. The matured fruits were harvested for conservation and herbarium specimen of fruiting twig was prepared as per standard procedure (Jain and Rao, 1977). The passport data along with coordinates of collecting site and taxonomic observations of collected specimens were recorded. Seed material was conserved in the National Genebank (IC0630421) while herbarium specimens were deposited in the National Herbarium of Cultivated Plants (NHCP) at ICAR-NBPGR, New Delhi and BSI, Itanagar Centre (Fig.1f).

***Details of herbarium specimens*:** India, Arunachal Pradesh, Upper Siang district, Jengging Circle, road side along forest margins near Janbo village, 22.12.2018, coll. RS Rathi and NS Panwar (NHCP23695) (Fig.1e); East Kameng district, Chiyang Taja Forest, 15.11.2018, coll. UK Tiwari (ARUN47143).

Results and Discussion

Tubocapsicum anomalum (Franch. & Savat.) Makino. Bot. Mag. Tokyo 22: 19. 1908; Basionym *Capsicum anomalum* Franch. & Savat., Enum. Pl. Jap. 2: 452. 1878 (1879). Lectotype: Japan, Leg. *Savatier* (P00279723). Syn. *Solanum anodontum* H.Lev. & Vaniot Monde Pl. sér. 2, 10: 37. 1908. Holotype: Korea, *U.J. Faurie* 776 (E00109636) [family Solanaceae].

A perennial herb, glabrous, height up to 2 m; stem stout, erect, sub-angular to-terete, sparingly pubescent, dichotomously branched with straight internodes. Leaf petiolate, ovate-elliptic or ovate-lanceolate, 5-15 x 3-6 cm, papery, base obtuse, margin subentire, apex acuminate. Flowers small, axillary, 2-5 flowers per cluster, calyx cup-shaped, 2-2.5×3 mm, truncate on margin, green; receptacle widely enlarged. Corolla yellow, short, campanulate, 5-8×6-8 mm; lobes

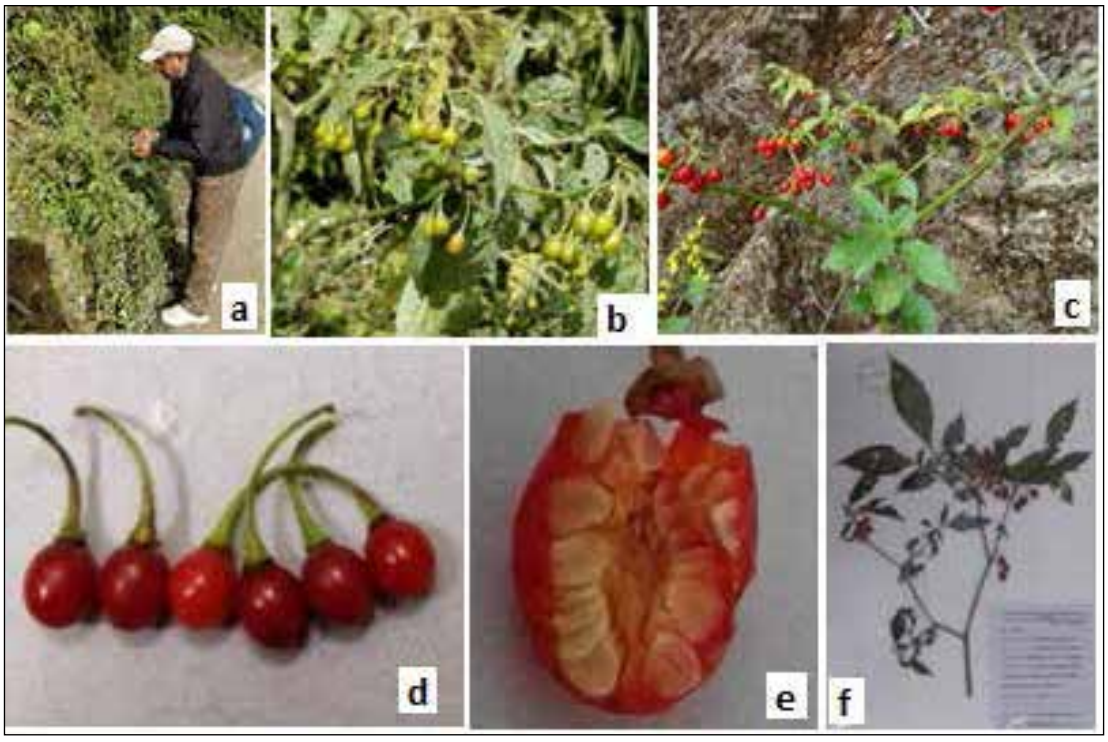

Fig. 1. (a) Collecting site and habitat of *Tubocapsicum anomalum*; (b) unripe berries; (c) mature berries; (d) mature berries with long pedicel; (e) longitudinal section of berry; (f) herbarium specimen.

Fig. 2. Distribution range of *T. anomalum* shown in green colour (historical distribution) and collection sites in Arunachal Pradesh, India (shown in black dots).

reflexed, ovate-deltoid. Stamens 5, somewhat exserted, erect, glabrous, adnate to the upper portion of corolla-tube base. Ovary depressed-globose, glabrous, 2-locular, style erect, terete-filiform, nearly equalling the stamens in height. Fruiting calyx not enlarged. Fruit a berry, juicy, bright red, shiny on ripening, 8-12 mm, persists for more than a month, wrinkles and shrivels at later stage. Seeds pale-yellow, 0.5-1.5 mm across, sub-orbiculate, laterally compressed and have a cavernulous reticulate surface.

Flowering during the month of August-October; and fruiting during October-January (in Arunachal Pradesh); flowers remain open during day and night (which is an unusual character of Solanaceae family). According to Makino (1908) flowering and fruiting occur during August-October in Japan.

***Field Observations*:** The first and sixth authors have observed only four plants in the collection site within 2 km^2 range, which is an indicative of poor regeneration ability. However, individual plants were growing luxuriantly under shade in moist forests. The associated floral elements around the site were *Hedychium spicatum* Sm., *Hyptis suaveolens* (L.) Poit., *Bidens pilosa* L., and *Solanum violaceum* Ortega. The plants were found with scarlet red berries, with 120-135 seeds/berry. The taste of berry was slightly bitter with little pungency and an aroma like chilli, with capsaicin value being 0.483 µg/g. Walsh and Hoot (2001) also reported pungency in fruits.

The map (Fig. 2) shows occurrence of the species in areas experiencing moderate temperatures (4-21ºC in winter and 13-39ºC in summer) and mild-moist climate. Collected sites are located at 28.35° N latitude and 94.37º E longitude at an elevation of 929-1000 m in mountain slopes. It was observed that *T. anomalum* requires abundant moisture; same observation was also reported by Proctor and Lack (1996). Merrill (1923) recorded its occurrence in the Philippines in mossy forest at an elevation of 1800–2000 m along streams in shaded ravines at low and medium altitudes in mesophytic sites in forests or open places.

Conclusion

Tubocapsicum anomalum is reported here as a new distribution record to the state of Arunachal Pradesh, India. Considering its potential as a genetic resource, effort should be made for germplasm collection for *ex-situ* conservation, biochemical characterization and utilization in crop improvement programmes.

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