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Development and Characterisation of New *Hibiscus rosa-sinensis* Cultivar ('A.A. Mao') from India

Jetti Swamy[1*], Deep Chakraborty[1, 2] and Devendra Singh[1]
[1,2]Botanical Survey of India, Acharya Jagadish Chandra Bose Indian Botanic Garden, Howrah-711103, West Bengal, India.
[2]Ramakrishna Mission Vivekananda Centenary College, Rahara, North 24 Paraganas District, West Bengal, India.
*Corresponding author email id: swamy.2706@gmail.com

***Abstract* – Hibiscus *rosa-sinensis* L. is a well-known traditional, ornamental, and aesthetic plant in India and China due to its wide range of coloured cultivars, a long history of cultivation and worship. There is a huge scope of hibiscus breeding in West Bengal because it is no longer used only as an offering to Hindu goddess Kali/Durga, Lord Vinayaka, etc. The prime aim of this study is to develop new cultivars of Hibiscus through selection, hybridisation and to improve the overall aspects of the ideal plant. A new significant cultivar H. *rosa-sinensis* 'A.A. Mao' has been developed from the cross breeding of Hibiscus *rosa-sinensis* L. 'Bengal sunrise' (Female pod parent) and Hibiscus *rosa- sinensis* L. 'Valentine's Day' (Male pollen parent). Detailed breeding process and characterisation of the new cultivar is discussed and photographs are provided to facilitate to identification.**

***Keywords* – A.A. Mao, Bengal sunrise, Cultivar, *H. rosa-sinensis*, Valentine's Day, West Bengal.**

I. INTRODUCTION

The genus *Hibiscus* L. belongs to the flowering plants family Malvaceae. It comprises about 432 species [1] and more than 23306 registered cultivars [2] 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 [3] and more than 369 registered cultivars [2]. As per our recent enumeration in various gardens, nurseries, etc., the state West Bengal has more than 300 cultivars of *Hibiscus*.

Hibiscus rosa-sinensis L. is a well-known traditional, ornamental, and aesthetic plant in India and China due to its wide range of coloured cultivars, a long history of cultivation and worship. The flowers of hibiscus are locally called Joba/Gudhal, and which are offered to Goddess Kali/Durga and Lord Vinayaka in West Bengal, India. The improvement of ornamental *Hibiscus* through breeding in India is mainly done in tropical areas like southern states like Karnataka, Tamil Nadu, and Kerala where the environmental conditions are congenial for seed setting in some of the species/cultivars. But now-a-days it is not confined to the above-mentioned areas; rather, it has been extended to other parts of India like West Bengal and Odisha. There is a huge scope of hibiscus breeding in West Bengal because it is no longer used only as an offering to Hindu goddess Kali/Durga, Lord Vinayaka, etc. but considered of great significance as an ornamental and aesthetic plant due to its wide range of coloured cultivars. The prime aim of this study is to develop new cultivars of *Hibiscus* through selection, hybridisation and to improve the overall aspects of the ideal plant. To conduct the hybridization, authors has been selected parents from of India and California USA. They were mostly used as parents because they have unique flower colours, form, and produce large blooms.

II. MATERIALS AND METHODS

Parents Selection

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. Before cross pollination, authors randomly cross checked that, how genetic traits of parent plants has come into play and how they tend to pass genes to progeny. To track the lineage of Hibiscus cultivars, authors have been consulted cultivar genealogy tree of International Hibiscus Society database. Based on the genealogy of Hibiscus, the authors obtained female parent (Bengal Sunrise) from India and male parent (Valentines Day) from California, USA.

Hybridisation

During winter (December), the designated female parent was identified one day before pollination, while the flower is at the full balloon stage [4-5]. The petals were removed to expose the stigma and this was covered with a piece of packet to avoid pollen contamination. During the breeding, authors have collected pollen from a designated male parent (Bengal sunrise) through brush methods then it was transferred manually into the previously covered stigma of the chosen female parent (Valentines' Day) during day time at 9:56 am (10.12.2021). After cross pollination, crossed flowers are covered with paper bag immediately to prevent contamination. The pollinated flowers are labelled, which is indicating that the parents were involved in crossing. After a week of crossing, the bags are removed and the young capsules were allowed to develop under natural conditions. After 60 days of its successful breeding, 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 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 is consisting 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 field observation found that one seedling was obviously different from the previous registered hibiscus cultivars. After six months healthy seedlings were shifted experimental garden of AJC Bose Indian Botanic Garden, Howrah for further characterisation.

III. 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 developed new cultivar is named after Dr. A.A. Mao, Director, Botanical Survey of India for his great contribution in plant taxonomy and tissue culture. The new cultivar characterised by bright pink flower with big velvety red eye zone when its full bloom and a longer flowering period (more than two days in winter and 1 day in summer) has been determined as a stable character. The new cultivar registration (https://internationalhibiscus society.org/searchive/genealogy_tree?Search_box=A%20A%20Mao) was accepted by the International Hibisc--us Society on 29.01.2023.

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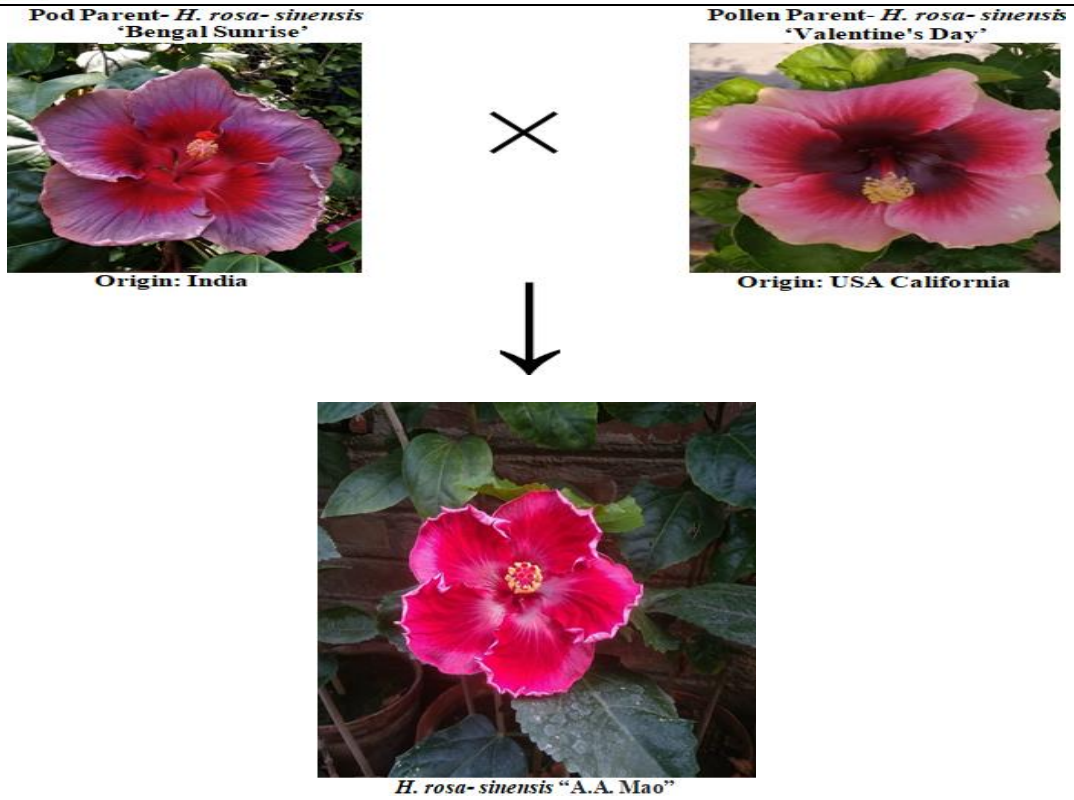

Fig. 1. The hybrid *Hibiscus rosa-sinensis* 'A.A. Mao' and it's female parent 'Bengal Sunrise' and male parent *H. rosa- sinensis* 'Valentine's Day'.

Taxonomy of Hibiscus rosa-sinensis L. "A.A. Mao"

Shrubs up to 1.5-2 m high; branches upright, green; intermodal portion 1.4-2.8 cm long. Leaves simple, petiolate; petiole *c*. 4.5 × 0.3 cm; blades broadly ovate, 10-11.3 × 9.5-10.1 cm, cordate at base, crenate along margin, acute at apex, dark green above, light green and pubescent beneath, lateral nerves 6-7 from the base. Stipules linear 0.8-0.9 × 0.1-0.2 cm. Inflorescence axillary, solitary; peduncle 2-2.2 × 0.15-0.2 cm; pedicel *c*. 0.4 × 0.3 cm; flower bud pale yellow, 4.5 × 2 cm. Flowers pinkish red, *c.* 15 × 15 cm. Epicalyx *c.* 2.9 × 3 cm, linear to lanceolate, 4-lobed; lobes 1.2-1.4 × 0.2-0.3 cm. Sepals united below the half *c*. 2.3 × 6.3 cm; tube *c*. 1.8 × 1.1 cm long, 5- lobed; lobes ovate-lanceolate, *c.* 1 × 0.9 cm, acute to acuminate at apex. Petals 7-7.5 × 6-6.5 cm, polypetalous, 5; obovate, cuneate to unequal at base, entire to undulate along margin, rounded at apex, upper surface velvety red cantered and pink rings at edges, lower surface pink with yellow; veins prominently raised beneath, creamy. Staminal column red, *c*. 4.3 × 0.3 cm; naked zone *c*. 3 cm long; anther zone *c.* 1.4 × 1.4 cm; anthers *c.* 0.2 × 0.3 cm, kidney shaped, yellow; filaments 0.4-0.5 × 0.1-0.2 cm long. Pistil 5-5.3 cm long; ovary cylindrical, c. 0.8 × 0.5 cm; style 4.5-4.7 cm long, linear; stigma red, *c*. 1 × 1 cm, 5-lobed; lobes *c.* 0.1 × 0.3 cm, unequal, densely hairy.

Flowering:

Throughout the year but very prominent in winter. Flowers open early in the morning and close after two days of its open.

Propagation:

It can be done by cuttings, grafting and budding.

IV. CONCLUSION

Hibiscus rosa-sinensis L. has a wide range of applications. Various parts of the plant are used in the preparation of jams, spices, soups, and sauces [6]. In foods and beverages, hibiscus is used as a flavouring agent. It is also used to improve the odour, flavour, or appearance of tea mixtures [6-7]. In addition to the above, it is used for treating injuries, inflammation, fever and coughs, diabetes, infections caused by bacteria and fungi, alopecia, gastric ulcers, heart, and nerve diseases in several tropical countries [8]. Hibiscus oil is extracted from the hibiscus plant and is considered as an essential oil. The fragrance of this oil is found to be pleasant, relaxing and calming. It has a wide variety of practical applications, ranging from aromatherapy to skin and hair care. The oil can be used as a perfume on its own, adding to its versatility. It acts as an excellent moisturizer for dry skin, and it also helps to heal lesions caused by skin infections such as psoriasis or eczema [9]. The leaves and flowers of this plant have been used in the treatment of scalp conditions such as dandruff since ancient times [7 & 10]. Due to wide range applications/importance of *Hibiscus rosa-sinensis*, breeding on different hibiscus cultivars from local and foreign sources (India & USA California) was conducted from 2021-2023 to develop unique cultivar that are comparable with other flowers. This breeding work led to the development of a new cultivar which has a very much ornamental potential, cultural significance and also useful in landscaping. Since, the hibiscus flowers have high demand in the country especially in West Bengal for cultural significance. The newly developed *H. rosa-sinensis* L. "A.A. Mao" cultivar will address the current demand of the country/region and further it has a wide scope for future research, especially in the field of pharmacology and as cosmeceuticals. The developed hibiscus cultivar registered in the International Hibiscus Society.

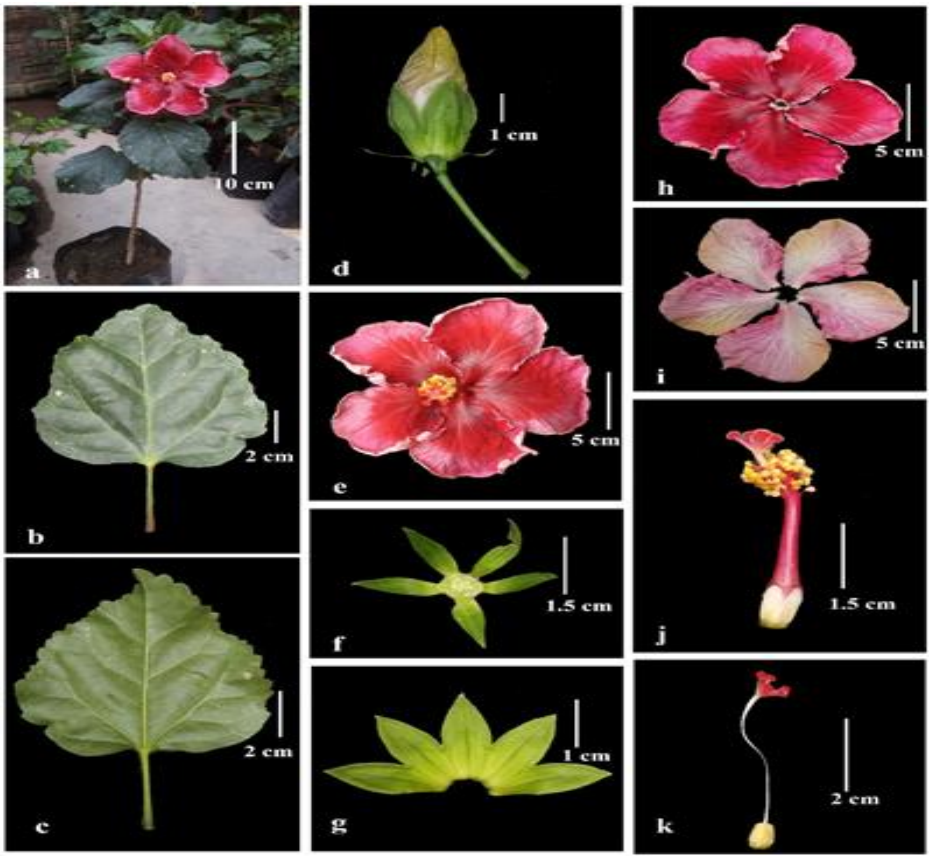

Fig. 2. The hybrid *Hibiscus rosa-sinensis* 'A. A. Mao': a. Habit; b-c. Leaves; d. Flower bud; e. Flower; f. Epicalyx; g. Calyx; h. Corolla- upper surface; i. Corolla- lower surface; j. Staminal column with pistil; k. pistil.

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AUTHOR'S PROFILE

First Author

Dr. J. Swamy, is working as a Scientist- C in Acharya Jagadish Chandra Bose Indian Botanic Garden, Botanical Survey of India, MoEF & CC, Howrah. He has 14 years of experience in Taxonomy of Angiosperms, Conservation Assessment (Sacred Groves), NDF studies and Medicinal plants. He has published 07 books and 108 research papers, including 12 new discoveries in science. Presently working on ex-situ conservation of endemic and threatened plants of India and development of new cultivars.

Second Author

Mr. Deep Chakraborty, is pursuing M.Sc. in Botany in Ramakrishna Mission Vivekananda Centenary College, Rahara, North Paraganas District, West Bengal, India. As part of his dissertation working on the Development and Characterisa--tion of new hibiscus cultivars at Acharya Jagadish Chandra Bose Indian Botanic Garden, Botanical Survey of India, Howrah. He has developed more than 30 new hibiscus cultivars and published a book chapter on Hibiscus.

Third Author

Dr. Devendra Singh, Ph.D. is working in Botanical Survey of India as Scientist E and heading the Acharya Jagadish Chandra Bose Indian Botanic Garden, Howrah. He has been engaged in extensive survey and documentation of bryophy--tes from India (North east India, Western Himalaya, Central India) and Antarctica (Larsemann Hills, East Antarctica) since 2004. He has discovered one new genus, seven species and one variety as new to science, and one genus and 38 species as new distributional records for India; authored one book and published 70 research papers in peer reviewed National and International journals, 03 book chapters and 04 popular articles.