

# Cytotaxonomical studies in the genus *Senecio* L. From Maharashtra, India

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## Abstract

The genus *Senecio* L. is the largest genus in the family Asteraceae Bercht. & J. Presl. Comprising about 3000 species in the world, mainly distributed in sub-tropical and tropical region of the world. It is very difficult to delimit the taxa from the genus because of lack of defined taxonomic boundaries that has led to a major confusion and conflict in this genus. In the present work taxonomic and cytological studies in genus *Senecio* L. from Maharashtra was carried out. Out of 8 species reported from Maharashtra, 3 endemic species viz. *S. bomabyensis* N. P. Balakr, *S. dalzellii* C. B. Cl., and *S. edgeworthii* Hook. f. were studied for their mitotic studies and it was found that all the three species has  $2n=20$  chromosome number with a variation in the karyotype. Here with we report the chromosome number for two species viz. *S. bomabyensis* N. P. Balakr, *S. edgeworthii* Hook. f.

**Keywords:** *Senecio*, endemic species, cytotaxonomy, karyotype.

## Introduction

The genus *Senecio* L. belongs to family Asteraceae, described by Linnaeus. Asteraceae is the largest family in plant kingdom, which comprises about 3100 species in the world, mainly distributed in tropical and sub-tropical regions [1-4]. The genus represented by about 63 species in India [5].

In Maharashtra the genus is represented by 8 species out of which 7 species are endemic [6]. The species of the genus have a great range of variations and also shows diverse populations restricted to particular geographical areas.

Species of *Senecio* L. are usually found growing along exposed hill slopes and rock crevices. The genus is worked by various authors [5-7]; a detailed taxonomic account of the genus was given by Hajra et. al [8] reporting 43 species India. As the genus shows a great range of diversity it is very difficult to assign the populations to a respective species and hence the present work was undertaken to revise the genus from Maharashtra and solve its taxonomic ambiguity.

In the present work 3 different species viz. *S. bombayensis*, *S. dalzellii*, *S. edgeworthii* were collected from various locations of Maharashtra. The collected plant materials was studied thoroughly with respect to their morphology and were identified with the help of Flora of Maharashtra. At the cytogenetic level, the genus is highly diverse, with haploid numbers varying from  $n = 5$  to with a modal number of  $n = 20$ . Lopez et.al. [9] proposed the existence of a polyploidy complex in *Senecio* that could explain some of the difficulties in the species identification. In this sense, chromosome studies would help to enlarge the understanding of the evolutionary pattern of this group. These species shows remarkable cytomorphological as well as ecological diversity. In Maharashtra the genus is represented by about 8 species out of which 7 species are endemic [6]. It also possesses diverse populations restricted to particular geographical areas. Significant work has been done mainly to species from Northern parts of India and it is only restricted to meiotic studies. The species and populations of the genus from Maharashtra are need to be worked out thoroughly so as to know the exact number of existing species and the variability amongst them. In the present work all the populations are analysed with respect to their cytology to know the variations in the species and polyploidy present in the genus.

Hence with this backdrop in mind three species viz. *S. bombayensis* N.P. Balakr, *S. dalzellii* C.B. Clarke and *S. edgeworthii* Hook. f. from Bhandardara, Anjaneri Hills and Ankai fort respectively along with flowering and fruiting were collected. The mature seeds were collected and mitotic studies were carried out to know the chromosome number and karyotype.

### Collection

*S. bombayensis* N.P. Balakr : N 19° 31' 51.06'' E 73° 49' 46.80'' 777 m Bhandardara

*S. dalzellii* C. B. Cl. : N 19° 55' 19.37'' E 73° 34' 22.46'' 1291 m AnjaneriHills

*S. edgeworthii* Hook. f.: N 20° 11' 19.30'' E 74° 27' 03.00'' 814 m Ankai Hills

## Methodology

In the present work all three species viz. *Senecio bombayensis* N.P. Balakr, *S. dalzellii* B. Cl. and *S. edgeworthii* Hook. f. were collected from Bhandardara, Anjaneri hill, and Ankai fort respectively in flowering and fruiting, GPS coordinates for the collection sites were marked and recorded.. The mature seeds were selected for mitotic studies. Seeds were germinated on germination paper and coco-peat. Seeds germinated in three days. Germinated seeds with 2 to 3 mm long roots were pre-treated with saturated 1, 4 dichlorobenzene at early morning 9:00 to 9:30 am. the vials were stored in refrigerator at 5 ° to 7 ° C for 4 hours. The vials were removed and kept at room temperature for 1 hour. Root were then hydrolyzed with 1N Hydrochloric acid and stained with 2% propionic orcein. Slides were prepared and images were taken under LEICA DM 1000 microscope. The chromosome number was recorded for all the three species. For pollen studies, fresh flowers were used. The pollen grain was mounted in glycerin on a glass slide. Microphotographs were taken using LEICA DM 1000 microscope at 100X magnification.

### Taxonomy

#### *Senecio bombayensis* Balakr.

Herbs up to 40 cm height, erect, branched, hairy. Stem 5 mm diameter, branched; branches mm diameter. Leaves 1.4-5 × 0.5-3 cm, simple, alternate, rhomboid, acute at apex, exstipulate, pinnatifid at base of petiole, auricled, broad nerve present in lower surface, upper surface rough, hairy; Petiole 0.5-2 cm long, hairy. Inflorescence capitulum head, 14 mm diameter, bracteolate, heterogamous, hairy, yellow, head pedunculate;

peduncle 1.5–9 cm long. Involucre 6.5 × 5.0 mm, bracts biseriate, leafy, oblanceolate, mucronulate margin hairy or minutely teeth. Flower lateral ray florets 8–11, 9.0 × 2.0 mm long, pappus absent; ligulate. central florets bisexual; Corolla 5.3 × 1.2 mm, companulate, yellow; pappus unequal, longer than central florets. Stamens 5, 1.18 mm long, syngencious, epipetalous, Carpels ovary 2.5–2.7 mm long, inferior; Style simple; Stigma bifid. Achenes 1.5 × 0.5 mm, hairy, vertical ridges present.

Phenology- July to October

Locality- Bhandardara

#### ***Senecio dalzellii* C.B.Cl.**

Herbs, erect, terete, branched. Stem, glabrous. Leaves 1.5–9.0 × 0.2–2.5 cm, simple, lower leaves rhomboid–ovate, upper linear, auricles at base, white tomentose lower surface, upper surface rough, broad nerve present, base acuminate, apex acute, 1.5–9 × 0.2–2.5 cm, alternate, exstipulate, petiole 1.0–3 cm long, Inflorescence capitulum head, c 2.2 cm diameter, yellow, bracteolate, heterogamous, pedunculate; Peduncle 1.3–6.5 cm long, hairy, slender; Involucre bracts 2 seriate, lower lobes laterally membranous margin, 5.63–2.54 mm. Flowers Lateral ray florets 8 × 3.75 mm, 4 nerved, yellow, 3 lobed; Pappus absent; Corolla ligulate 7 × 4 mm, central disc florets bisexual, 4 mm long; Pappus longer than achenes companulate, yellow. Stamens 5, c 2.0 mm long syngencious, epipetalous, filament free. Ovary mm long inferior style simple, stigma bifid.

Achenes 1.5 mm long.

Phenology: July - October

Locality: Anjnerii Hills

#### ***Senecio edgeworthii* Hook.f.**

Sufruticose, perennial herb, erect; Stem roughly woody, 1.0–1.5 cm diameter, teret, obscurely branched, branches 7–9 mm diameter. Leaves simple 2.0–5 × 0.5–3.0 cm, alternate, suborbicular, margin rhomboid, toothed, acute at apex, base unequal sub-cordate, exstipulate, reticulate, wooly pubescent at lower surface, upper surface scarcely pubescent; petiole 0.8–2.5 cm long, wooly, pinnatifid leaf blade auricled at the base of petiole. Inflorescence capitulum head, c 2 cm diameter, bracteolate, heterogamous, hairy; Pedunculate, Peduncle 1.5–6.0 cm long. Involucre biseriate c 5.75 mm long, membranous, strigose. Flowers: Lateral florets female 8–11, c 8.63 mm, long; Pappus absent, corolla ligulate, 7.0 × 2.5 mm, 4 nerved obscurely 3 lobed yellow, central florets bisexual 6.0 mm long; corolla c 3.5 × 1.5 mm long companulate, yellow; Pappus unequal, ciliate. Stamens 5, c mm long syngencious, epipetalous, filament free. Ovary c 3.0 mm long, inferior, style simple, stigma bilobed. Achenes 1.56 mm long longitudinally grooved, minutely villous.

Phenology: August–November

Locality: Ankai–Maharashtra

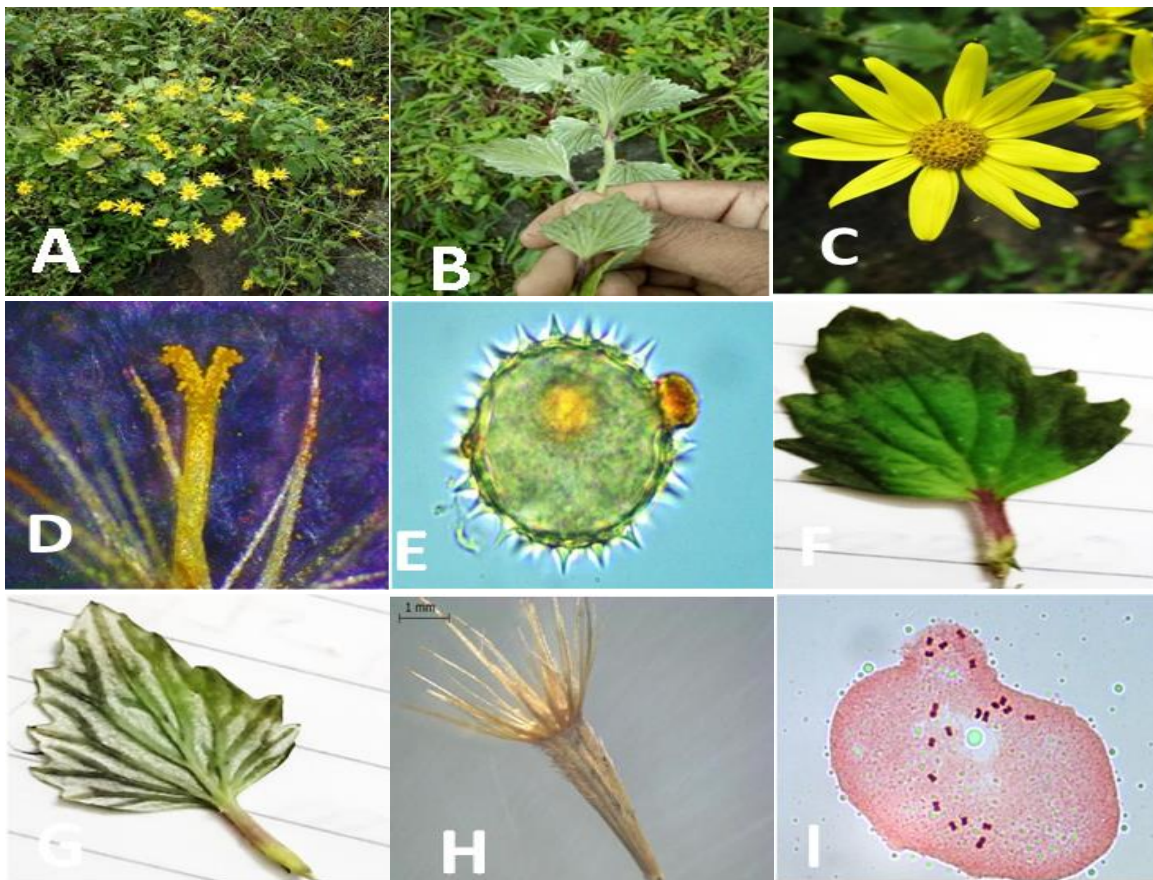
## Results and Discussions

All the three collected species were studied morphologically and were confirmed as *S. dalzellii*, *S. edgeworthii* and *S. bombayensis* by comparing with protologues and by using floras [6,10]. Our cytological studies also confirm that the earlier reports of chromosome numbers. Herewith we also report chromosome number for *Senecio bombayensis* N.P. Balakr and *S. edgeworthii* Hook.f.

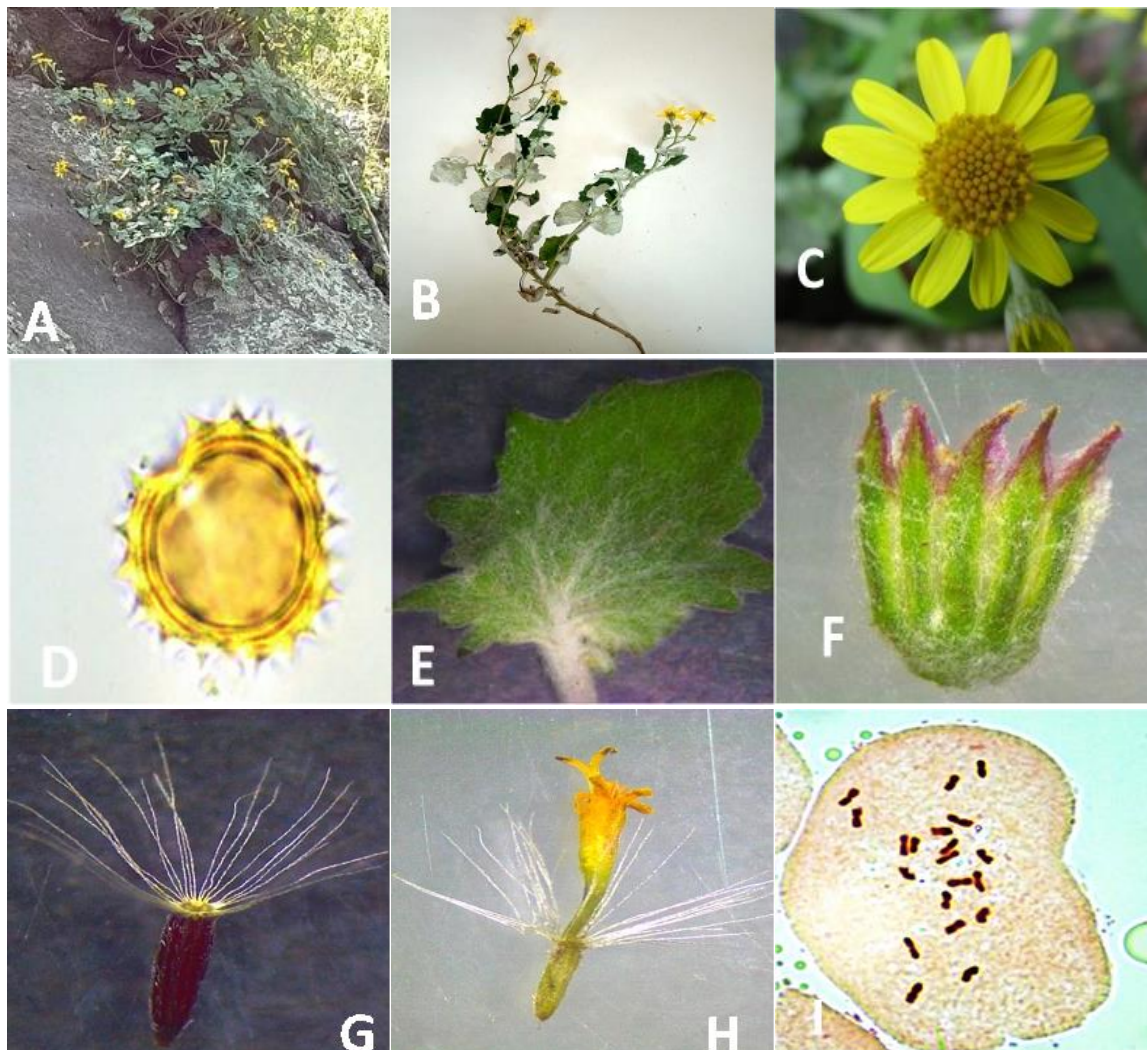
Sr. No.	Name of the species	Locality & habitat	Chromosome number
1.	<i>S. bombayensis</i> N.P. Balkar	Bhandardara, grows hilly area and hill slopes	20
2.	<i>S. dalzellii</i> C.B.Cl.	Anjineri hill, grows top floor hill	20
3.	<i>S. edgeworthii</i> Hook.f.	Ankai Fort, grows cervices of rocks	20



**Figure 1:** *Senecio dalzelli* C. B. Cl A. Habitat, B. Flowering branch, C. leaf dorsal view, D. leaf ventral view, E. Flower, F. Pollen grain, G. Seed, H. Mitotic plate



**Figure 2:** *Senecio bombayensis* N. P. Balakr A .Habitat, B. Habit C. Flower D. Bifid stigma E. Pollen grain, F. Leaf dorsal view, G. Leaf Ventral view, H. Seed, I. Mitotic plate



**Figure 3:** *S. edgeworthii* Hook. f. A. & B Habit, C. Flower, D. Pollen grain, E. Leaf, F. Involucre lobes, G. Seed, H. Central florets, I. Mitotic plate

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**Conflicts of interest:** The authors stated that no conflicts of interest.

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