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Número especial:
"Floral Biology and Pollination of Native and Cultivated Plants (Intensive Course)"

INTRODUCTION TO THIS SPECIAL ISSUE ON FLORAL BIOLOGY AND POLLINATION OF NATIVE AND CULTIVATED PLANTS

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The purpose of this Special Issue is to expose the research projects that past graduate students have conducted as part of the requisites for the completion of a graduate course on *Floral Biology and Pollination of Native and Cultivated Plants*. This course has been traditionally offered by the Comparative Biology Graduate Program at the Universidade Estadual de Maringá (UEM), Paraná, Brazil. The idea of this special issue came about from our experiences as instructors and coordinators of the graduate course but also because we believe that it is worth publishing the high-quality research that our students have been able to put together in relatively short time and under tremendous pressure. Sometimes, weather or unexpected turns forced students to quickly change directions or modify some aspect(s) of the project and prepare for oral presentation and final report.

Briefly, this is an intensive course entailing a survey of floral diversity, pollination mechanisms and major sexual systems and reproductive strategies of seed plants, with emphasis on angiosperms and crop plants. All these topics, and some other current issues, e.g. climate change and its effects in crop and wild plants, are addressed due to the increased interest on floral evolution and plant reproductive and pollination biology, and seed science. This course is extremely important for students in the area of plant systematics, biology, ecology and plant sciences, and more recently, it has attracted students from other botanical, agriculture, zootechny, and environment-related areas, who have benefited from this course.

Over the past six years, the course has been delivered annually by myself and my esteemed colleagues Drs. Odair Almeida and Luiz Antonio de Souza. Our main goals include the formation of well-rounded professionals with strong voice, critical thinking and vision in the area of plant reproductive biology, with emphasis in crop plants and other angiosperms. Specifically, our aims are:

- To broaden the student's general knowledge and understanding of floral biology and evolution in relation to plant reproductive systems and strategies, and plant-animal interaction systems.
- To introduce students to the scientific value of analyzing different reproductive aspects in plants, e.g., pollination, pollen viability, pollination syndromes, floral visitors.
- To develop the capacity to discuss and synthetize current research articles and conduct meaningful holistic research in laboratory and outdoor settings, as well as to recognize and provide solutions to significant scientific problems related to floral morphology and reproduction.
- To understand the value and significance of flowers and pollinator and their role in natural ecosystems, agriculture and society.

After offering this course five times, we decided to move forward and find avenues to reward the dedication and hard work we all have been involved in during the two weeks of intensive coursework and research. Therefore, we decided to take advantage of the interesting results obtained by the different independent students' group projects. That is, as part of the course requirements, students (teams of 3-4 persons) must design and develop a research project doable in one-week, after the first week of classes. A project proposal is presented by each team and evaluated by instructors and other students in the class. After discussion adjustments are normally made based on suggestions and the project and goals are then fully determined. It should be noted that the elaboration of this project is an excellent opportunity for students to develop research skills and design, critical thinking and scientific writing experience. Because of the wide range in research interests of students enrolled in the course (Figs. 1 and 2) over the past two past years the projects have encompassed an ample diversity of topics.

A brief description of each project presented as an article is provided next in the order that they appear in this Special Issue. The papers have been organized in monocotyledons and dicotyledons *sensu lato*.

1. Reproductive biology of *Antigonon leptopus* Hook. & Arn. (Coral vine, Coralia, family Polygonaceae). This is a vine plant is native to Mexico and Central America but introduce to the tropical world as ornamental. This investigation characterizes the floral morphology and protandrous syndrome of the species and

also documents the different assemblages of floral visitors and their behaviours. As such, different phases of protandry have significantly different morphology.

2. Morphological survey of the fascinating flower of *Dillenia indica* L. (Elephant apple, family Dilleniaceae). This is an interesting examination of the macro- and micromorphological floral attributes of the Elephant plant. This species exhibits a combination of ancestral and advanced characters, a syndrome that is referred as mosaic evolution. The large pendulous flowers, in addition to being fascinating and attractive, are nocturnal and designed for bat or moth pollination; however, no formal studies have been presented. This study revealed that while the flowers are nocturnal, they remain open the next morning allowing visits by several species of insects, which are also potential pollinators that work their way to extract pollen from the poricidal anthers.
3. Biologia floral de *Pleroma granulosum* (Glory tree, family Melastomataceae) e fidelidade dos visitantes florais da Order Hymenoptera. This work is based on flower characteristics. The objectives of the study were to evaluate the flower's phenology and reproductive biology as well to characterize and compare floral visitors in the two floral phenotypes, pink and purple blossoms.
4. Caracterização morfológica e visitantes florais de *Dichorisandra thyrsifolia* J.C. Mikan (Blue ginger, family Commelinaceae). In this article, the flowers of this ornamental plant, native to Brazil, were used to evaluate the floral morphology as well as the floral resources presented to potential pollinators. The floral size, morphology, color, number and arrangement of floral pieces, anthesis duration, availability of attractions, nectar guides, and odor, were evaluated in several inflorescences along with identification of visitors, abundance and their behavior.
5. Morfologia floral e variações de coloração em peças florais de *Pleroma granulosum* Ders. D.Don (Glory tree, family Melastomataceae). This is a species from the Atlantic Forest used as ornamental for the beautiful and showy flowers that vary in color from pink to purple. In this study the flowers of this species were characterized in terms of morphology and reproductive system. In addition, this study attempted to identify whether there is variation in the ultraviolet spectrum, perceptible to pollinators.
6. Morfologia da flor e visitantes florais de *Nerium oleander* L. (Nerium, family Apocynaceae). The investigation of this Mediterranean species, used as ornamental across the Americas, shows that the rather showy flowers are

nectarless but offer pollen as a reward. The study documents aspects of floral morphology and pollen:ovule ratio in relation to breeding systems and main pollinators of this species.

7. Aspectos da biologia floral de *Tradescantia pallida* (Rose) D.R. Hunt (Commelinaceae). This study investigated the floral morphology of the purple heart plant and its interactions with visitors from the Hymenoptera order.

We hope the readers enjoy the research presented in this Special Issue and encourage them to make comments and/or suggestion regarding the articles in this Special Issue. We also invite future graduate students to join this course. In the same way, we welcome potential collaborations from other researchers in the area of Plant Reproduction and Pollination Biology.

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Class of 2019



Figure 1. Field trip of the 2019 class at the Experimental Farm of the Maringá State University. *Back row left to right:* Douglas Galhardo, Nick Belliveau (Canada), Cláudio Gómes da Silva Júnior, Maria Juliana da Silva (UNESP), Caroline Marinho Hernandes, Renata Gomes de Oliveira Guerreiro, Jessica Carolina Camargo López (Colombia), Anderson Ferreira dos Santos, Rosana Muller Padilha Feitosa, Priscilla Esclarski, Beatriz Fernanda da Silva Pitarelli, Beatriz Dean Rizzo (UNESP), Cinthia Leão Figueira, Geovana Gentilin Martins, Amanda Aparecida Oliveira do Carmo, Michelle Rodrigues de Souza, Tuan Henrique Smielevski de Souza, and Isabele Pierin Carneiro. *Front row left to right*: Sandra Milena Diaz Puentes (Colombia), Carine Ulian Moya, José Washington Santos Oliveira, Gustavo Henrique Simões Pereira (and beautiful doggie), Hugo Cota-Sánchez (Canada), and Odair Almeida (UNESP).

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Figure 2. Lab class on floral biology and breeding systems of the 2020 course in the teaching lab of the Department of Biology, Maringá State University. *Back row left to right:* Thaisa Mara Miyamato Martarelli, Luiz Antonio Souza (UEM), Victoria Sotti Batista, Caio Ramos, Odair Almeida (UNESP), Mariana Fernandes Rocha, Hugo Cota-Sánchez (Canada), Sofia Alvim, Hugo Lima Kirsten, Wesley Onofre Soares, Veronica Rubim Apolonîo (UNESP). *Front row left to right:* Kaoma Fernandes Coelho, Talita Angélica de Oliveira, Alessandra Fernandes Gonçalves, Kérolym Lomes da Cruz, Maria Estela Afonso (Executive Secretary, Graduate Program in Comparative Biology, UEM).