Study of Phenology of Euphorbiaceae: Euphorbia Milli Des Moul. A Medicinally Significant Shrub

Ms. Juli Tangsariya
Corresponding Author
Dept. of Botany,
Raghunath Girl's (P.G.) College, Meerut

Dr. Amita Sharma
Corresponding Author
Dept. of Botany,
Raghunath Girl's (P.G.) College, Meerut

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Ms. Juli Tangsariya
Dr. Amita Sharma

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Abstract

This paper deals with the investigation of phenological events of Euphorbia milii Des Moul.. Phenological studies were conducted on Euphorbia milii Des Moul. belonging to family Euphorbiaceae in potted shrubs . Euphorbia miliiis a perennial shrub with bright green leaves. Flowering period was found throughout the year. Although maximum flowering seems to occur during February to March. During field study bud initiation, bud opening, flowering season, anthesis time, anther maturation & dehiscence, pollination, fertilization, fruit maturation & seed set were observed and recorded for two consecutive years 2018-19 and 2019- 20.

Keywords

Phenology, Pollinators, flowering, Euphorbiaceae.

Introduction

It is introduced as an ornamental plant across the world. *E.milii* is succulent shrub. It belongs to family Euphorbiaceae. In family Euphorbiaceae there are about 300 genera and 7500 species that have their own unique medicinal properties. It is grown in warm climate. Common name of *E.milii* is crown of thorn or christ thorn. The deep red bracts and thorn referred to the crown thorn Jesus. At the time of crucification Jesus wore crown of thorn due to which red blood was coming from injured head.

The inflorescence is cyme modified as a cyathium in Euphorbia species. The flowers of *E.milii* are unisexual actinomorphic bracteate with superior, tricarpillary ovary. Placentation is axil. Latex is present. Male and female flowers are apatelous.

Phenological patterns of reproductive activities were analyzed for 2 years in the tagged plants in the field. The dates were recorded during the field observations.

According to T. Haevermans (2004) *Euphorbia milii* Des Moul. is listed in the IUCN list of threatened species. The flowers are small bearing petal like bracts of red, pink or white color. The flowering was observed all year round. *Euphorbia milii* is used as pesticide effective on mollusc and thus it is a natural alternative to pest control. So it is helpful in snail control.

It is woody succulent and shrub. *Euphorbia milii*has been used as a medicinal shrub. Medicinal use as pesticide and the WHO has recommended the usage of *Euphorbia milii* in aiding snail control. it plant use for humans when it comes to developing drugs for ailments. In this family Euphorbiaceae there are about 300 genera and 7,500 species that have their Own unique medicinal values.

Many species of economic potential are present in the family hence contribute the floristic wealth of tropical and subtropical countries of the world (Condamudi et al, 2009).

Major component of *Euphorbia*is the milky; that contain latex are sterols, terpinoids, vitamins, insecticides and anticancerous properties (Martin et al.,2005)

For the antimicrobial activity;study of hexane, ethyl acetate, acetone, methanol and water extracts of flowers of *Euphorbia milii* were performed on gram positive bacteria, *Bacillus subtilis, Staphylococcus aureus*, and gram negative bacteria *Escherichia coli Proteus vulgaris* by using cup plate method (Devanaboyina Narendra at., al. 2015).

According to T. Haevermans,(2004) *Euphorbia milii* in the IUCN list of threatened species.

Materials and Methods

Euphorbia milii was grown in Ragunath Girl's (PG) College, Meerut.The phenological investigations were recorded in college. *Euphorbia milli* plant was observed on daily basis. Photographs were captured and slides were prepared. Floral visitors and pollinators were recorded during the entire flowering period by capturing picture.

Phenology

Phenological observations were recorded daily after initiation of bud. Tagging is done. All the events from flowering (bud initiation to fertilization) to fruiting (period between fruit maturation until seed dispersal) on the tagged plants. During peak periods of flowerings and fruiting observations were recorded daily.

Floral pollinators

Observations were made on daily basis. As during full blooming period, the insects visit

the flower to collect the nectar and pollen. Common pollinators observed during study like were ants, bee, butterfly, honeybees etc.

Results and Discussions

Phenological study of *Euphorbia milii* Des Moul.

Bud Initiation

Early bud initiation usually take place during February and March and remain dormant for 5-6 days covered by completely closed bracts which protected the flower bud from several harmful agents. Color of buds are green.(Fig. A) Day 1

Bud opening

The flower blooms after 5-7 days, in the morning at 9 - 11 am. Color of bracts are yellowish (Fig –B, C)

Flowering season

Flowering season is prolonged from Feb to April in which maximum flower formation takes place. Even flowers arise continuously but at high temperature flower growth was low. Inflorescence is cyathium in this plant. Two bracts are present. Bract colour are red . 8-10 stamens are present. Five nectary are present. (Fig. E)

Anthesis

The anthesis period is morning 9am to 12 pm. Colour of bracts are red (Fig.D)

Anther maturation and dehiscence

Recently, Singh (2009) has also studies the reproductive biology and found that anther reach to maturity before anthesis. It means protandry condition found in this plant.Anthers are bilobed. Sometimes, anther dehiscence takes place 3-4 days before anthesis as it was observed that in many cases when the bud is closed pollen are attached to the style. Dehiscence of anther take place through pore which are morphologically basal in position but acquired apical position due to inversion of anthers. (Fig. –G)

Pollination

Only cross pollination occurs in this species after 5-6 days of anthesis as observed during the field studies. Pollination occurred mainly by insects like honey bee, ant, butterfly etc. These vectors visit flowers for their forage and carry pollen from one place to another because of the red color of bracts and basal nectary, the insect visits are observed. (Fig. –F)

Fertilization

Interval between pollination and fertilization was 8-12 days after anthesis. The marker for fertilization is the change in color of bract. Bract change from green to red color. The receptivity of stigma remains for 2-4 days and it depends upon the climate.

Fruit formation & maturation

Between the fertilization and seed maturation a long time take place. It is observed that seeds mature in May to June. (Fig. K, L)

Seed germination

Seed dispersal take place between June to July with the mechanism of antimophilly and enimophilly but these seeds remain buried in humas soil in dormant stage. The germination takes place in optimal conditions as the weather condition e.g. January to February.

The pollinators

Pollination take place through insect (anemophilly), entimophillly. During field study pollinators like, ants, bees, butterfly etc. were recorded .(Fig.-F)

Phenological cycle of flower of *Euphorbia milii* (2 year)

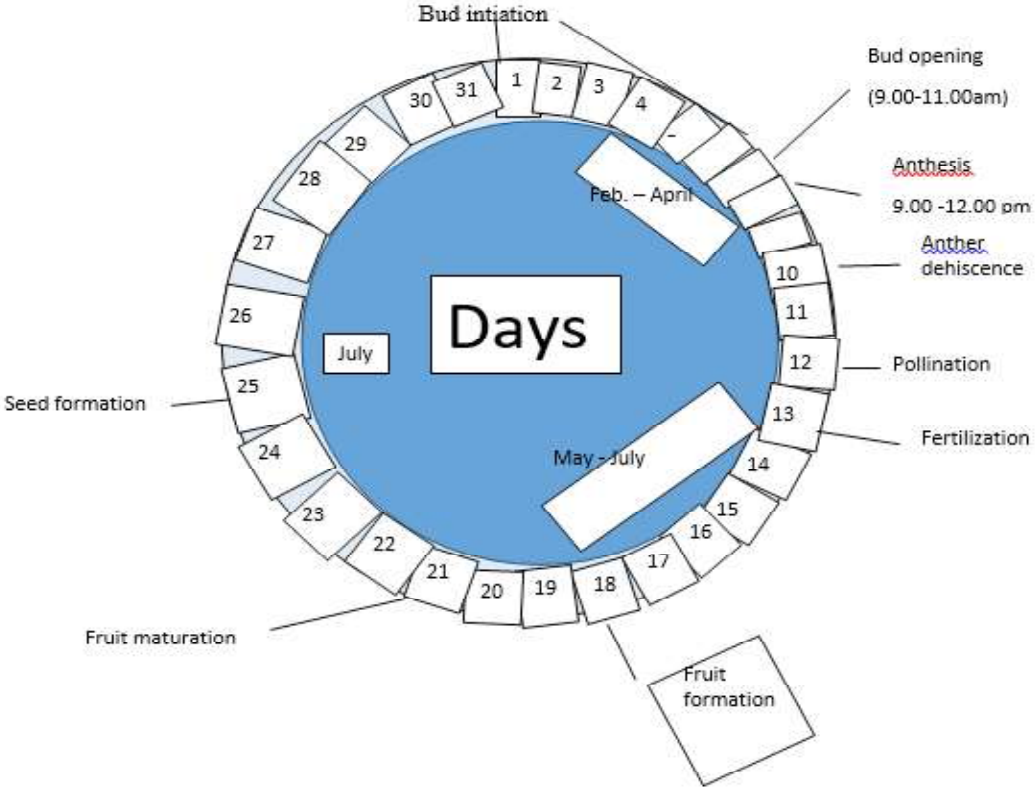
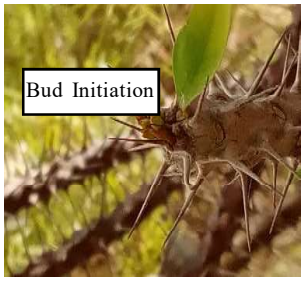


Plate 1 - Plant phenological pictures



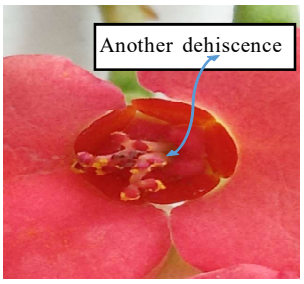
A - Bud initiation (Day- 1)

B – Bud mature (Day- 4)

C – Bud opening (Day – 6) 9.00 am

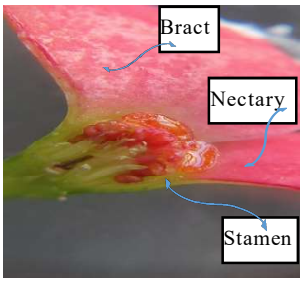
D – Inflorescence (day-7) 12.00 pm

E- Full bloom of inflorescence(Day- 8)



F – Anther maturation & dehiscence(Day – 10)

G- Pollination (Day -9) 10.00 am



H – L.S. of cyathium

K - Fruit (Day - 15)

L - Mature fruit (Day – 20)

Fig – showing the different stages of phenology of flower of *E.milii*

Conclusion

Plant phenology is the life cycle of a plant from seed germination to senescence or death. It is concluded that in the plant species life cycle vary season to season because flowering timing is different in the plants. Floral phenology is important for scientists, farmers and researcher for maximum reproduction and yield of a crop and endangered species. The insects are very important pollinator in E. Miilii according to observations. It is observed in this study that two types , one chief pollinator first is anemophily and second is entomophily. The family bears secretary nectar glands a characteristic feature. Pollinators are attracted easily by colored bract and nectar glands in cyathium inflorensece . Flowering phenology is an important feature in the life history of a plant as seasonal fluctuations in temperature and precipitation studied showed that warm climate helps in vigorous flowering. Further studies are required to study the phenology in a large ecosystem.

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