



Phenology and floral biology of *Lagerstroemia speciosa* (Linn.)Pers. Family -Lythraceae

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Abstract:

The information on reproductive biology of plant is essential for biodiversity conservation. Present communication deals with the phenology, floral biology of an ornamental tree *Lagerstroemia speciosa* (Linn.)Pers. It is grown as avenue tree and for decoration in gardens .

It is a tall perennial, deciduous tree with branched cylindrical stem, simple leaves and panicle inflorescence. Flowering period, the beginning, peak and end of flowering as well as longevity was registered. Ovules per flower, pollen viability, stigma receptivity, number of pollen/flower, pollinators and fruit/seed dispersal mechanism, pollen /ovule ratio were also studied. In *L. speciosa*, anthesis occurs before 0600h and anther dehiscence between 0930h – 1030h. Duration of stigma receptivity is 12 hrs. and pollination is entomophilous.

Keywords: Anthesis, Entomophilous, Floral morphology, Pollen/Ovule ratio.

Introduction:

Survival of any plant in a particular region is determined by the efficiency of their reproductive performance. Due to large size, long life cycles and inaccessible flowers, trees have not received the attention they deserve in conducting researches. Less work has been done on reproductive biology of trees. Climate change, pollution, deforestation, habitat fragmentation, use of pesticides affecting plants and pollinators. Reduced pollination decreases the fruit set. Researches on reproductive biology is today's need to understand breeding systems, plant pollinator relationship, pollination mechanism and fruit set success.

Lagerstroemia speciosa (Linn.) Pers. (Family-Lythraceae) is named after a Swedish botanist, magnus V. Lagerstrom. It is commonly called as Pride of India, Queen's crepe myrtle and Jarul in Hindi, also called as Banaba (Merrill, 1923). It is native to Asia, Australia and East Indies, widely distributed in India in wet forest of Western Ghats, Punjab, U.P., Rajasthan, Madhya Pradesh, Orissa, Karnataka and forest of Assam and Kerala

It is grown as an ornamental plant in gardens for its ornamental value serving an aesthetic rather than a useful purpose but it is also important for its economic uses. It bears large mauve purple flowers. Quality of its wood is similar to teak and very useful for boat building and carts etc. Roots are astringent and seeds are narcotic whereas the bark and leaves are purgative. In Andaman the fruit is used for curing ulcers in the mouth, leaves and fruits are used for preparing tannin extract. It has been used in Southeast Asia for centuries as a medicinal plant particularly in the treatment of diabetes and kidney related disease (Klein *et al.* 2007). Its large leaves called Banaba are dried ground and made into tea that until recently has been confirmed to have chemical properties and effects similar to those of insulin.

Lagerstroemia speciosa (Linn.) Pers. is a perennial tall tree with branched stem, simple leaves and panicle inflorescence. Present investigation was undertaken to obtain information on the phenology and pollination biology of *Lagerstroemia speciosa* growing in Chhatra Vilas garden of Kota. It is cultivated for the beauty of its flowers can easily be grown from seed. The growth is slow in the first year but improve in the next year. It flowers 3-5 years after planting.

Improvement protection and management of plants particularly of tree species are impossible without clear understanding of reproductive Biology (Moza and Bhatnagar 2007, Jain *et al.* 2013).

Material and Methods:

Present study was undertaken at Kota, Rajasthan, India (75 °37'to77°26' east longitude and 24°25' to 25°51' north latitude).

The present study has been conducted to study the flowering phenology, floral biology, pollen viability, foraging behaviour of flower visitors and mechanism of pollination in *L. speciosa*.

Flowering phenology and floral morphology of *L. speciosa* were observed. Observations were recorded everyday between 0600-1000h during the entire flowering period from 20 marked plants growing in Chhatra Vilas garden, Kota, Rajasthan, India.

Flower longevity was determined by marking 50 buds on different branches of plants. Time was recorded when new flowers opened i.e. when the plants reflect to expose the androecium and gynoecium flowers are observed at regular intervals until the corolla withered. These changes were observed every day for 2 weeks.

Pollen production per flower was calculated by counting the number of pollen grains per anther and then multiplying this figure by the number of anthers per flower (Cruden, 1977). The number of ovules per ovary was counted. The pollen ovule ratio was calculated as per the method after Cruden, 1977. The pollen viability of plant was observed by method after Hauser and Morrison (1964) using 0.2% TTC (2,3,5 triphenyltetrazolium chloride) solution at 5.8 pH using 0.15 M tris-HCl buffer. Stigma receptivity was determined by using α -naphthyl acetate test as described by Shivanna and Rangaswami (1992).

Pollination Biology was studied by observing the number of floral visitors, foraging nature, foraging hours. Frequency of insects visiting stigma was recorded. Insect visitors was fixed in 70% alcohol and identified. The stigma was also observed carefully to confirm the pollen transfer to the stigma by pollinators.

Result and discussion:

L. speciosa is a deciduous 22.8± 4.80 (12-40) ft. tall tree with branched stem, simple leaf and panicle inflorescence, produce large, showy, mauve, odorless flowers. The plant begin to shed its foliage in first week of February and completely became bare by last week of February. The leaves turn red before falling.

Leaf primordia appeared in the first week of March and leaves attain their maximum size by the end of March. Leaf size is 23.7 ± 2.85 x 9.38 ± 1.36cm.

Floral biology: The inception of inflorescence primordia occurred at the end of March. The flowers commenced opening during first week of April which extended up to October. Peak flowering time was May to June. Fruiting commence from mid - May and the fruits reach to maturity in the month of October. Dried fruits remain attached on plant up to February next year. Inflorescence is axillary or terminal panicle. Inflorescence bear flowers in acropetal succession. Size of inflorescence is 26.96 ± 2.97 cm. Number of buds and flowers per inflorescence are 38 ± 9.39. Flowers (6.34 ± 0.25 x 6.96 ± 0.42 cm.) are bracteate, bracteolate, complete, actinomorphic, hermaphrodite hexamerous, hypogynous and cyclic.

Sepals 6, green, gamosepalous, forming hypanthium. Petals 6, polypetalous, often crumpled in bud condition, mauve-purple, crinkled like crape paper, inserted at the rim of calyx tube.

Number of stamens are 278 ± 9.62 per flower, polyandrous, arranged in several whorls, inserted at the base of hypanthium and filament inflexed in bud condition. Each filament measures 1.76 ± 0.05 cm. Anthers small, yellow, introrse, connective divaricate, dehisce longitudinally. Pistil consists of an ovary with long style and capitate stigma. Diameter of ovary is 0.5 ± 0.03 cm. and style is 2.7 ± 0.12 cm. long. Each ovary bore 17.2 ± 1.36 Ovules.

Flowering phenology: The flower bud on inflorescence develop into flowers in acropetal succession. Size of youngest visible bud is 0.15± 0.1 as a protuberance. The flower open before 0600h, anthers dehisce between 0930-1030 h, lifespan of an individual flower is 3-4 days. During the peak flowering season April to May, on each plant nearly 75 flowers bloom per day in 25 inflorescence.

Initiation of petals occurred on 2nd day, which were light green in colour and turned into lemon white on 15th day, light mauve on 16th day and finally became dark mauve coloured.

Anthesis occurred on 27th day after initiation of bud before 0600 h.

Cytochemical localisation of stigmatic esterases by α -naphthyl acetate test as described by Shivanna and Rangaswami (1992) indicated that stigma becomes receptive on the day of anthesis persists up to 12 hours after anthesis. Full blooming stage of a flower lasted for 9 days. After that colour of petals became fade with shedding of one or two petals.

Fruits per inflorescence was 4.9 ± 0.57 and number of seeds per fruit is 84 ± 9.69. Fruit ellipsoid or globose, dehiscent capsule, ripened after 75 days. Fruiting commence in the month of May extended up to October. Sometimes fruit were attached on tree for long time even up to next season. The size of fruit is 3.48 ± 0.19 x

1.7 ± 0.08 cm. Young fruit is green turns dark brown after maturity. Seeds are golden brown, flat, winged, heteromorphic, nested in overlapping fashion within each locule. Size of distal wing increases gradually with the increase in seed size and seed size is 1.36 ± 0.10 x 0.66 ± 0.04 cm. Fruit dehisces on the plant itself as they mature, started from top to bottom of fruit. Seeds disperse gradually in air from dried fruit which remains attached on the plant.



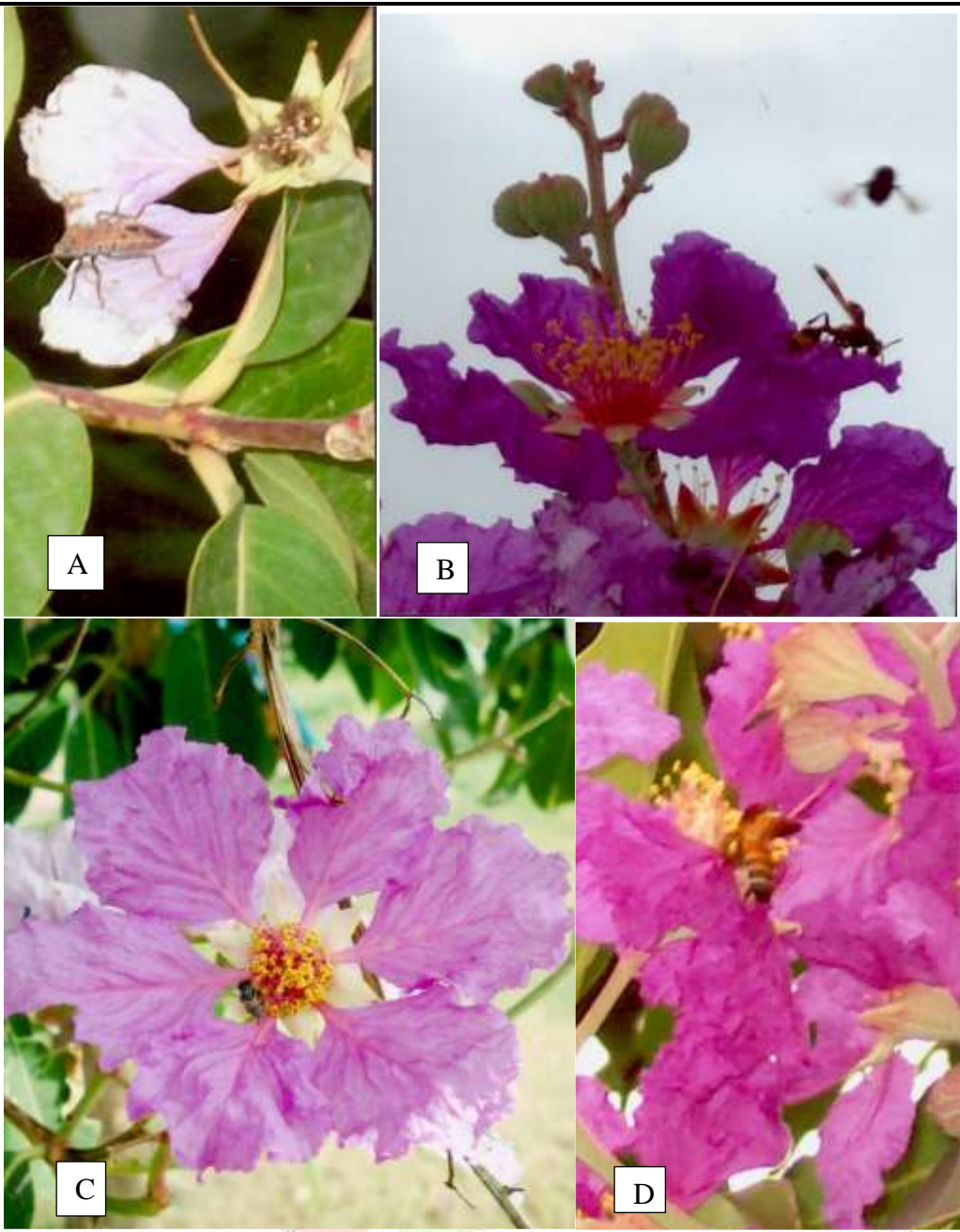
L. speciosa : Undehiscent fruits, dehiscent fruits and seeds

Pollen grains: The pollen grains were released by longitudinal slit. Pollen grains are rounded in shape. Size of pollen is $35.3 \pm 1.71 \times 30.64 \pm 0.67 \mu$ and size of tetrad is $33.97 \pm 1.25 \times 28.64 \pm 1.26 \mu$. Each stamen contained 336 pollen grains in its anther. The total pollen production per flower is 93408. Pollen viability by tetrazolium test confirms that 99.2% pollen grains were available on the day of anthesis and gradually reduced after second day of anthesis. Pollination is entomophilous. P/O ratio is 1086. High P/O ratio indicates that species is xenogamous.

Pollination Biology : Observations recorded on floral visitors between 0530 and 1830 h show that a large number of visitors were attracted by purple coloured flowers and their activities start soon after the opening of flowers. Pollen grains constitute primary floral reward for the visitors. A wide range of visitors including bees and wasps visit flower but only few of them were effective pollinators. They visit the flower and pollinate flower by their rapid and frequent visits to flower. Maximum visitation occurs between 0900 h to 1500 h. Pollen grains get transferred upon their feathers and other body parts. They land upon different branches and flowers, in the process transferring the pollen to the stigma. *Dysdercus sp*, *Xylocarpa iridipennis*, *Wasp*, *Trigona sp* and *Apis indica* visited flowers. Visitation rates of wasp are low but they are effective pollinators.

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Different visitors on *L. speciosa* :
(A) *Dysdercus sp* (B) *Xylocarpa iridipennis* and Wasp. (C) *Trigona sp* (D) *Apis indica*