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Convolvulaceae: A taxonomically and medicinally important morning glory family

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Abstract
Taxonomically and medicinally important morning glory family of Convolvulaceae at Rajshahi district was carried out. A total of 9 species under 2 genera belonging to the family Convolvulaceae were collected and identified. Out of the total number of species *Evolvulus nummularius* (L.) L., *Ipomoea aquatica* Forssk., *Ipomoea alba* L., *Ipomoea batatas* (L.) Lamk., *Ipomoea fistulosa* Mart. ex Choisy were common and *Ipomoea cairica* (L.) Sweet., *Ipomoea nil* (L.) Roth., *Ipomoea pes-tigridis* L., *Ipomoea quamoclit* L. was rare species in the study area. For each species English name, botanical name, synonyms, local name, status of occurrence, habit, habitat, flowering and fruiting time, chromosome number, distribution Taxonomic description and medicinal uses have been mentioned.

Keywords: Convolvulaceae, Taxonomy, Medicinal Uses, Rajshahi, Bangladesh

1. Introduction
The family Convolvulaceae of about 55 genera and 1650 species, distributed in both tropical and temperate regions of the world. About 20 genera and over 150 species have been reported from India. Some of the largely represented genera with their number of approximately reported species are *Ipomoea* (500, Morning glory), *Convolvulus* (250, blindweed, or wild morning glory), *Jacquemontia* (120), *Evolvulus* (100) and *Calystegia* (25).

The family important as a source of food, for drugs, for several ornamentals etc. Plant used for edible purposes include (i) *Ipomoea batatas* (Sweet potato or Shakarkandi), of which fleshy roots are eaten because of their rich content of sugar and starch, and are also used for production of industrial alcohol, pectin, starch and sugar-syrup; (ii) *Ipomoea aquatica* (Nari-ka-Sag), of which leaves and young shoots are used as vegetable (iii) *Calonyctin muricatum*, of which floral pedicels are eaten, (iv) *Calystegia sepium*, of which roots are cooked and eaten, (v) *Rivea hypocrateriformis*, of which young shoots and leaves are used as vegetable. Plants of medicinal value include (i) *Evolvulus alsinoides*, used as a bitter tonic, (ii) *Exogonium purge*, yields the drug 'jalap' used as a purgative, (iii) *Ipomoea violacea*, of which seeds contain d-lysergic acid amide and are hallucinogenic. Plants of ornamentals value include (i) *Argyreia speciosa* (elehant creeper), *Calonyction aculeatum* (moon flower), *Ipomoea carica* (railway creeper), *I. coccinea* (star *Ipomoea*), *Ipomoea fisulosa*, *I. lobata*, *I. purpurea* (morning glory), *I. quamoclit* (*Cyperus* vine), *I. tuberosa* (wood rose), *I. violacea* (heavenly blue), and *Porana paniculata* (Christmas vine) [63].

The Family Convolvulaceae consists of about 50 genera and 1500 species widespread in tropical and subtropical regions of the world. In Bangladesh, this family is represented by 15 genera and 55 species [1].

The importance of studying local floristic diversity and medicinal uses has been realized and carried out in Bangladesh by [14-61, 62, 64-67]. The main objectives of the present study are to explore, identify, medicinal aspects and document the family Convolvulaceae of Rajshahi district, Bangladesh.

2. Materials and Methods
2.1 Study area
Rajshahi district is a district in North-Western Bangladesh. It is a part of the Rajshahi division. The metropolitan city of Rajshahi is in Rajshahi district. The Rajshahi district is bounded by Naogaon district to the north, Natore district to the east, and Chapai Nawabganj district and the river Padma to the south. The Rajshahi district has a sub-tropical monsoon climate, typical of Bangladesh, which falls within a low rainfall zone of the country. 75 percent rainfall occurs during June-September. The annual rainfall is 1350 mm. Temperature of the area is low in January varies from 9.0°C to 14.1°C. From February an increasing trend of temperature is found up to April and thereafter temperature start to decline. In April temperature varies from 22.6°C to 36.9°C. The mean relative humidity is found to be low in March (65%) and high in July-September (88-89%) [4].

2.2 Methods of the study
Taxonomic investigation on the family Convolvulaceae growing throughout the Rajshahi district was carried out from September 2014 to October 2015. A total of 9 species under 2 genera of the family Convolvulaceae were collected and identified. Information on local uses of plants was collected from various localities of Rajshahi district. The plants were tagged with signified data, local and other characteristic about the plant species. The specimens were pressed in a presser with blotting paper between the adjacent specimens. The blotting papers and newspapers were changed from time to time depending upon the weather and situation of plant. Dried species were treated by 2% solution of Mercuric Chloride and Ethyl Alcohol, mounting of specimens was made on standard herbarium techniques.

2.3 Identification
The plant specimens were identified by consulting different Floras and literatures, viz, Ahmed *et al*. [1], Hooker [7], Prain [13], Kiritikar and Basu [11] and by comparing with the

herbarium specimens available at the Herbarium, Department of Botany, Rajshahi University. For updated nomenclature of the species Ahmed *et al.* [1], Huq [8] and Pasha and Uddin [12]. Voucher specimens are deposited in the Herbarium, Department of Botany, Rajshahi University, Bangladesh.

3. Results and Discussion

The plant materials collected from the study area using the identification methods and medicinal information was accumulated and described below.

1. *Evolvulus nummularius* (L.) L.
Synonyms: *Convolvulus nummularius* L., *Volvulopsis nummularium* L.
English name: Roundleaf Bindweed.
Local name: Bhuiokra.
Status of occurrence: Common.
Habit: Herb.
Habitat: Open of fields; roadsides, waste places.
Flowering and fruiting time: Throughout the year.
Distribution: Africa, Malaysia and Myanmar. In Bangladesh, it is found in all districts [1].
Chromosome number: 2n = 24 [5].
Taxonomic description: A perennial herb with prostrate stem, often pilose at the nodes with short trichomes to glabrate. Leaves broadly ovate to orbicular. Flowers 1-2 in axils, rarely more, up to 5 mm high, pedicels 2-6 mm long. Fruit a globose capsule, 3-4 mm across, often reflexed at maturity.
Medicinal Uses: Whole plant is used as epilepsy and paralysis.

Fig 1: *Evolvulus nummularius* (L.) L.

2. *Ipomoea aquatica* Forssk.
Synonym: *Ipomoea reptans* Poir.
English name: Swamp Cabbage.
Local name: Kalmi.
Status of occurrence: Frequent.
Habit: Aquatic herb.
Habitat: Wet lowlands, tanks or ditches.
Flowering and fruiting time: January to December.
Distribution: Circum-tropical. In Bangladesh, it is found throughout the country [1].
Chromosome number: 2n = 30 [5].
Taxonomic description: A glabrous trailer on ground or floating on water, stem hollow, rooting at the nodes. Leaves 5-12.5 cm long, ovate, ovate-oblong, deltoid, lanceolate or linear, base cordate, sagittate or hastate. Flowers 1-few in axillary cymes. Corolla 2.5-5 cm long funnel-shaped, pink of pale lilac. Capsule 8 mm, ovoid to globose.
Medicinal Uses: Plants are anthelmintic and carminative; useful in leucoderma, leprosy, fever, jaundice, biliousness, bronchitis and liver complaints. It is considered very wholesome for females who suffer from nervous and general debility. The juice of the plant is used as an emetic in cases of arsenic or opium poisoning; it is also used in liver complaints. Leaves and seeds are cooling. The buds are used in the treatment of ringworm. Flower juice is given to inflamed eyes as a drop. The root juice is administered in cases of diarrhea.

Fig 2: *Ipomoea aquatica* Forssk.

3. *Ipomoea alba* L.
Synnonyms: *Ipomoea bona-nox* L; *Calonyction bona-nox* Bojer.
English name: The moon flower, tropical white morning glory.
Local name: Dudhikalmi.
Status of occurrence: Frequent.
Habit: Herb.
Habitat: Roadsides jungles, waste places.
Flowering and fruiting time: Throughout the year..
Distribution: India and Myanmar. In Bangladesh, it is found in Bandarban, Chittagong, Cox's Bazar, Manikganj, Pabna and Rajshahi districts [1].
Chromosome number: 2n = 30 [5].
Taxonomic description: A twinner with milky juice. Leaves 7-21 cm long, ovate to oblong or orbicular, entire or 3-lobed, cordate at base, acuminate. Flowers one to several in axillary cymes; corolla 7-12 cm long, salver-shaped, white with greenish midpetalline bands. Capsules 1.5-3.5 cm long, ovoid.
Medicinal Uses: The root bark possesses purgative properties. Leaves are used in filariasis, constipation, boils and wounds [68].

Fig 3: *Ipomoea alba* L.

4. *Ipomoea batatas* (L.) Lamk.
Synnonym: *Convolvulus batatus* L.
English name: Sweet potato.
Local name: Misti alu.
Status of occurrence: Frequent.
Habit: Prostrate herb.
Habitat: Cultivated.

Flowering and fruiting time: December to May.
Distribution: A native of America now cultivated throughout the tropics and subtropics. In Bangladesh, it is cultivated throughout the country [1].
Chromosome number: 2n = 30 [5].
Taxonomic description: A prostrate herb with trailing stem and tuberous roots; tubers red, white or rarely yellow. Leaves ovate-cordate, acute angular or more or less lobed. Flowers 1-several in axillary cymes. Corolla 3-4.5 cm campanulate to funnel-shaped, pale violat. Capsule ovoid, rarely formed.
Medicinal Uses: Plant is used as anti-diabetic. Whole plant or its infusion is used in low fever and skin diseases. Root is aphrodisiac and laxative; useful in strangury and diarrhea. Leaf paste with salt is applied to whitlow. Leaves are good source of vitamin B and C [68].

Fig 4: *Ipomoea batatas* (L.) Lamk.

5. *Ipomoea fistulosa* Mart. ex Choisy
Synonyms: *Batatas crassicaulis* Benth, *Ipomoea crassicaulis* B. L. Rob.
English name: Bush morning glory.
Local name: Dholkolmi.
Status of occurrence: Common.
Habit: Shrub.
Habitat: Fallow lands, roadsides and sides of water bodies.
Flowering and fruiting time: Throughout the year.
Distribution: Tropical Africa and Asia elsewhere cultivated for flowers or naturalized. In Bangladesh, it is found all over the country [1].
Chromosome number: 2n = 30 [5].
Taxonomic description: A shrub, up to 2.5 m tall, branches ascending, usually fistular, containing milky juice. Leaves ovate to ovate-oblong, base cordate to truncate, acuminate. Flowers few to many in axillary and terminal cymes. Fruit a capsule, ovoid, pale brown, 2- or incompletely 4-celled, 4-valved.
Medicinal Uses: Not known.

Fig 5: *Ipomoea fistulosa* Mart. ex Choisy

6. *Ipomoea cairica* (L.) Sweet.
Synonyms: *Convolvulus cairicus* L., *Ipomoea palmata* Forssk.
English name: Railway creeper.
Local name: Rail lata.
Status of occurrence: Frequent.
Habit: Perennial herb.
Habitat: Roadsides, waste places, bushes.
Flowering and fruiting time: Throughout the year.
Distribution: Tropical Africa and Asia cultivated elsewhere for flowers or naturalized. In Bangladesh, it is found in Dhaka, Mymensingh, Rajshahi and Sylhet districts [1].
Chromosome number: 2n = 30 [5].
Taxonomic description: A perennial herb, with a tuberous root. Leaves palmately cut to the base usually into 5 segments, each segment ovate or lanceolate to ovate or elliptic. Flowers 1 to few, in axillary cymes. Fruit a capsule smooth, 4-valved.
Medicinal Uses: Not known.

Fig 6: *Ipomoea cairica* (L.) Sweet.

7. *Ipomoea nil* (L.) Roth.
Synonyms: *Ipomoea hederacea* Sensu C.B. Clarke., *Convolvulus nil* L.
English name: White-edge Morning Glory.
Local name: Nil Kalmi.
Status of occurrence: Frequent.
Habit: Herb.
Habitat: Waste places, roadsides and bushes.
Flowering and fruiting time: October to December.
Distribution: Circum-tropical distribution. In Bangladesh, it is found in Dhaka, Habiganj, Mymensingh and Rangpur districts [1].
Chromosome number: 2n = 30 [5].
Taxonomic description: A twiner, stem sparsely retrosely hirsute. Leaves broadly ovate to orbicular, entire or 3-lobed, base cordate, apex acuminate, pilose with short appressed hairs. Flowers 1 to several in axillary umbellate cymes. Fruit a globose capsule.
Medicinal Uses: Seeds are purgative and used as a substitute for the drug Jalap. It is also used as anthelmintic [9].

Fig 7: *Ipomoea nil* (L.) Roth.

8. *Ipomoea pes-tigridis* L.
Synonym: Not known.
English name: Bind weed.
Local name: Langui lata.
Status of occurrence: Frequent.
Habit: Herb.
Habitat: Waste places, roadsides and bushes.
Flowering and fruiting time: May to August.
Distribution: From East tropical Africa and Mascarene Islands through tropical Asia up to Malaysia. In Bangladesh, it is found in Rajshahi, Rangpur and Dinajpur districts [1].
Chromosome number: 2n = 28, 30 [5].
Taxonomic description: A slender, annual twiner, stem patently hirsute. Leaves 3.8-10 cm diam., palmately divided up to the base with 5-9 segments, segments elliptic to elliptic-oblong, densely appressed or patently hairy. Flowers few in head-like involucrate axillary cymes; corolla 3-4 cm long, funnel-shaped, white. Capsule 5 mm, ovoid, papery, concealed in the calyx.
Medicinal Uses: Roots are purgative; used for the treatment of bolis, carbuncles and dog-bites.

Fig 8: *Ipomoea pes-tigridis* L.

9. *Ipomoea quamoclit* L.
Synonyms: *Quamoclit pinnata* Boj., *Quamoclit vulgaris* Choisy.
English name: Star glory.
Local name: Taru lata, gatephul.
Status of occurrence: Frequent.
Habit: Annual herb.
Habitat: Gardens.
Flowering and fruiting time: July to September.
Distribution: Circum-tropical. In Bangladesh, it is cultivated in different gardens as an ornamental herb [1].
Chromosome number: 2n = 30 [5].
Taxonomic description: A slender annual, twiner. Leaves 7.5-12.5 cm long, pinnately cut, up to the midrib into many pairs of linear to filform patent segments. Flowers 1-few in axillary cymes. Corolla salver-shaped, red, tube 2.5-3.5 cm long. Capsule ovoid about 1 cm long.
Medicinal Uses: The plant is considered cooling and purgative; used in cancer and Breast pain. Pounded leaves are applied to bleeding piles and as a plaster to carbuncles [68].

Fig 9: *Ipomoea quamoclit* L.

Based on this study, a preliminary plant list of Convolvulaceae family at Rajshahi, Bangladesh conducted during July 2014 to August 2015. A total of 9 species belonging to 2 genera of the family were recorded. The collected information is comparable with the result of other studies in Bangladesh. A total of 5 species belonging to 2 genera of the family Convolvulaceae were recorded in Khagrachhari district [9]. A total of 2 species belonged to 2 genera of the family Convolvulaceae are documented in Habiganj district [3]. A total of 9 species belonging to 4 genera of the family Convolvulaceae are recorded in Teknaf wildlife sanctuary [64]. A total of 5 species belonging to 3 genera of the family Convolvulaceae are recorded in Munshiganj district, Bangladesh [62]. No published information recorded on the family Convolvulaceae at Rajshahi district, Bangladesh.
The important medicinal values of Convolvulaceae family of Rajshahi district were highlighted. A total of 9 medicinal plant species belonging to 2 genera were collected and recorded for their use in various ailments. These medicinal plants are used by them to cure the following diseases, especially for anthelmintic, jaundice, leprosy, bronchitis, constipation, diarrhea, fever, skin diseases, biliousness, boils, dog-bite, filariasis, wound and others. The collected medicinal information of those plant species is in agreement with the result of other studies done in Bangladesh [68, 10, 6, 2].

4. Conclusion
Taxonomically and medicinally important morning glory family of Convolvulaceae at Rajshahi district was carried out. A total of 9 species under 2 genera belonging to the family Convolvulaceae were collected and identified. The older people of the area knew the importance of these plants and they transfer their knowledge to the younger. This is the first research work on Convolvulaceae family attempt in this area in which medicinally important plants were identified, classified and collected. The result showed that this area contain a valuable plant species which need conservation and proper management.

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