BOTANICA LITHUANICA 2007, 13(1): 9–12

FLOWERING SEQUENCE DURATION AND FRUIT PRODUCTION IN THE SPECIES OF *EMILIA* (*SENECIONEAE*, *ASTERACEAE*)

Olubukola Adedeji

Obafemi Awolowo University, Botany Department, Ile-Ife, Osun State, Nigeria; e-mail oadedeji@oauife.edu.ng

Abstract

Adedeji O., 2007: Flowering sequence duration and fruit production in the species of *Emilia* (*Senecioneae*, *Asteraceae*) [Emilijos (*Emilia*) genties (*Senecioneae*, *Asteraceae*) augalų žydėjimo seka, trukmė ir derėjimas]. – Botanica Lithuanica, **13(1)**: 9–12.

The flowering sequence duration, fruit production and percentage of fruit-set per capitulum of the three *Emilia* Cass species in Nigeria were investigated. There were similarities, differences and overlaps in the duration of the different stages of the flowering phase among the three species. Flowering of *E. praetermissa*, the allotetraploid hybrid of *E. coccinea* and *E. sonchifolia*, starts faster than of its parental species. Fruit production performance was found to be associated with a number of vegetative and reproductive characteristics of *Emilia* plants. Fruit production and percentage of fruit-set per capitulum were highest in *E. praetermissa*. *E. coccinea* achenes had a shorter post-pollination period on the plant. Fruit set and production of *Emilia* species are discussed.

Keywords: *Emilia*, flowering phase, fruit production, capitulum, reproductive characteristics.

INTRODUCTION

Flowering is a phase of development in plants, regulated by external (and sometimes internal) factors. Of all phenological events in plants, the onset of flowering is considered the most significant. This is because it marks the transition of the plant from a vegetative to a reproductive mode (Black & Edelman 1970; Lawn et al., 1995). Fruit and seed production is important because, according to Janzen (1969), it provides the plant with the prominent functions of dissemination, genetic recombination and dispersal for colonization.

The condition and exposure of a plant during the flowering and fruiting phase strongly determine the quality of fruits produced and the seeds set. In fact, Burtt (1975) emphasized that the demands of the flowering and fruiting phases of a plant interact. Adedeji (2005) highlighted the protectoral role of some floral parts in the flowering and fruiting phases of the plant life. The call for more studies, earlier solicited for by Burtt (1975) on the co-evolution of these two phases, has remained very relevant even now for a deeper understanding of the reproductive strategies in the array of plants dotting our terrain.

Emilia praetermissa Milne-Redhead is an allotetraploid hybrid (a hybrid and a polyploid of E. *coccinea* (Sims) G. Don. and *E. sonchifolia* (L.) DC.) (Olorode & Olorunfemi, 1973). The genus *Emilia* is represented in Nigeria and West Africa by these three species (Hutchinson & Dalziel, 1963) representing two different ploidy levels, i. e. that is the diploids and the polyploids.

The objectives of this research are to reveal the duration of the flowering sequence of three species of *Emilia* representing two different ploidy levels and also to put on record the fruit production potentials of the species. The quality of fruits produced by the different

species is also being elucidated with a view to identifying any plant survival strategies associated with fruit production and quality of fruits in *Emilia*.

MATERIALS AND METHODS

Assessment of flowering sequence duration in *Emilia* species

Seeds of the studied *Emilia* species were collected from the wild in the Southwestern part of Nigeria and planted in labelled research bowls in the screen house on the same day for all the species. Fifty seedlings per species were transplanted to the experimental garden at the Obafemi Awolowo University, Ile-Ife, Osun State, Nigeria at the 3-leaf stage. Other 50 seedlings per species were transplanted one per bowl and left in the screen house. The duration of the flowering events in the experimental garden and screen house were regularly monitored, and the observations recorded. This was done at the different developmental stages of the plants. The experiment was repeated three times.

Randomly selected plants (25 per species) were marked with labels for regular entries in the garden and screen house. The collected data included: date of sowing or transplanting, date of appearance of flower buds, the period (in days) to flowering (anthesis), period between flower opening and flower reclosure (fertilization of florets), period between flower reclosure and the appearance of ripe fruits (achenes), pappus on the capitulum (post-pollination period).

Estimation of fruit production performance and assessment of fruit quality in *Emilia* species

An overall estimation of fruit production for each of the investigated species per plant was made by collecting the data on:

(a) the number of branches per plant;
(b) the number of terminal capitulum-clusters per branch;
(c) the number of capitula per terminal cluster per branch;
(d) the number of set (filled) fruits per capitulum.

For this investigation *Emilia* plants with luxurious growth at the 50 % blooming stage were employed. Values for fruit production indices in the species of *Emilia* were calculated according to the formula $I_F = (a) \times (b) \times (c) \times (d)$ according to Ayodele (1999). The mean of the fruit production potential index obtained for each plant was estimated. Collected achenes were inspected for mature fruits filled with embryo. *Emilia* fruits (achenes) were classified into two groups for the purpose of this study, namely – the large (2.5–5.5 mm length) and small (0.5–2.5 mm) fruit types (Ayodele, 1987). The large fruit type was assessed by visual and physical observation of fruit plumpness. Each fruit was held between the thumb and the first finger, or by means of a pair of forceps, and pressed to feel whether fruits were filled or empty. The smaller fruit type was observed in batches under a dissecting microscope by means of a pair of forceps and pressed to feel whether fruits were filled or empty. Filled and empty or shrivelled fruits were separated and counted by means of a tally counter; 2000 fruits per species were assessed.

The fruit set values for each of the species were obtained as the percentage of all examined fruits filled with embryos. The observed fruits were obtained from at least 25 randomly selected ripe capitula per species from both the screen house and the garden. The mean values of all attributes were calculated.

RESULTS AND DISCUSSION

There were similarities, differences and overlaps in the duration of flowering sequence among the different species (Table 1). Number of days to flowering initiation was lowest in *E. praetermissa*, the tetraploid hybrid

Table 1.

Flowering sequence duration in the studied species of *Emilia*

Species	Flowering initiation (days)	Flowering initiation to flower opening (days)	Flower opening to flower reclosure (days)	Flower reclosure to pappus appearance (days)
E. praetermissa	51–55	6–8	3–4	8–9
E. coccinea	65–84	10–13	4–8	5–6
E. sonchifolia	54–62	8–9	4–5	8–9

Table 2.

Mean values of vegetative and reproductive attributes associated with fruit production in *Emilia*

Species	Mean number of stem branches per plant	Mean number of terminal capitula clusters per branch	Mean number of capitula per terminal cluster per branch	Mean number of set fruits per capitulum
E. praetermissa	3.80	2.80	4.90	96.00 (97.25)*
E. coccinea	3.20	1.80	4.45	68.00 (92.70)
E. sonchifolia	3.20	1.70	7.10	39.00 (41.70)

(Table 1), followed by E. *sonchifolia*, while *E. coccinea* had the highest number of days to flower initiation. Flower initiation to flower opening (anthesis period) and flower opening to flower reclosure (pollination period) also follow the same trend with *E. praetermissa* having the lowest number of days. However, the number of days between reclosure of flowers and appearance of pappus (post-pollination period) is shortest in *E. coccinea*. This has some reproductive implications. Florets are pollinated during flower opening, and post-pollination sign is the reclosure of the involucres (ADEDEJI, 2005). It is during this reclosure, before pappus appearance, that fruits from the pollinated florets mature but the phyllaries remain green.

BURTT (1977) itemized two major factors necessary to meet the demands of the fruiting phase; namely, the protection of the maturing achenes and their adequate dispersal. It is probable that the lower fruit set observed in *E. coccinea* as compared with *E. praetermissa* and *E. sonchifolia* (Table 2) is due to lower number of days for flower reclosure signifying lesser number of days for the development and protection of the maturing achenes before pappus appearance leading to the dispersal of many shrivelled fruits.

E. praetermissa, the tetraploid hybrid, was observed to have the shortest flowering initiation period and generally the best flowering sequence attributes (Table 1). According to SWANSON (1968), the increased size of certain organs, particularly seeds, which accompanies polyploidy, helps in the process of stabilization and establishment in new habitats, since it increases seedling vigour. The trend observed in the garden and screen house correlates with the observations made in the wild. There is hardly any time of the year that a population of *E. praetermissa* cannot be found flowering in almost all habitats. The species was observed capable of thriving at locations with minimal moisture status and even in waterlogged areas, producing its flowers relatively earlier than the other species. They are thus readily located on lawns, in the bushes and among ornamental plants as weeds throughout the year. This success suggests an "all purpose genotype" earlier highlighted by BAKER (1965). SWANSON (1968) reiterated that many individual polyploid genotypes have phenotypes which are able to tolerate a wide range of environmental conditions and are thereby referred to as "general purpose genotypes".

The type of fruits produced in *Emilia* is achenes. Fruit production performance in the species investigated was observed to be associated with a number of vegetative and reproductive characteristics of the plant. These include the incidence of stem branching and number of such branches in a plant, the number of terminal capitulum clusters on a plant and the number of capitula per terminal cluster per branch (Table 2).

Achenes that contained embryos were considered "filled" or "set" (i.e. of good quality). These were hard to touch and plump. Achenes without embryo were shrivelled and chaffy and contained no embryos when dis-

Table 3.

Index of mean fruit production potential and percentage of fruit-set in *Emilia*

Species	Mean	Percentage of fruit-set		
		Examined number	Fruit-set percentage	Growth form
E. praetermissa	7.200	2.000	97 %	Erect herb
E. coccinea	2.224	2.000	69 %	Erect herb
E. sonchifolia	2.808	2.000	90 %	Erect herb

sected. AYODELE (1999) in his work on the genus *Vernonia* reported that many of the herbaceous species were observed to be among the species producing good quality (i.e. filled) achenes. Generally, a high fruit-set percentage is advantageous for plants to survive and reproduce in moisture-distress situation. This is a property of weedy colonizers (BAKER, 1965). *E. praetermissa* is the most prolific fruit (achenes) producer with a higher incidence of well-set fruits on individual plant basis, followed by *E. sonchifolia* and *E. coccinea* (Table 3).

The high fruit production and quality observed in *E. praetermissa*, the allotetraploid hybrid, is of high adaptational value. It contributes largely to the success of the plant in a wide environmental range.

REFERENCES

ADEDEJI O., 2005: Studies on the reproductive biology of *Emilia* (*Asteraceae*): flowering and post-pollination developments in the capitulum. – Comp. News., **42**: 115–124.

AYODELE M. S., 1987: Cytological and Morphological Studies on Some Species of *Vernonia* Schreb. in Nigeria (Thesis). – Ile-Ife.

AYODELE M. S., 1999: Studies on the reproductive biology of *Vernonia* Schreb. (*Asteraceae*). V. Fruit production and fruit-strategies among growth forms. – Comp. Newsl., **34**: 9–18.

BAKER H. G., 1965: Characteristics and modes of origin of weeds. – In: BAKER H. G., STEBBINS G. L. (eds.), Genetics of Colonizing Species. – New York.

BLACK M., EDELMAN J., 1970: Plant Growth. – London.

BURTT B. L., 1975: Patterns of structural change in the flowering plants. – Trans. Bot. Soc. Edinb., **42**: 133–142.

BURTT B. L., 1977: Aspects of diversification in the capitulum. – In: HEYWOOD V. H., HARBORNE J. B., TURNER B. L. (eds.), The Biology and Chemistry of the *Compositae*, **1**: 4–59. – London.

HUTCHINSON J., DALZIEL J. M., 1963: Flora of West Tropical Africa (2nd ed.). – London.

JANZEN D. H., 1969: Seed-eaters versus seed size, number, toxicity and dispersal. – Evolution, **23**: 1–27.

LAWN R. J., SUMMERFIELD R. J., ELLIS R. H., OI A., ROBERTS E. H., CHAY P. M., BROUWER J. B., ROSE J. L., YEATES S. J., 1995: Towards the reliable prediction of time to flowering in six annual crops VI. Applications in crop improvement. – Expl. Agric., **31**: 89–108.

OLORODE O., OLORUNFEMI A. E., 1973: The hybrid origin of *Emilia praetermissa* (*Senecioneae*: *Compositae*). – Ann. Bot., **37**: 185–191.

SWANSON C. P., 1968: Cytology and Cytogenetics (2nd ed.). – New Jersey.

EMILIJOS (*EMILIA*) GENTIES (*SENECIONEAE*, *ASTERACEAE*) AUGALŲ ŽYDĖJIMO SEKA, TRUKMĖ IR DERĖJIMAS

Olubukola ADEDEJI

Santrauka

Straipsnyje pateikiami duomenys apie Nigerijoje (Vakarų Afrika) paplitusių 3 *Emilia* genties rūšių augalų žydėjimo seką ir trukmę, potencialųjį sėklų derlių ir subrendusių vaisių kokybę.

Trumpiausias laikas iki žiedynų susidarymo pradžios būdingas tetraploidinei hibridinės kilmės rūšiai *E. praetermissa*, kiek ilgesnis periodas būdingas *E. sonchifolia*, o iki *E. coccinea* žydėjimo pradžios praeina daugiausia dienų. Tokie patys dėsningumai nustatyti ištyrus šių augalų žydėjimo trukmę, tačiau žiedams peržydėjus skristukas greičiausiai išauga ant *E. coccinea* vaisių.

Nustatyta, kad *E. praetermissa* ne tik greičiausiai pradeda žydėti, bet ir subrandina daugiausia vaisių. Galima teigti, kad dėl tokių savybių šios rūšies augalai yra plačiai paplitę, o nuo genetinių savybių priklauso jų gebėjimas įsikurti įvairiose buveinėse. Iš tirtų augalų kiek mažiau vaisių subrandina *E. sonchifolia*, o mažiausia – *E. coccinea*.