BULL. BOT. SURV. INDIA
Vol.50, Nos.1-4 : pp.57-66, 2008

FLORAL BIOLOGY VIS-À-VIS POLLINATION ECOLOGY OF *ABROMA AUGUSTA* (L.) L. F.

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ABSTRACT

Floral biology with respect to pollination ecology of *Abroma augusta*, a traditionally used medicinal plant, has been worked out. The pollination is entomophilous, performed by two species of *Diptera*, one belonging to *Agromyza* and the other to *Melanagromyza*. The former one is overwhelmingly dominant in the visitor-population and found to be much more active within the flower in comparison to the latter, which is somewhat lethargic. Pollinators are primarily attracted by sapromyophilous means. The flower is pendulous and semi-trap type with lateral windows and window-panes. Internally, the flower is differentiated into the androecial and gynoecial chambers separated by a staminodial cup. The plant is obligatorily entomophilous, even for autogamy. A number of floral rewards are offered within the androecial and gynoecial chambers for retention and movement of the pollinators. Pollen deposition over the pollinators is nototribic.

INTRODUCTION

Abroma augusta (L.) L. f., commonly known as the Devil's Cotton, is a large shrub with slender, shaggy branches, belonging to the family Sterculiaceae. In India, the plant is referred to as the 'Ulatkambal' in Hindi and Bengali vernaculars. It is widely distributed throughout the hotter parts of India, including Sikkim (900 m) and Khasia hills (1200 m). Outside India, the plant is known to occur in Nepal, Bhutan, China, Philippines, Indonesia and Malaysia (Hooker, 1872; Willis, 1973; Malick, 1993). Ulatkambal is a valuable medicinal plant and has long been used in our indigenous system of medicine (Kirtikar and Basu, 1999; Joshi, 2000). The commercial drug, derived from woody roots, is considered to be a uterine tonic and an emmenagogue. Powdered roots act as abortifacient and anti-fertility agent. Leaves are also reported to be useful in diabetes, rheumatism and sinusitis. Seeds are used in the control of arteriosclerosis. Due to the above-mentioned medicinal properties, *A. augusta* finds usage in a number of modern medicines, like the uterine tonics, Mensural (Ralson Remedies), Abort (Hahnemann Pharmacy and Laboratory), Mensolin (Hahnemann Laboratory Ltd.), Gynical (Allen), Menstrol (Allen), etc. and Leucocure (Allen) which is used for the treatment of leucorrhoea. It is also the source of some homoeopathic medicines like Abrotanum, Abroma Augusta, Abroma Radix, etc.

An extensive survey conducted throughout West Bengal, during the present work, only a limited number of individuals have been found to grow in the natural habitats. In view of that, appropriate strategies for conservation and successful propagation of this valuable medicinal plant are most essential. Proper understanding of the reproductive biology is required for the formulation of such strategies. Therefore, investigation of its pollination biology was undertaken.

So far, there is no report of any work done on the pollination biology of *Abroma augusta*, excepting preliminary observations by van der Pijl (1953) in Java. He mentioned Milichiidae as floral visitors of *A. augusta* there. The present paper deals with the floral biology vis-à-vis the pollination ecology of *A. augusta* in plains of West Bengal.

Date of Publication : 15 September, 2009

MATERIAL AND METHODS

Studies are based on nine plants growing in wild state, in and around Burdwan town, within an area of approximately 6 sq km. Also, a few plants were grown in the garden. Observations were made throughout the flowering season at various times of a day. Bagging experiments were performed to ascertain the nature of the floral attractant and the role of the floral visitors. Bagging of flowers was done with pieces of a fine silken cloth that allowed aeration but prevented the entry and exit of visitors. To identify the source of floral odour, the 'closed vial test' was performed as per the method of Faegri and van der Pijl (1979). For confirmation of apparently secretory nature of tissues including osmophores, neutral-red staining was carried out (Esau, 1965; Endress, 1994). The whole flower was dipped into a 0.05 % aqueous solution of the stain and positive reaction was taken as confirmation for the secretory nature of the concerned tissues. To determine whether pollen is the sole reward provided by an *Abroma* flower to its pollinators, the behaviour of pollinators in emasculated flowers was closely observed. Emasculation was done prior to anther dehiscence with the help of a fine forceps, taking care not to injure any other floral part. Observations were made using a 10× hand-lens and also with the help of a WILD M3B Leica stereobinocular microscope and a Leica DM LB bright-field microscope. Photomicrographs were taken with the help of Leica MPS–60 Photoautomat, using Fujicolor Crystal 100, 35 mm colour films, under strong incident light. Floral visitors were captured at different times of the day in different months of the flowering season with a hand net of appropriate mesh size. They were preserved both in dry state and in 70% ethanol. Visitors were identified with the help of the scientists of the Zoological Survey of India, Ministry of Environment and Forests, Govt. of India and of the Zoology Department of the University of Burdwan.

OBSERVATIONS AND DISCUSSION

The flower : The inflorescences are few-flowered (three- to five, mostly four) scorpioid cymes **(Pl. 1, A)**. Flowers are drooping owing to soft, slender pedicels. Flowers are complete, bisexual, hypogynous and pentamerous **(Fig. 1A)**. Calyx consists of five, green, lanceolate, free sepals, typically 1.9 cm × 0.7 cm. Each of the five petals of the corolla is differentiated into two distinct parts – a basal part (petal base) and a laminar portion **Fig. 1C)**. The two parts of a petal are so unlike each other that to a casual observer, they seem two entirely different organs.

The laminar parts of the petals are soft, thin and remain twisted in bud condition. Those are scoop-like in appearance, maroon in colour and a little hairy. Each, typically measuring 3.2 cm × 2 cm, is ovate in major part and then gradually becomes narrow to a cochleate claw-like structure at the point of attachment with the petal base. A hinge-like configuration is thereby formed at the junction of each petal base with its lamina. This kind of laminar attachment together with the pendulous nature of the flower cause the laminar parts to flutter freely at the slightest touch of wind. Hairs on the lamina are non-glandular and of two types – the marginal ones are slender, flexible and violet in colour while those distributed over the general surface are short, stiff and colourless. The periclinal walls of the epidermal cells are papillate, imparting a scabrate, velvety look to the laminar surface.

Each petal base is again differentiated into two parts, an elliptical, thick, dark-maroon, button-like smaller proximal part, measuring 1.5 mm in length and 3 mm in width and a larger ovate, keeled distal portion, 6 mm long and 5 mm wide with pronounced attenuation at the middle. Both the apical and lateral margins of a petal base are strongly reflexed and dark-maroon in colour while the middle portion is creamy-white and translucent. The maroon tissue along the margins of petal bases is spongy in texture and seems to be secretory in activity. The wide proximal and distal parts of adjacent petal bases laterally touch each other without any fusion, thereby assuming a configuration in which an oval opening, approx. 1.5 mm × 2 mm, is left between two

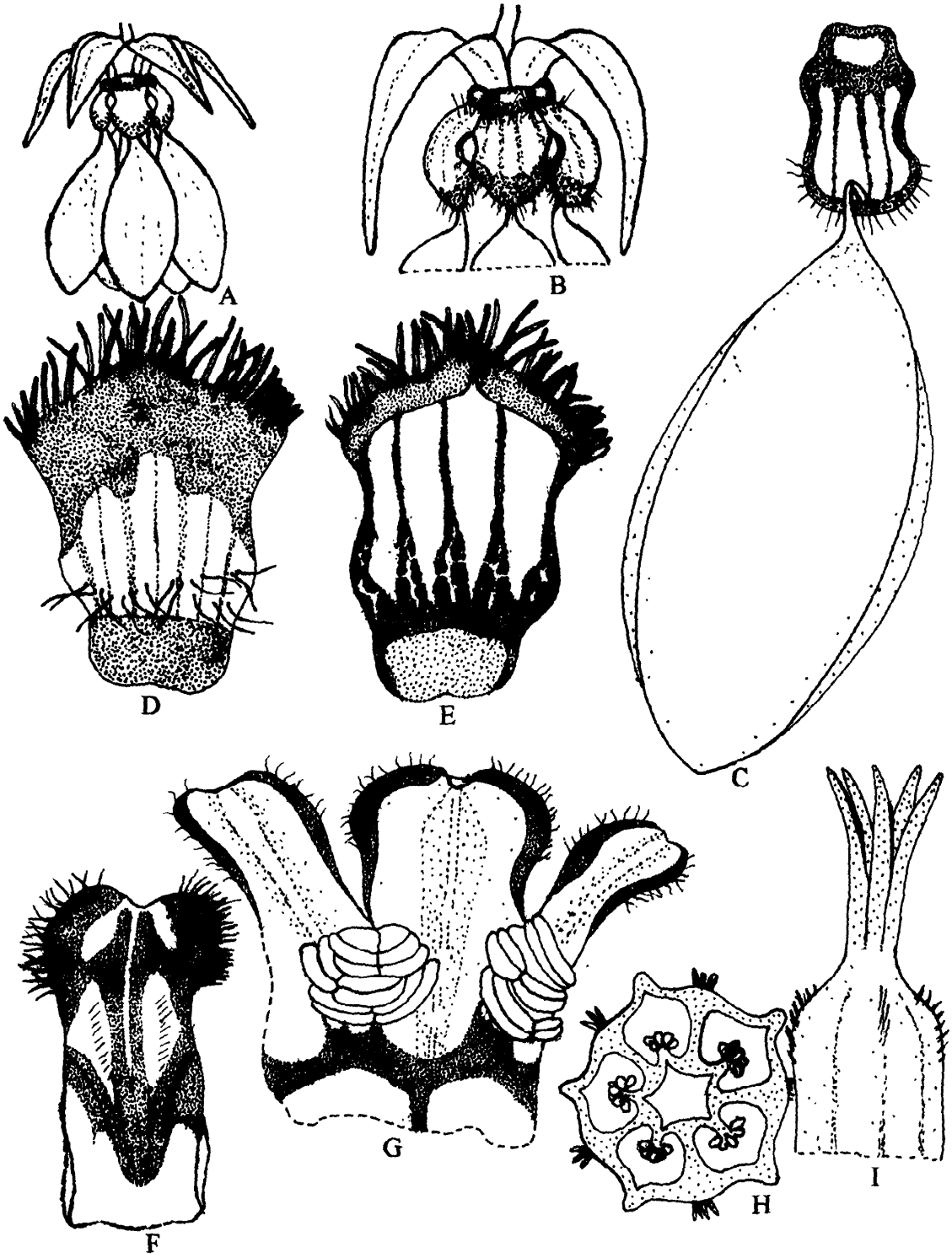


Fig.1: **A.** A flower, × c. 1; **B.** Diagrammatic representation of the enlarged view of a flower (petals partly chopped off) showing the window openings between adjacent petal bases and the window-panes × c. 2.5; **C.** Enlarged view of a petal showing differentiation into the basal part and the laminar portion attached together by the cochleate, hinge-like structure × c. 3.5; **D.** Details of the outer side of a petal base ×7; **E.** Details of the inner side of the petal base bearing the osmophore at its proximal portion ×7; **F.** Details of the inner view of a staminode × 10; **G.** The androecial cup as seen from outside comprising outwardly reflexed petaloid staminodes alternating with groups of fertile stamens × 10; **H.** T. S. of ovary × 15 & **I.** The gynoecium (configuration of stigma is rather unusual because it is that of an unpollinated one at its post-receptive phase) × 11.

adjacent petal bases (**Fig. 1B**). On its inner surface, each petal base bears five parallel, longitudinally running maroon ridges that form a contrast against the creamy-white translucent background. The maroon ridges are apparently uniform. However, under a stereobinocular microscope, each ridge is found to be constituted of two distinctly rugulate structures, convoluted and mutually parallel (**Pl. 1C**). The maroon ridges are secretory in nature. Histologically, the ridge tissue is made up of a layer of epidermal cells followed by a 3- to 4-cells thick hypodermis. The periclinal wall of each epidermal cell is papillate. The hypodermal cells are thin-walled, isodiametric and with maroon protoplasmic contents. The outer and inner sides of the distal extended portion and the outer side of the central constricted part of each petal base are densely covered with glandular trichomes of various lengths. Those are unicellular, thin-walled, but appear quite turgid due to the presence of a violet, sticky fluid inside them (**Pl. 1D**). Some of them are quite long with somewhat capitate ends.

Inner to corolla, the androecium is represented by a cupular structure. At each junction of a petal base with the androecial cup, there exists a spongy tissue, bright orange in colour (**Pl. 1E**). It is composed of thin-walled parenchyma with yellow to light orange contents. The androecium, as a whole, comprises five antipetalous groups of fertile stamens alternating with five antisepalous petaloid staminodes. The staminodes and the stamens are proximally fused with each other forming the androecial cup (**Pl. 1F, G; Figs 1F, G**). The individual staminodes are somewhat obovate in shape, measuring 0.5 cm × 0.25 cm, and slightly emarginate at apex with their distal free parts outwardly reflexed. Staminodes are whitish with the distal margins bearing a maroon border. Also, the inner face of each staminode bears violet, glandular trichomes that are sparsely distributed over the general surface but quite dense near the margins, particularly in the apical region. Each staminode has a longitudinal central furrow on the inner face accompanied by two maroon ridges, one on either side, converging towards the base of the staminode. The tissue of these maroon ridges is also secretory in nature.

The number of fertile stamens per group is typically three, rarely two or four. The free recognizable part of the filament of a stamen is rather short, less than a millimetre in length, and reflexed, leading to an inverted disposition of the anther. Anthers are pale yellow in colour, bilobed and more or less sagittate, with the lobes quite divergent. The connective tissue is broad and somewhat brittle in texture. Each anther lobe is provided with a dorsal slit of dehiscence.

The gynoecium is syncarpous with five carpels. Ovary is superior and cylindrical, ± 2 mm in length. The outer surface of the ovary bears ten longitudinal ridges, five dehiscence-ridges alternating with five minor ridges. Each minor ridge is with a tuft of glandular hairs in its upper portion. Hairs are multicellular, yellowish in colour and appear quite juicy under microscope. Internally, the ovary is five-chambered. Each of the ovary chambers contains many ovules on axile placenta (**Pl. 1H; Figs 1H, I**). Central portion of the ovary is hollow. The style is extremely reduced (less than a millimetre in length) and bears five slender stigmatic lobes, each lobe a little more than a millimetre in length. Stigma is of wet type and papillate with unicellular papillae.

Floral visitors : The population of floral visitors, as captured at different times of the day in different months of the flowering season, was found to be represented by two species of Diptera, one belonging to the genus *Agromyza* and the other to *Melanagromyza*, of the family Agromyzidae. The former is overwhelmingly dominant in the visitor-population and found to be much more active within the flower in comparison to the latter, which is somewhat lethargic.

Flies arrive very early in the morning. Their number gradually increases till late morning and in typical instances, ultimately ± 50 flies are found to gather in and around a flower.

That the floral visitors captured are the pollinators of the plant was inferred from the following observations. The time of arrival of the visitors in the flower corresponds with the earliest time when pollen grains are lodged

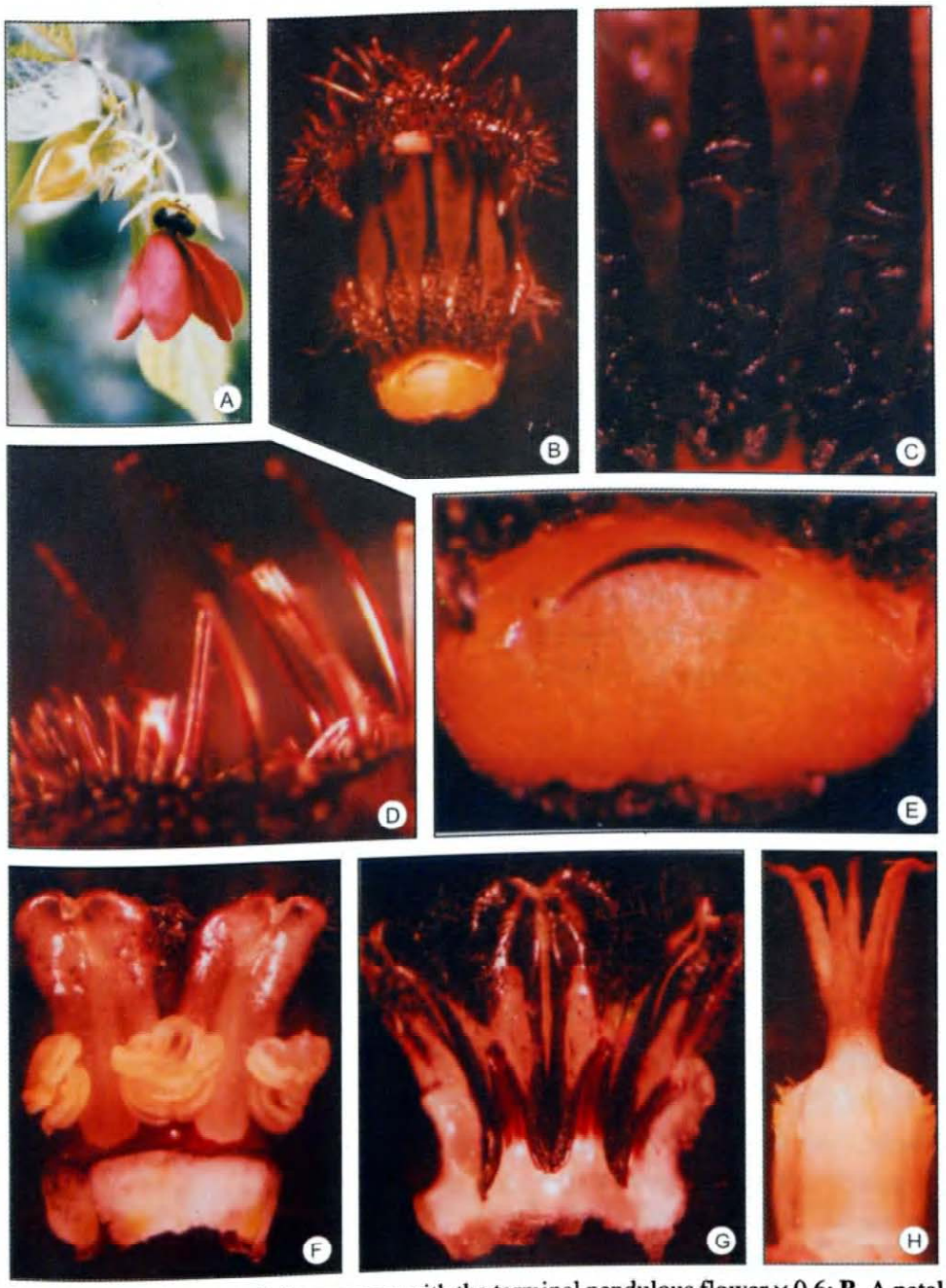


Plate 1 : A. Scorpioid cymose inflorescence with the terminal pendulous flower × 0.6; **B.** A petal base, inner side, showing five parallel, longitudinally running maroon ridges that form a contrast against the creamy white translucent background tissue (window-panes). Unicellular glandular trichomes densely covering the distal extended part and the spongy orange tissue (osmophore) at the proximal part are visible × 7; **C.** Middle portion of the petal base in fig. 2 magnified, showing maroon ridges, each comprising two distinct rugulate secretory structures that are convoluted and mutually parallel × 30; **D.** Distal part of the petal base magnified, showing the details of thin-walled, unicellular, glandular trichomes of various lengths, each appearing quite turgid due to the presence of a violet, sticky fluid inside × 28; **E.** Magnified view of the osmophore at the proximal part of the petal base in fig. 2 × 30; Fig. 6. Portion of the androecial cup (outer side) showing groups of fertile stamens (three per group) alternating with the petaloid staminodes. Reflexed filaments bearing pale yellow, quite divergent lobes of sagittate anthers with dorsal slit of dehiscence are visible × 9; **G.** Portion of the androecial cup (inner side) showing three obovate staminodes with their maroon, outwardly reflexed free distal parts, violet glandular trichomes sparsely distributed over the general surface but quite dense near the distal margins and a longitudinal central furrow accompanied by two basally convergent maroon ridges one on either side are visible × 9 & **H.** Gynoecium showing the five-lobed stigma, extremely reduced style and cylindrical ovary bearing five longitudinal dehiscence-ridges alternating with five minor ridges. Each minor ridge distally showing a tuft of multicellular juicy hairs. Curvature of the stigmatic lobes is rather unusual because it is that of an unpollinated one at its post-receptive phase × 11.

onto the stigmatic lobes. Also, visitors were seen moving about in the androecial and gynoecial chambers of the flower, the dorsal surface of their head and thorax profusely smeared with yellow pollen grains. Finally, the role of the visitors as pollinators was ascertained by bagging several flowers early in the morning prior to their arrival. No fruit set occurred in any of such cases. On examination of the stigmatic lobes of a few of such flowers under a compound microscope, no pollen deposition could be detected. Therefore, it was concluded that no pollination occurred in such cases.

Protection of the pollination organs as well as the pollinators against rain : In this part of the world, the plant flowers from April to November, with its peak flowering during the months of August and September. As the peak flowering time of the plant coincides with the rainy season, its flowers show certain adaptations, for protection of the pollination organs against wetting. The pendulous nature of the flower, which is an outcome of the pedicel being very soft and slender, may primarily be an adaptation to protect the pollination organs against rain. Also, the hairy, velvety texture of the various floral parts provides a water-resistant character to the flower. The extended distal portion of each petal base also helps in shielding the fertile stamens from rain.

Regulation of the entry of pollinators : The pendulous nature of the flower and the fluttering laminar parts of the petals create an obstacle to the entry of the visitors directly to the floral centre. This obstruction provokes the visitors to enter through the lateral window-openings between the petal bases, which constitute the legitimate route.

Visitation route and the semi-trap structure of the flower : In flowers of *Abroma augusta*, a small chamber (androecial chamber) is formed by the narrow space between the inwardly concave petal bases and the outwardly reflexed androecial cup. The flies enter the androecial chamber through the window-openings **(Figs 1 A, B)**.

Flies, in general, are known to have positive preferences for certain colours, particularly the yellow (Kugler, 1956). In *A. augusta* the translucent whitish tissue of the petal base serves as "window-pane" or "light window" **(P 1B. Figs 1B, C)**, that lies just opposite the anther groups. Light from outside, entering through the light windows, primarily guides the movement of the flies within the androecial chamber and induces them to move towards the anthers that gleam a pale yellow colour.

While roaming over the groups of anthers and feeding on the pollen grains, the flies are attracted towards the shining, light-yellow coloured ovary bearing multicellular, juicy hairs along its minor ridges and ultimately towards the wet stigma, to effect pollination.

Occasionally, the flies have also been observed to come out of the androecial chamber through the window-openings. Therefore, the exit of the visitors from the flower though rather difficult, is not impossible. While the distal extended hood-like part of each petal base together with the outwardly reflexed distal part of each staminode prevents an easy exit of the insect visitors from the androecial chamber, there is no such structure in the flower that can physically keep the visitors confined for a fixed duration within the flower. Hence, the flower of *A. augusta* can be designated as a semi-trap one. On the other hand, in case of true trap-flowers, the visitors are detained in the flower for a fixed time duration by the trapping mechanism (Faegri and van der Pijl, 1979). In many trap-flowers (e.g., *Arum maculatum*), the insects are attracted by deceit; the flower does not provide them with any reward and they are detained mechanically in the flower by the trap. Most traps work on the principle that the detaining structures become non-functional after some time, releasing the imprisoned visitors. However, in contrast to the genuine trap-flowers, in semi-trap flowers, such as those of *Abroma augusta*, there is no fixed or predestined time duration between the entry and exit of the floral visitors. Though certain structures make the exit of the visitors from the blossom difficult to some extent, they can leave the blossom whenever they wish.

Floral attractants : The long distance floral attractants, in general, are visual and/or olfactory in nature. There is good reason to believe that the flower of *Abroma augusta* attracts its pollinators from a distance by olfactory attraction rather than by visual means. The subdued maroon colour of the corolla is not very suitable for long-distance visibility of the flower. The flowers are indeed not very clearly visible from a long distance, at least to human eyes. Also, the large leaves of the plant shield the flowers from view. On the other hand, on carefully smelling a flower, a mild, unpleasant odour can be detected. Olfactory attractant was confirmed by bagging experiments. On several days, all the open flowers of an isolated individual were bagged separately with pieces of a silken cloth early in the morning, before the arrival of pollinators. After some time, pollinators were found to have arrived and were swarming around each of the bagged flowers. This proves that the long distance attractant of the *Abroma* flower is an olfactory one.

To identify the source of the floral odour, the 'closed vial test' (Faegri and van der Pijl, 1979) was performed separately with the staminodes, the orange tissue excised out of the petal bases and the petal bases without the orange tissue. Several specimens of each of the above tissues were kept enclosed in a glass vial for about 24 hours. Positive result was obtained only with the orange tissue. On opening the vial, a strong unpleasant odour was detected. The observation indicates that the orange tissue is responsible for the unpleasant smell of the flower. The secretory nature of the orange tissue was subsequently confirmed by neutral-red staining that imparted a positive result. As the tissue exhibits no apparent secretion, the secretory product must be volatile in nature. Therefore, it was concluded that the tissue producing it is an osmophore. The term 'osmophore' was introduced by Vogel (1990) for glands producing volatile secretion that is responsible for floral odour. In sectional view, the cells of the orange tissue were seen to be compactly arranged, with dense, yellow to light orange protoplasmic contents.

Though the corolla probably has no role in the long distance attraction of the floral visitors, its dull maroon colour probably helps to enhance, secondarily, the attractiveness of the flower to a visitor at proximity. This was confirmed by excising the laminar portions of the petals of certain flowers before pollinator arrival. In comparison to the normal flowers, these flowers were seen to attract only a limited number of pollinators.

Floral rewards : On carefully observing a flower with the help of a hand lens, the insect visitors were seen moving about in the androecial chamber and feeding on the yellow pollen grains sticking to the dehisced anthers.

Emasculated flowers were observed minutely for considerable time to ascertain whether pollen is the only reward provided by *Abroma* to its pollinators. It was noted that the number of pollinators present within and around each of the emasculated flowers was much less than that present in and around the unmanipulated flowers. This suggests that though pollen is the main floral reward, the flower of *Abroma augusta* also provides a few other rewards to its visitors.

In search of the other rewards offered by the flower, various parts of the flower were analysed critically. Those have been dealt with here. i) The secretory tissue forming the five longitudinal maroon ridges on the inner surface of each petal base and also that present in the form of the ten maroon ridges on the inner face of the androecial cup (two per staminode) produces a secretion that probably functions as a floral reward. On holding back a petal base, the pollinators were actually observed to feed on the somewhat sticky secretion produced by the maroon ridges of the petal base. ii) The relatively sticky secretion of the maroon glandular trichomes, located on the petal bases and the staminodes, is perhaps nutritive for the pollinators. In addition, the secretion may help in the adherence of pollen grains to their bodies. iii) It has been observed that the pollinators crowd in large numbers in the gynoecial chamber (i.e., the tiny space between the ovary and the androecial cup) and stay there for a while. A possible reason behind their swarming in the said region may be

the attraction of the multicellular juicy hairs occurring in longitudinal rows along the minor ridges of the ovary. iv) The five-lobed stigma is papillate and of wet type. It produces a copious secretion at anthesis. The pollinators clamber quite energetically all over the stigma, perhaps to feed on the stigmatic exudates, in effect bringing about pollination.

CONCLUDING REMARKS

Abroma augusta is characterized by semi-trap type of flower, with window-openings accompanied by light windows. Pollination is of sapromyophilous type. van der Pijl (1953) mentioned Milichiidae as pollinators of this species in Java. However, the present study reveals that at least in this part of the world, pollination is carried out by two species of Diptera, one belonging to the genus *Agromyza* and the other to Melanagromyza of the family Agromyzidae. Pollen deposition over the pollinators is of nototribic type, i.e. pollen grains are carried over the dorsal surface of the pollinators. Sapromyophily has also been reported from another member of Sterculiaceae, *viz.*, *Sterculia chicha* by Taroda and Gibbs (1982). They found that the flowers of this species are adapted for pollination by medium-sized species of a few sapromyophilous genera of Diptera, *viz.*, *Acroglossa*, *Cochliomya*, *Gaemnochaetopsis*, *Ornidia* and *Parasarcophaga*. *Abroma augusta* shows several features that have been frequently found to be associated with this type of pollination syndrome (sapromyophily). Those are the unpleasant floral odour, the dull (maroon) colour of the petals, the semi-trap structure of flower, the occurrence of window-openings through which the visitors crawl into the flower, the presence of light windows (or window panes) in the petal bases forming the wall of the "trap" and the presence of trichomes on the staminodes as well as on the petal bases. Moreover, the concealment of the pollination organs (here the stamens in the androecial chamber) is also a common feature of sapromyophilous blossoms. The abundance of trichomes in the flower gives it a hairy appearance and may mimic crawling flies already present in it. Wiesmann (1962) demonstrated that the presence of very small, slender, club-shaped trichomes activates the aggregation instincts of flies.

A number of rewards have been offered inside both the androecial and gynoecial chambers, in order to detain the visitors in the flower, to ensure pollination. Those rewards are edible pollen grains, the edible secretions produced by the secretory tissue of the maroon ridges over the petal bases and staminodes, the maroon glandular trichomes of the petal bases as well as the staminodes and the multicellular juicy hairs occurring in longitudinal rows along the ovary surface and the copious stigmatic exudate. Therefore, though the flower is structurally a semi-trap one, it functions almost as a true-trap flower.

Among the known sapromyophilous flowers (species of *Aristolochia*, *Rafflesia*, *Ceropegia*, etc.), majority are trap-flowers. According to Faegri and van der Pijl (1979), sapromyophily, in general, is associated with trap-flowers, usually characterized by the absence of floral rewards (other than pollens). Detention of the visitors inside the flower is ensured by the 'trap'. On the other hand, the sapromyophilous flower of *Abroma* is structurally of semi-trap type and its true trap nature is achieved by means of various floral rewards. It may be noted that presence of nectar has also been reported in several sapromyophilous species of *Aristolochia*. Nectar is secreted at the inner wall of the trap in *Aristolochia grandiflora* (Cammerloher, 1923) and *A. macroura* (Costa and Hime, 1983) and at the floral entrance in *A. fimbriata* (Daumann, 1959).

In *Abroma augusta*, the cupular ring of outwardly reflexed staminodes and the inverted disposition of the anthers hinder pollen transfer from the anthers to the stigma. There is no possibility of the stigma receiving pollen grains from anthers of even the same flower unless they are carried by a biotic vector. Thus, the plant is obligatorily dependent upon its pollinators, even for autogamy. This has been confirmed by bagging several flowers before the arrival of pollinators. Fruit set did not occur in any of those flowers. This pollinator-

dependence of the plant is reflected by its enormous investment towards the production of floral rewards. Moreover, as the plant produces one-day flowers, the time allowed for successful pollen transfer is relatively short. Pollination within this limited span of time is ensured by offering various types of floral rewards to the insect vector. The floral structure and pollinator-dependence of *Abroma augusta* are closely comparable with those of *Theobroma cacao* (Kaufmann, 1975).

ACKNOWLEDGEMENTS

The authors are thankful to the University of Burdwan for providing the necessary library and laboratory facilities. Sincere thanks are due to Prof. Dr. Ettore Pacini, Università di Siena, Italy, Prof. Dr. Stefan Vogel, Universität Wien, Austria and Dr. K. R. Shivanna, Professor (retired), University of Delhi, for sending relevant reprints of not only their works but also others. The authors are indebted to the scientists of the Zoological Survey of India, Ministry of Environment and Forests, Govt. of India and to Prof. P. K. Chaudhuri of the Zoology Department, University of Burdwan for identification of floral visitors. CSIR-UGC Research Fellowship granted to one of the authors (M.B.) is also gratefully acknowledged.

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एब्रोमा ऑगस्टा के परिस्थितिकी परागण की तुलना में वनस्पतिजातीय जीव विज्ञान

मौमिता बसु एवं पंकज के पाल

सार संक्षेप

परम्परागत रूप से औषधीय उपयोग में आने वाले एब्रोमा ऑगस्टा की परागण पारिस्थितिकी का वनस्पतिजातीय जीव विज्ञान प्रस्तुत किया गया है। एग्रोमाइजा एवं मेलेनेग्रोमाइजा, जो डिप्टेरा की दो जातियाँ हैं, द्वारा निष्पादित यह कीट परागण है। आगन्तुकों में एग्रोमाइजा के अधिक प्रभावी होने के कारण मेलेनेग्रोमाइजा से पुष्प के अन्दर वह अधिक सक्रिय होता है। बाद वाला कुछ निश्चेष्ट होता है। परागणकर्ता आरंभ में सैप्रोमायोफिलस साधनों से आकर्षित होता है। पार्श्व वातायन वाले निलम्बी पुष्प अर्ध फन्द जैसे होते हैं। अन्दर से पुष्प पुमंग एवं पुंजायांगी (gynoecial) में बंध्य पुंकेसर चषक द्वारा अलग किए होते हैं। अनिवार्य रूप से यह पौधा कीटभक्षी (entomophilous) एवं स्वयुग्मक है। परागणकर्ता का आवागमन बनाए रखने के लिए पुमंग एवं पुंजायांगी कोष्ठों के भीतर कई वनस्पतिजातीय प्रतिफल दिये जाते हैं। परागणकर्ताओं पर पराग निक्षेपण नोटोट्राइबिक है।