

Floral Biology of Strawberry (*Fragaria ananassa*) cv. “Winter dawn”

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Taxonomical classification of Strawberry



Kingdom: Plantae

Clade: Tracheophytes

Clade: Angiosperms

Clade: Eudicots

Clade: Rosids

Order: Rosales

Family: Rosaceae

Sub Family: Rosoidae

Genus: Fragaria

Species: F. × ananassa

Binomial name: Fragaria × ananassa

Origin: France (manmade hybrid)

Chromosome No.: 2n = 8x = 56

Fruit type: Etaerio of achenes

Bearing Habit: Crown bearing

Type of flowering: Pentamerous

Floral Biology of Strawberry

Strawberry flowers are typically white and have five petals, resembling a simple, five-petaled flower. They contain both male (stamens) and female (pistil) reproductive organs. Most strawberry varieties are self-fertile, meaning they can pollinate themselves. However, cross-pollination by insects such as bees can increase fruit set and yield. Pollination is essential for the formation of strawberries. After successful pollination, the ovary of the flower develops into a fruit called the receptacle. The tiny "seeds" on the surface of the strawberry are actually the true fruits, each containing a seed. Strawberries use a unique reproductive strategy called "pseudo-fruitle" or "false fruitle." The fleshy part of the strawberry is not derived from the ovary of the flower but rather from the receptacle, which swells and becomes fleshy as the fruit develops.

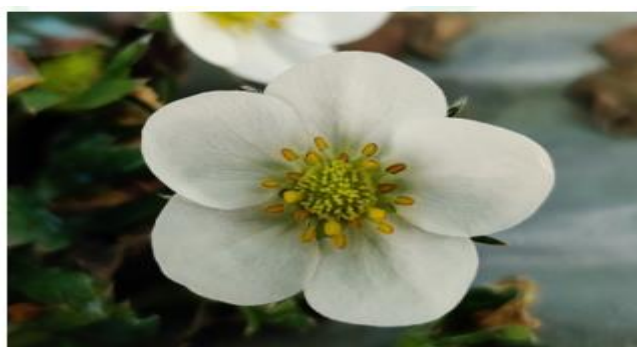





Fig.1. Strawberry Flower cv. "Winter dawn"

Flower characteristics

-  **Structure:** Strawberry flowers are small and delicate, typically white in color. Due to pentamerous flower nature each flower consists of 5 petals, 10 sepals, and numerous stamens (20) (male reproductive organs) surrounding a central pistil (90-120) (female reproductive organ).
-  **Color:** The petals of strawberry flowers are white, although they may sometimes have a slight pink tint. This coloration is often accompanied by contrasting yellow stamens and a yellow-green receptacle at the center of the flower.
-  **Shape:** Strawberry flowers have a simple, yet elegant, five-petaled structure. The petals are usually rounded or slightly ovate, overlapping, forming a star-like shape when fully open.

- ✚ **Size:** The size of strawberry flowers can vary depending on the cultivar and growing conditions, but they are generally small, typically measuring around 1 to 2 centimetres (0.4 to 0.8 inches) in diameter.
- ✚ **Sexuality:** Strawberry flowers are typically hermaphroditic, meaning they have both male (stamens) and female (pistil) reproductive parts within the same flower. This allows for self-pollination, although cross-pollination by insects, particularly bees, is also common and beneficial for fruit development.
- ✚ **Texture:** The petals of strawberry flowers are delicate and thin, with a soft texture. They may appear slightly translucent, especially in bright sunlight.
- ✚ **Positioning:** Strawberry flowers are arranged in clusters at the ends of stems arising from the crown of the plant. These clusters often emerge above the foliage, making them easily accessible to pollinators.

Inflorescence type and characteristics

- ✚ **Type of inflorescence:** Crown
- ✚ **Positioning:** Strawberry inflorescences emerge from the crown of the plant, typically at the ends of stems.
- ✚ **Clustered Arrangement:** Strawberry flowers are clustered together, with multiple flowers appearing in close proximity to each other. These flowers are attached to the receptacle, which is the thickened part of the stem to which the flowers are attached



Fig.2&3. Inflorescence type & characteristics of strawberry flower

- ✚ **Structure:** Each strawberry flower is small and delicate, typically white in color. It is pentamerous. The petals are often rounded or slightly ovate, forming a star-like shape when fully open.

✚ **Reproductive Organs:** Strawberry flowers are typically hermaphroditic, containing both male (stamens) and female (pistil) reproductive organs within the same flower. This allows for self-pollination, although cross-pollination by insects, particularly bees, is also common and beneficial for fruit development.

✚ **Fragrance:** Strawberry flowers often emit a sweet, pleasant fragrance, which can attract pollinators such as bees, butterflies, and other insects.

✚ **Seasonality:** Strawberry plants typically produce flowers in the spring, with the timing varying depending on the specific cultivar, climate, and growing conditions.



Fig.4.Bearing Habit of Strawberry Pollination:

Most strawberry varieties are self-fertile, meaning they can pollinate themselves. However, cross-pollination by insects such as bees can increase fruit set and yield. Pollination is essential for the formation of strawberries.

Anthesis

The process of opening of flowers in strawberry took place rather quickly. The calyx segments were noted to separate out gradually due to the inner pressure of the protruding corolla. On the day of anthesis, the buds became balloon shaped and petals appeared slightly loose. First of all, a small split in the center of the upper portion of corolla was noticed. The splits slowly appeared as adjacent petals were pushed out and it divided.



Fig 5 Anthesis of Strawberry

The whole compact corolla into two clearly visible portions. After that all the petals continued to stretch out and large portion of stamens and fully expanded pistil became visible. The flowers finally opened exposing all the stamens and fully expanded pistil. The period of anthesis varied from 6 am to 6 pm with the peak period of anthesis (38%) having reached between 10 am to 12 noon.

Dehiscence

The rate of anther dehiscence was recorded to be higher between 10.00 am to 12.00 noon. Further dehiscence started after opening of flower in all the plants studied. The peak period of dehiscence was recorded between 10.00 am to 12.00 noon (44.54%), followed by (16.36%) between 12.00 noon to 2.00 pm.



Fig.6. Dehiscence of Strawberry

The anthers lobes started bursting marginally and all the anthers did not dehisce synchronously, some of these started to dehiscence just after opening of flower.

Stigma Receptivity

For stigma receptivity through visual method, stigmas of different age groups i.e. two days and one day before anthesis, on the day of anthesis and one and two days after anthesis were observed with the help of hand lens. It is clear from the data in Table 3 that the stigma receptivity increased with the age of the flower bud up to the day of anthesis and after that it declined gradually. Mean stigma receptivity two day prior to anthesis was 1.16 per cent which increased to 30.53 per cent one day before anthesis and on the day of anthesis it was 93.93 per cent. Thereafter, stigma receptivity declined gradually to 82.01 per cent and 36.59 For stigma receptivity through visual method, stigmas of different age groups i.e. two days and one day before anthesis, on the day of anthesis and one and two days after anthesis were observed with the help of hand lens. It is clear from the data in Table 3 that the stigma receptivity increased with the age of the flower bud up to the day of anthesis and after that it declined gradually. Mean stigma receptivity two day prior to anthesis was 1.16 per cent which increased to 30.53 per cent one day before anthesis and on the day of anthesis it was 93.93 per cent. Thereafter, stigma receptivity declined gradually to 82.01 per cent and 36.59 For stigma receptivity



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Placentation

The placentation of a strawberry, like that of many other fruits in the Rosaceae family, is parietal. Parietal placentation means that the ovules are attached to the inner wall (parietal wall) of the ovary. In the case of strawberries, each small, seed-like structure embedded on the surface of the fruit, known as an achene, contains a single seed and is attached to the inner wall of the enlarged receptacle, rather than to the ovary wall itself. This arrangement allows for the development of multiple achenes on the receptacle, forming the characteristic surface of the strawberry fruit. Each achene corresponds to one ovary of an individual flower in the inflorescence.

Conclusion

Strawberry plants produce hermaphrodite or bisexual flowers during the period of February to June. Flowering continued for 90-95 days and floral buds took 16-20 days for its development. Opening of the flowers started at 6 am in the morning and continue up to 4 pm with the peak period between 10 am to 12 noon. The anthers started to dehiscence just after opening of the flowers and complete within 8-9 hours. the floral biology of strawberries is characterized by flowers with five white petals containing both male (stamens) and female (carpels) reproductive organs. Pollination, primarily facilitated by insects like bees, leads to the development of seeds within the carpels and the swelling of the receptacle to form the fleshy fruit. This unique reproductive process results in the formation of strawberries, which are composite fruits. Understanding the floral biology of strawberries is crucial for effective pollination management and maximizing fruit yield and quality in cultivation practices.