Original Research Article

Development and characterisation of a new *Hibiscus rosa-sinensis* L. cultivar ('Krishna's Radiance') from India

Abstract

A new significant cultivar *Hibiscus rosa-sinensis* L. cv. 'Krishna's Radiance' has been developed from the cross pollination of *H. rosa-sinensis* L. cv. 'Houdini' (Female pod parent) and *Hibiscus rosa-sinensis* L. cv. 'HVH Rain Drop' (Male pollen parent). The new cultivar characterised by upright, fast growing shrubs with bluish-purple flowers. It can be recognised from parents by its large, creamy-white eye zone and allied to male parent (HVH Rain Drop) by its bluish colour flower but it can be separated by large single regular flower, clockwise arrangement of petals and creamy-white large eye zone whereas male parent has small single cartwheel flower, anticlockwise arrangement of petals and small whitish-pink eye zone.

Keywords: Cultivar, 'Krishna's Radiance', *Hibiscus,* West Bengal, 'Houdini', 'HVH Rain Drop'

1. INTRODUCTION

The genus *Hibiscus* L. belongs to the flowering plants family Malvaceae. It comprises about 432 species [1,2,3] and more than 23,306 registered cultivars [4] in the world and is naturally distributed in tropical, subtropical, and warm-temperate regions of the world. In India, the *Hibiscus* is represented by 27 taxa belonging to 23 species, one subspecies and three varieties [5] and has 372 registered cultivars [4]. The state West Bengal is represented by 300 cultivars of *Hibiscus* [2,3], which are using in landscape development and also as ornamental plant.

While working in the *Hibiscus* section, Acharya Jagadish Chandra Bose Indian Botanic Garden, Botanical Survey of India, Howrah, a new cultivar of *Hibiscus* has been developed by cross pollination between the *Hibiscus rosa- sinensis* L. cv. 'Houdini' (Female pod parent) and *Hibiscus rosa- sinensis* L. cv. 'HVH Rain Drop' (Male pollen parent). The cultivars were

procured from plant nurseries of West Bengal which were imported from Texas and USA California respectively. The newly developed cultivar can be recognised by its blue flower with whitish eye zone and white veins radiating from centre. The blue colour of the flower symbolises to ‘Lord Sri Krishna’ to and the spreading of white veins on the petals from eye zone is symbolises to the radiance of peacock feather on his head. Hence, the new hybrid seedlings were named as ‘Krishna's Radiance’. The new cultivar characterised by upright, fast growing shrubs with bluish-purple flowers. It is easily recognised from parents by its large, creamy-white eye zone.

1. MATERIALS AND METHODS

2.1. Experimental site

The development and characterisation of *Hibiscus* has been carried out at Acharya Jagadish Chandra Bose Indian Botanic Garden, Botanical Survey of India, Howrah.

2.2. Selection of parents

Selection of parent plants are very important to develop and improve plant quality, bloom presentment, ability to bloom, bloom size and other aspects of ideal new *H. rosa-sinensis* cultivars [2,3,6,7]. Before cross pollination, role of genetic traits of parent plants was cross checked to verify the passage of genes to progeny. Lineage of *Hibiscus* cultivars was tracked in consultation with cultivar genealogy tree of International Hibiscus Society database and the National Gardening Association. Based on the genealogy of *Hibiscus*, female parent (Houdini) and male parent (HVH Rain Drop) were obtained from the nurseries of West Bengal which were imported from Texas and USA California respectively.

2.3. Hybridisation

During winter (December, 2021), the designated female parent was identified one day before pollination, while the flower is at the full balloon stage [2,3,6,7]. The petals were removed to expose the stigma and this was covered with a piece of packet to avoid pollen contamination.

For *Hibiscus* breeding, pollens were collected from a designated male parent through brush methods then it was transferred manually into the previously covered stigma of the chosen female parent during day time at 10:03 am (10-12-2021). After crossing, the crossed flowers were covered with paper bag to avoid contamination from pollinators. The pollinated flowers were labelled, to indicate that the parents were involved in crossing. After a week of crossing, the bags were removed and the young capsules were allowed to develop under natural conditions. After 60 days of its successful pollination, about 15 seeds were collected from the matured capsules in February 2022. At the end of March, 2022, the collected seeds were carefully cut round with a sharp sterilised blade to open hard shells and were soaked overnight in water. Soaked seeds were covered with tissue paper and shifted to an airtight container and maintained 25-30°C temperature. The seeds were sprouted within 7-8 days. The sprouted seeds were transferred to a media bed which consisted of coco peat. Seedlings were gradually acclimatized in to natural conditions, after sprouting of 2-3-leaves from the growth media bed. Undeveloped or poorly developed and die back diseased seedlings were discarded. After the examination of seedlings, found that few seedlings were obviously different from the previous registered *Hibiscus* cultivars. After six months healthy seedlings were shifted from experimental garden of AJC Bose Indian Botanic Garden, Howrah for further characterisation. For the hybridisation, development and characterisation, the methodology described [2,3,6,7] has been followed.

Pod Parent- *H. rosa- sinensis* L.

cv. Houdini

Pollen Parent- *H. rosa- sinensis* L.

cv. HVH Rain Drop

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***H. rosa-sinensis* L. cv. 'Krishna's Radiance'**

Figure 1: The hybrid *Hibiscus rosa- sinensis* L. cv. 'Krishna's Radiance' and it's female parent *H. rosa-sinensis* L. cv.'Houdini' and male parent *H. rosa-sinensis* L. cv. 'HVH Rain Drop'.

3. RESULTS AND DISCUSSION

3.1. Characterization of new cultivar

The developed new cultivar started to produce flowers attaining at the age of 1 year old. The fully developed cultivar branches were collected for cuttings, grafting, budding for clonal propagation and multiplications. The propagated saplings were used to check/stabilise the characters. High quality, bush development, propagation, disease resistance power, ability to bloom and bloom size has been observed in the newly developed cultivar. The characters like beautiful blue flower with a brilliant contrasting white eye at centre and white rays spreading up to the margin, a longer flowering period (more than two days in winter and 1 day in summer) and upright, well branched bush have been observed with stability. Hence, the new cultivar was registered on 05.04.2023 at the International Hibiscus Society and subsequently, the register cultivar accepted by the society. (https://internationalhibiscussociety.org/searchive/genealogy_tree?Search_box=Krishna%20s%20Radiance). The new cultivar characterised by upright, fast growing shrubs with bluish-purple flowers. It can be recognised from parents by its large, creamy-white eye zone The detail differences between the parents and cultivar have given in table 1.

Table.1. Morphological comparison of Krishna's Radiance with its parents

Sl.No	Characters	Pod parent (Houdini)	Pollen parent (HVH Rain Drop)	New Cultivar (Krishna's Radiance)
1	Plant height	30-60 cm	40-60 cm	50-150 cm
2	Plant growth	Spreading shrub	Upright	Upright
3	Leaf length and width	9-10 × 6.9-7 cm	7.4-7.5 × 8.4-8.4cm	11.7-12 × 10cm
4	Leaf shape	Elliptic	Broadly ovate	Ovate
5	Flower type	Single regular	Single cartwheel	Single regular
6	Flower size in diameter	10-12 × 10-12 cm	9-10 × 9-10 cm	15.5-16 × 15.5-16 cm
7	Flower colour	Lavender purple with orange-yellow margin	Bluish purple crisp petals with bluish margin a few pinkish dots on the edges.	Bluish purple with bluish margin

8	Colour of eye zone	Lavender	Small creamy-pink	Large creamy-white
9	Orientation of petals	Clock wise	Anti - clock wise	Clock wise
10	Bloom features	Ruffled and recurved	Ruffled	Ruffled and tufted
11	Petals lower surface	Creamy	Purple	Creamy with purple
12	Petal fading of colour in scorching	No	Strong	Medium
13	Staminal column colour	Creamy red	Creamy with pinkish base	Creamy
14	Anther colour	Yellow	Orange	Orange
15	Stigma pad colour	Red	Yellow	Yellow
16	Seeder traits	Very good	Capsule not set	Good
17	Bush development	Rapid	Medium	Rapid
18	Propagation	Grafting, budding and seeds	Only grafting and budding	Cutting, grafting, budding and seeds
19	Disease resistance	Good	Medium, plant heavily affected in die back, root rot and leaf curled disease	Good
20	Flowering season	Prominent in winter	Only in winter	Throughout the year but very prominent in winter

3.2. TAXONOMY OF *HIBISCUS ROSA-SINENSIS* L. CV. KRISHNA'S RADIANCE

Shrubs up to 1.5 m high; branches densely upright, green; intermodal portion 2.5-4.5 cm long. Leaves simple, petiolate; petiole ca. 4.5 × 0.3 cm; blades ovate, 11.7-12 × ca. 10 cm, cordate at base, crenate along margin, acute at apex, dark green on upper surface, light green on lower surface, 5-nerved from the base. Stipules linear to lanceolate. Inflorescence axillary, solitary; peduncle ca. 4.1 × 0.3 cm; pedicel ca. 0.7 × 0.4 cm; flower bud pale yellow, ca. 5.3 × 2 cm. Flowers purple 15.5-16 × 15.5-16 cm. Epicalyx number ca. 3 × 3.2 cm, linear to lanceolate, 7 lobed, each lobe 0.8-0.9 × 0.2-0.3 cm. Sepals united below the half ca. 3.1 × 4.8 cm, tube ca. 1 × 0.9 cm long, 5-lobed; lobes ovate-lanceolate, ca. 2 × 0.9-1 cm, acute to acuminate at apex. Petals 8-8.2 × ca. 8 cm, polypetalous, obovate, cuneate to unequal at base, entire to undulate along margin, rounded at apex, upper surface with white eye zone and

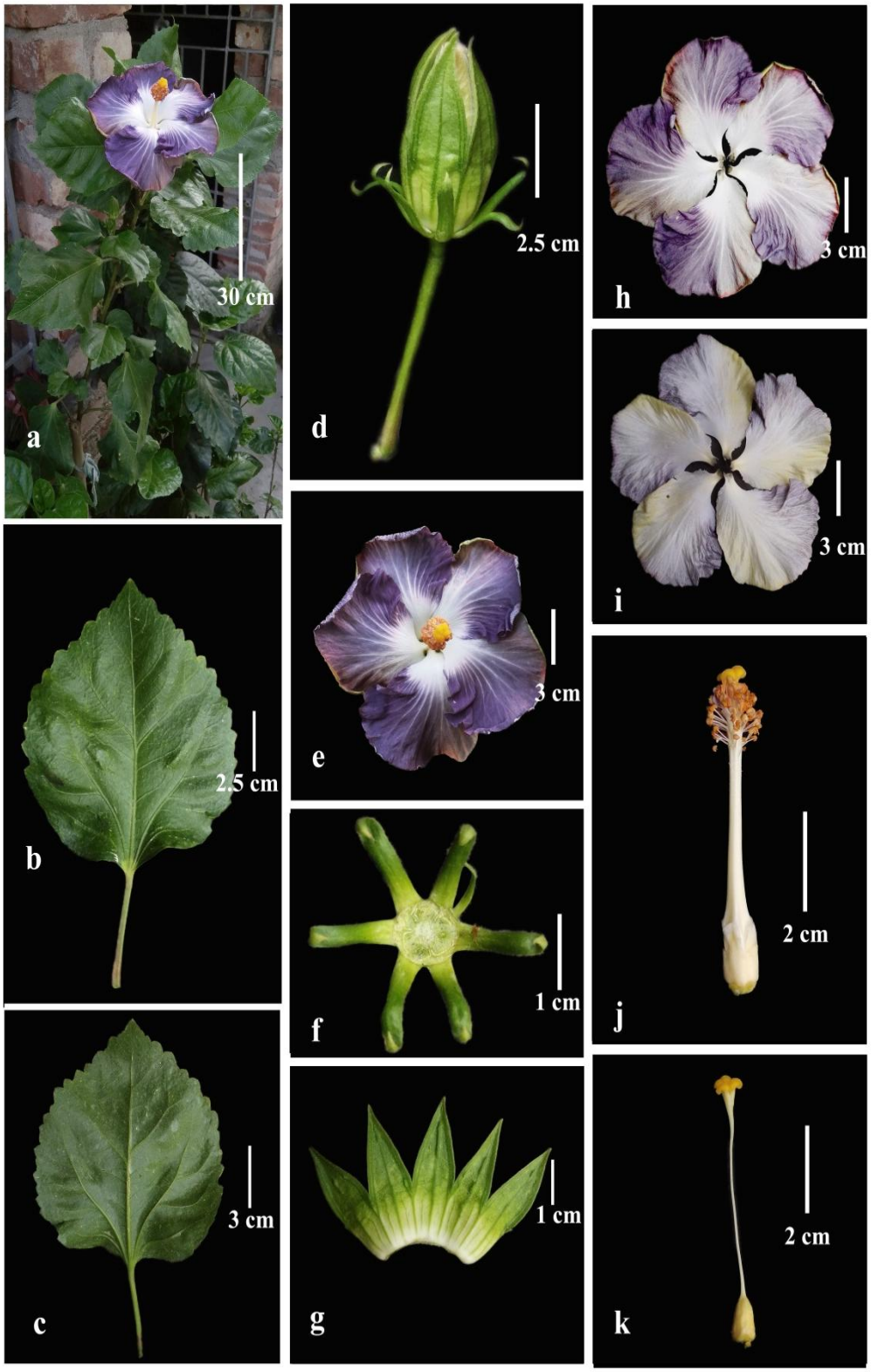

Figure 2: *Hibiscus rosa- sinensis* L. cv,'Krishna's Radiance': a. Habit; b-c. Leaves; d. Flower bud; e. Flower; f. Epicalyx; g. Calyx; h. Corolla-upper surface; i. Corolla- lower surface; j. Staminal column with pistil; k. pistil

purple to blue at edges, lower surface creamy with purple and pale-yellow patches; veins prominently raised beneath, whitish-creamy. Staminal column creamy, ca. 7.8 × 0.5 cm; naked zone ca. 5.1 cm long; anther zone ca. 1.7 × 1.3 cm; anthers golden 0.2-0.3 cm across, kidney shaped, yellow; filaments 0.3-0.4 × 0.1-0.2 cm. Pistil ca. 6.7 cm long; ovary cylindrical, ca. 1.1 × 0.5 cm; style ca. 5 × 0.1 cm long, linear; stigma yellow, ca. 0.8 × 0.9 cm, 5-lobed; lobes 0.2-0.3 × 0.3-0.4 cm, unequal, densely hairy.

4. CONCLUSION

Due to its versatile uses, the *Hibiscus rosa-sinensis* has long been cultivated in warm-temperate, subtropical, and tropical regions world and the main primary centre of diversity of the *Hibiscus rosa-sinensis* is China, India, Japan, and the Pacific islands [7,8]. Polyphyletic theory with chloroplasts DNA analysis reveals that, the centre of origin of the *Hibiscus rosa-sinensis* could be the Eastern Gondwana [9]. Throughout the world *Hibiscus rosa-sinensis* has been used for various purposes. In the Indian traditional medicine, the root decoction is considered to have medicinal properties against various ailments and flowers and leaves of *Hibiscus* are used as herbal medicine to treat different illnesses namely bronchitis as an expectorant, coughs and sore throat and fever as a refrigerant drink, dysentery, urinary tract infection and bladder infections, high blood pressure, constipation, headaches, boils, swelling, abscesses, and mumps [10] and remedy hair-fall and dandruff by inducing the hair follicles to make protective oils [11]. Similarly, in the Philippines, the *Hibiscus* is used as an expectorant, diuretic, emollient, anti-infectious, anti-inflammatory, antipyretic, anodyne, and refrigerant [11]. The juice of the leaves is used by midwives to stimulate the expulsion of the afterbirth after delivery of the baby. The red flowers are used to regulate menstruation and are purgative [6]. In Mexico fresh flowers are used as food coloring and as a component of vegetable salad, and the dried flowers are considered edible, and they are used as a special delicacy and for making jams [12]. Interestingly, the flower position where it is worn

signifies a civil status of the girls in Hawaii and Tahiti. If worn in the left ear, the women are in a relationship, while when worn in the right, the woman is single [7]. The cultivars of *Hibiscus rosa-sinensis* have high demand in the country especially in West Bengal for cultural significance and also useful in landscaping due its attractive wide variety of colors.

To address the current demand on *Hibiscus rosa-sinensis* in the country and to develop new and rare floral color, disease resistance, longer floral display an attempt has been made and successfully developed a new unique blue flower cultivar i.e. 'Krishna's Radiance' which has a very much ornamental potential, cultural significance and is also useful in landscaping. The newly developed cultivar has a unique blue flower and has a wide scope for future research, especially in the field of pharmacology and as cosmeceuticals. The developed hibiscus cultivar was registered in the International Hibiscus Society.

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