FLORAL BIOLOGY AND BREEDING MECHANISMS OF TIBOUCHINA HETEROMALLA COGN. IN ROCKY OUTCROPS IN THE SOUTH OF MINAS GERAIS.

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ABSTRACT

Tibouchina heteromalla Cogn. (Melastomataceae) has been extensively exploited, both for ornamental purposes and use in the recovery and reforestation of degraded areas. This study in floral biology, the reproductive system, potential floral pollinators and visitors was undertaken in the Ecological Park Quedas do Rio Bonito (PEQRB), Lavras - MG. Twenty specimens from the population were selected, marked and accompanied during flowering and fructification. The reproductive system was evaluated through manual pollination, and reproductive efficiency calculated. Manual pollination treatments indicated a facultative xenogamic species, with a larger formation of fruits through cross- (44.6%) than self- (12.7%) pollination. Emasculated flowers did not form fruits, as was the case with flowers through spontaneous self-pollination. The low rate of formation of control-fruit (29.2%) can be explained by the scarcity of floral visitors. Root protrusion occurred on the 6th day, with 56% germination. Flowering was spread from January to June, and fruit ripening from April and September. The available food resources for floral visitors and pollinators consisted of pollen grains, probably glandular trichomes located in the stamens, and the stamens themselves. The most frequent visitors were specimens from the families Aphididae, Curculionidae, Formicidae and Tettigonidae. *Xylocopa brasilianorum* was indicated as the main pollinator.

Key words: Melastomataceae, breeding mechanism, Tibouchine, rocky outcrops, crossed pollination.

INTRODUCTION

There are several important aspects, vital for a clear understanding of floral biology, such as morphology, phenology, the reproductive system, pollinization and fertilization. Studies on reproductive ecology are also important for increasing comprehension on features of ecological equilibrium existent in nature, how plants evolved on the planet, and how animals, mainly bees, manage to survive through making use of flowers.

Floral biology, through its reproductive system, blends with the ecology of pollinization, thereby relating floral diversity with the behavior and morphology of visiting and pollinizing animals (47), thus demonstrating their mutual dependence, since most plants rely on these agents for sexual reproduction. Furthermore, floral resources constitute the main food supply for several animal groups (36).

The interaction of plants with pollinizing agents is vital for the structural and functional integrity of natural ecosystems, besides the maintenance and increase in the production of food for human consumption. It is believed that three quarters of the plant products thus produced, as well as ninety percent of wild plants, are dependent on animal pollinization. Furthermore, the protection of wild species threatened with extinction, the use of plant species in urban environments and the production of fodder for feeding domestic animals are also benefited through understanding floral biology and pollinization concepts (17).

The system of pollinization can serve as an instrument for studying co-evolutionary processes, where the degree of morphological, physiological and behavioral adequacy observed between plant and pollinizer can be evaluated (36). In this context, aspects concerning floral morphology and visiting behavior, as well as those referring to flower physiology and

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morphology, could serve as parameters for measuring the degree of relationship between plant species and their floral visitors, as well as for discerning which among them effectively contribute to plant reproduction (15,36,18).

Research on plant-pollinizer interaction has been directed along several lines of inquiry, such as community ecology and population genetics, even to the point of aiding in elucidating/throwing light upon various fields, such as plant systematics and phylogeny and population ecology, besides evolutive, adaptational, reproductive and conservational biology. This information could be of further use in studies on the regeneration of degraded areas, the survival and maintenance of fragmented populations, the management of natural populations and environmental conservation (27,42,25,31).

The species *Tibouchina heteromalla* Cogn., endemic in Brazil, mainly in the southeastern and central-western regions, occurs either isolated or in the form of small scattered populations, often to be found in rocky areas and distributed mosaic-like, as a result of variations in topography, slope/declivity, physiognomy, nature of the substratum and microclimate (24). This species is extremely abundant in rocky outcrops of the Parque Ecológico Quedas do Rio Bonito (PEQRB), where the study was undertaken.

Even though *Tibouchina heteromalla* is a relatively common species in the region, so far no study has come to light regarding its reproductive ecology, which urges the need for developing research so as to understand its reproductive mechanisms, with a view to conservation.

With this in mind, the expressed aim is to describe the floral biology, reproductive system and pollinization of *Tibouchina heteromalla* Cogn., with a view to analyzing existent interactions and adaptations between plant and pollinizers.

MATERIAL AND MEHTODS

Description of the area – The study was carried out in the Parque Ecológico Quedas do Rio Bonito – PEQRB (21°19'-21°20'S e 44°58'- 44º59' W), in Lavras county, south Minas Gerais State. The park consists of 235 ha, and is situated at a height varying between 1.000 and 1.300 m. According to Köppen, the climate is of the Cw b type, mesothermic, with droughts in the winter and mild summers. The average temperature is around 19,3 ° and the average yearly rainfall 1.493 mm, with the rains concentrated in the summer (13).

The main original rocks are quartzite and micaxysts in the higher regions and granitic leukratic gnaisses and quartzite in the lower, with a predominance of litholic, alic and Cambi soils (10)

Study species – The species *Tibouchina heteromalla* Cogn., is usually bushlike or sub-bushlike. It is identified by the presence of villosities, tetragonal branches, opposed leaves with acrodomous nervures and villous indumentum. The flowers are of a purple or magenta coloring and classified as pentamerous sub-unsymmetrical. There are also very small-sized trichomes throughout (24).

The androecium is composed of ten diplostemonous stamens, five larger antesepal and five smaller antepetal. On the base and the region between the connective and the fillet anthers, there are wine-colored glandular trichomes, of the same shade as the base of the petals. The anthers of the antepetal stamens are of a pearlish shade and those of the antesepal rose-colored. The change in coloring becomes more evident as the flower matures (24).

Floral opening – Three buds in pre-anthesis in three individuals were marked with colored threads. The buds were observed throughout the day so as to accompany floral opening.

Pollinic feasibility – Six individuals were selected and five pre-anthesis buds extracted from each. These were fixed in FAA 50% to test pollen grain feasibility. They were then mounted on slides, stained with aseptic carmine and examined through an optic microscope (37). The first 100 grains on each slide were counted. The percentage of feasible grains was calculated from the proportion between feasible and unfeasible. Those with stained cytoplasm were considered feasible and those without and morphologically irregular were considered unfeasible (22).

Pollen grains collected from each individual were distinguished as regards stamens (antesepal and antepetal) and stigmas, for morphological studies through Scanning Electro-microscopy (SE).

In anticipation of SE analysis, pollen grains previously fixed in 1% osmium tetroxide were dehydrated in rising series acetone (25, 50, 75, 90 and 100%), mounted on metallic supports (stubs) and gold-coated. Images were obtained by electronic-microscope scanning (LEO Evo 40 XVP) in the Laboratory of Electronic Microscopy and Ultra-structural Analysis of the Department of Phytopathology of the Federal University of Lavras.

Stigmatic receptivity – Stigma receptivity in the field was ascertained by its viscous and humid aspect (1), and checked by using hydrogen peroxide (H_2O_2) at 3% (26) and observing the consequential liberation of oxygen through a magnifying glass. This was done with buds and flowers at the different phases, from pre-anthesis to senescence, the presence of catalase being indicative of receptivity.

Pollinization – During florescence, additional visits were made to undertake manual pollinization. Twelve individuals were selected, with the flowers receiving five types of treatment: 1) manual cross pollinization – reception from flowers of the same population; 2) manual self-pollinization – flowers were pollinized with their own pollen; 3) apomixis – the anthers and part of the stylet were excised at pre-anthesis; 4) open pollinization (control) – the flowers were only marked and left at random, without posterior treatment; 5) spontaneous self-pollinization –buds were isolated, without being manipulated. Threads of different colors were used for identifying treatments. Manipulated florescences were protected before treatments with organza nylon/sheer nylon bags, and were only unwrapped at the moment of treatment, so as to guarantee unfertilized flowers. The ratio between the percentage of fruits arising from manual self-pollinization and that of cross pollinization was used to define the self-incompatibility index (9)

Germination – Formed fruits were collected and their seeds set to germinate in type B.O.D germination chambers/rooms, at a temperature of 25 °C ± 1, thus reproducing the species' natural environmental conditions when flowering and forming fruit.

In the first place, seeds underwent aseptic treatment using a solution of 1% sodium hypochlorite for one minute. They were then washed with distilled water and left to dry naturally. This was followed by distribution in 9 cm Petri dishes with a double layer of filter paper wetted with 2,5 times its own mass in distilled water. The fruits and their respective seeds were separated according to the original reproductive treatment: T1 –seeds from manual self-pollinization; T2 - seeds from manual cross polinization; T3 - seeds from controls. No fruits were formed in the remaining treatments.

Germination tests were entirely random, with 8 repetitions of 25 seeds per treatment. Observations were done every two days, visually and by stereoscopic microscope, the results being registered during 30 days. The percentage of germination and starting times were calculated. Data analysis was based on non-parametric variance using R® software routines, by means of the Kruskal-Wallis test at 5% significance, seeing that pre-supposed homocedasticity and normality were not attained.

Seed water content/ – This was obtained by the 'hothouse at 105±3°C, for 24 hours' method (5), with two sub-samples of around 0,1g, expressed in percentages.

Floral visitors – Infield observations of floral visitors were carried out with 350 flowers, during the periods between 7,30 a.m. and 5 p.m., and for 30 days, with an eye to foraging behavior, as well as the time, frequency and duration of visits.

The methodology used was similar to that described in biocenotic studies (41), with anticipation of continuous displacement around those randomly chosen flowering plants under study, with the collection of all floral visitors

Witness specimens were collected by means of entomological nets, and, in some cases, directly in bottles, and after deposited in death-chambers for later taxonomic determination by specialists of the Departamento de Entomologia da Universidade Federal de Lavras.

RESULTS AND DISCUSSION

Flowering in *Tibouchina heteromalla* occurred between the months of January and June, with peaks at the end of the rainy season, between the months of March and May. The fruit-period extended from February to September, with ripening occurring during the dry season, between the months of April and September.

This flowering-pattern, with the production of flowers extending over a long time-span throughout the entire population, asynchronously among individuals, is characterized as intermediate annual flowering (34). In species of this type, the opportunities for crossing are not so limited in time, as is observed where the flowering period is short (34)

In *T. heteromalla*, inflorescence is of the cyme-type, subtype dichasium dimonochasium, whereby we encounter flowers in anthesis, others in senescence, and even buds just beginning to grow.

The floral bud is entirely coated by the calyx lappets, which will only open when anthesis is about to begin so that the petals can be released.. The wine-colored hypanthium is covered by trichomes.

The beginning of floral anthesis can be divided into three phases. In the first, the petals separate, whereat the folded stamens can be seen with the anthers turned towards the center of the flower. The stamens expand in the second phase. Finally, the petals are completely open and the stamens placed together at the lower part of the flower. Anthesis occurs during the daytime, mostly in the period between 6 and 8 a.m., although this has been observed at any time throughout the day. The flowers survive about two days until complete senescence.

Inside the flower, the color at the base of the corolla alters, passing from white at the beginning of anthesis to wine-colored in older flowers. This characteristic can be observed after 6 to 8 days from anthesis, as can be seen in Figure 1. This change in color has also been reported for *Tibouchina pulcra* and *Tibouchina sellowiana*, which were white at anthesis to later become reddish-violet (43). The color of the stamens changes from white to wine-colored when in the senescence phase, as was observed in the petals.

Figure 1 – Details of the flower and reproductive organs showing the change in coloring during floral maturation.

It is believed that the change in color functions for long-distance signaling to pollinizers, as a way of bringing plant and pollinizer together for mutual benefits. Plants are pollinized more efficiently, whereas pollinizers, through being guided, end up saving both time and energy (50).

High pollinic feasibility of 82,5% to 90% was established for both antepetal and antesepal stamens during all the phases of anthesis (19). In another study, similar results in all the phases (85,61% to 90,64%) were also attributed to *Cambessedesia hilariana* (Melastomataceae). Thus, pollen grains from all the anthers can be used in processes of plant fertilization and nutrition of bee-offspring.

At the population or species level, it is possible to suppose that averages above 85% for feasible grains indicate non-apomictic populations, whereas those below 20% indicate apomictic ones. Intermediary values could include apomictic individuals with high pollen feasibility, as is the case of *Miconia petropolitana*, or non-apomictic individuals with lower feasibility, as encountered in individuals of *Leandra dasytricha* and *Tibouchina cerastifolia* (22).

The images obtained through scanning electronic microscopy revealed a large amount of pollen both in the antesepal anther as well as the antepetal (Fig. 2A). The existent glandular trichomes (Fig. 2C) could be responsible for pollinator attraction through the release of odors. Although in the case of *T. heteromalla*, no characteristic odor was perceived, there are records of other Melastomataceae, (8) and (38), as well as *Miconia pepericarpa* Mart. and *Cambessedesia hilariana* (19), where it was reported that during the period of anthesis, the flowers exhaled an odor probably from osmophores present in the corolla, fillet, stylet and stigmatic papillae, and that intensification of this odor is through glandular trichomes, externally placed on the base of fillets, the hypanthium and the apex of the ovary.

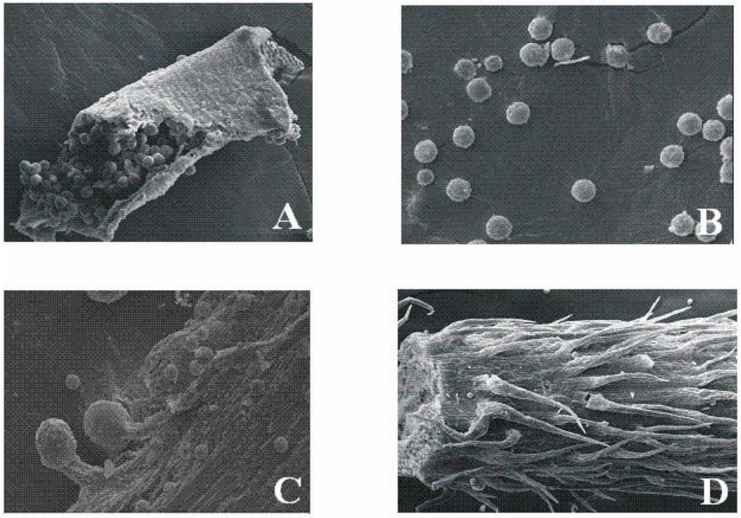

Figure 2 – Images obtained through scanning electronic microscopy. Details: (A) Pollen grains on the anther; (B) – Pollen grains; (C) – Glandular trichomes on a fillet; (D) Trichomes on the stylet.

Trichomes are numerous on the stylet base (Fig. 2 D) and, as is the case of the stigma, there is a change in color, both being white in younger flowers, and after maturation, the former becoming wine-colored and the latter pearlish.

The highest stigmatic receptivity was recorded in the morning from 7 a.m. to around 1 p.m., diminishing during the afternoon and at sunset, and continuing receptive for two days. The aspect of the stigma was viscous and humid in flowers in the earlier phase of anthesis. Catalasis was observed through a magnifying glass, receptivity being evident by the presence of sweat/perspiration from stigmatic papillae, with swelling of the stigma itself. After changing color, flowers were generally incapacitated, the stigma no longer being receptive (50).

These fall away from the calyx, so that in most inflorescences only the fruits remained in the form of capsules capable of changing color, green at the beginning of development, which starts on the 6th to 8th day after initiating anthesis, to brown when mature. In seeds, this change in color was a continuous process, going from white in the first weeks, to yellow, then brown, and finally a dark brown color, remaining so until the end of sampling.

A study of the reproductive system indicates that the species is xenogamous facultative, thus characterized by the linkage between the gametes of genetically distinct individuals. Spontaneous self-pollinization and emasculation do not generate fruit, so the species is non-apomictic. (Table 1). The index of self-incompatibility (ISI) found was 0,28, this revealing that *Tibouchina heteromalla* is self-compatible, although very close to the limit of self-incompatibility (ISI=0,25).

Table 1 – Manual pollinization on flowers of *Tibouchina heteromalla* (Cogn.) (Melastomataceae) in Parque Florestal Quedas do Rio Bonito, Lavras- MG.

Treatment	**Flower (n)**	**Fruit (n)**	**Successfully reproduced (%)**
Manual cross pollinization	150	67	44.6
Manual self-pollinization	102	13	12.7
Apomixy	173	0	0
Control	260	76	29.2
Spontaneous self-pollinization	76	0	0

With fertilization by gametes coming from the same flower or from flowers of the same individual, the plant is said to be self-compatible. Self-fertilization leads to the procreation of descendents equal to the plant that originally produced the gametes. If the mother-plant is well adapted to the environment, and this remains unaltered, it is advantageous for the plant species to generate alike descendents, for they will be born adapted to their surroundings.

Fertilization through cross pollinization gives rise to descendents different from the progenitor, for the embryo has a mother that passes on her characteristics through the ovule, and a father, whose characteristics were transported by the pollen grain. Thus, the advantage of cross pollinization is the increase in characteristic variability within plant species, thereby facilitating improved adaptation in future plant generations to environments under constant modification. It was also noted that cross pollinization leads the way to greater plant resistance against plagues and sicknesses (17).

Even though *T. heteromalla* is self-compatible, a flowering pattern favoring cross pollinization would be more advantageous for a species that depends on external vectors for pollen transportation (40). Thus, the scant availability of flowers per unit of time reduces the level of geitonogamy, and forces pollinizers to look for food from other individual flowers within the population, thereby increasing the chance of crossing (33). The flowering pattern and pollinizer foraging behavior could directly influence fruit formation in this species.

Even though it has been proven that *T. heteromalla* is not an apomitic species, studies undertaken in the Serra do Japi (SP) region gave evidence that 7 among the 13 species of the Melastomataceae studied form fruit from apomixis on (22). Nevertheless, amongst these, apomixis is more frequent in the Miconieae tribe, although uncommon among the Melastomeae, as was shown in the already studied *Tibouchina* species (40). Apoximis also appears to be related with polyploidy and hybridism, which consequently leads to pollen viability of apomitic species almost always being lower than that in non-apomitic (23).

The number of seeds per flower in control treatments and manual cross pollinization remains unaltered during the maturation phase, maintaining an average of around 760±21 seeds per flower, which implies that the number of seeds formed is more related to the rate of pollinization and fertilization than to the age of the fruit, since these values are maintained in younger fruits.

Further proof arises on analyzing the number of seeds in individuals that underwent manual self-pollinization, where the amount was much less than in the case of those in the aforementioned treatments, with an average of 450±21 seeds per fruit, thereby in agreement with observations on physiological maturation in *T. heteromalla* (30).

The seeds of *T. heteromalla* were of significantly different sizes, measuring approximately 0,6 x 0,2 mm in self-pollinized and 0,8 x 0,4 mm, on an average in controls and cross pollinization. These characteristics were also observed in *Miconia cinnamomifolia*, another of the Melastomataceae species, as shown (35).

This difference in seed development could be related to plant environmental resource availability (for the plant), the lack of fertilization of all the ovules present in isolated plants, and the low quality of pollen produced by the anthers, thereby explaining the large number of aborted seeds found in these fruits and in those of other Melastomataceae species, as shown in (50), (3) and (44).

Seed germination in *T. heteromalla* occurred from the 6th day on, and extended until the 30th day at a temperature of 25 °C in B.O.D. Reckoning was done according to the Rules of

Seed Analysis (5). The total germination rate was 56%. The germination of seeds from cross-pollinization was higher compared to control and manual self-pollinization (Table 2).

Table 2 – Percentages of seed germination in*Tibouchina heteromalla* Cogn. (Melastomataceae) flowers in the Parque Florestal Quedas do Rio Bonito, Lavras-MG.

Treatment	**Germination (%) ***
Cross	81
Control	68
Manual self-pollinization	20

*Kruskal-Wallis Test at 5 % , p (0,00003)

Data from experiments on germination in *T. heteromalla* indicated that the germination rate in seeds from cross pollinated fruits was higher (81%), whereas in fruits formed from self-pollinization, it was only 20%. These data confirm that, even in self-compatible species, genotypes from cross-pollinization should be selected, due to the subsequent increase in population genetic variability, and the forthcoming improved conditions for species survival in the environment (33).

Very often, ideal environmental conditions for germination are related to the predominant ecological conditions of the plant-habitat. The most significant germination rates are those whereat the temperature is close to that recorded at the most propitious time for sprouting (4). In the present study, the test temperature portrays reality as it is to be found by *T. heteromalla* in the field, thus confirming the high values encountered in treatments.

The average time for germination ($\bar{t}$) is an indication of the speed of the procedure, and can be used as proposed by (16) to classify seeds into three categories: quick (< 5 days), intermediate (5<t - < 10 days) and finally slow (>10 days).On considering this classification, for *T. heteromalla* seeds germinated under continuous white light, the average time till completion was intermediate, the lowest average being recorded at 25°C, as shown by (21), when working with *Tibouchina multiflora*.

T. heteromalla seeds are classified as orthodox, according to their internal water content. Thus they can be stored after drying due to their facility in losing water. This was noted after the humidity test, whereby the water rate was 23%, reaching below 10% after hot-house drying.

Development in orthodox seeds is complete only when the humidity rate is low (2). (44) Drying is an important factor through interrupting essential steps in development leading to germination, as continuance is coincident with re-hydration of quiescent seeds. In photosensitive seeds, phytochrome photoconversion only occurs in tissues with at least 15% humidity (45), thus confirming that the degree of tissue humidity is of prime importance.

During the process of seed development and maturation, the progressive loss of water directly influences the speed of germination (2,11,30). This can thus be considered as an efficient indicator of seed physiological maturity (2,11,44).

As to *T. heteromalla* visitors, individuals were registered from the following orders: Hemiptera - Family Apidae; Coleoptera - Family Curculionidae; Hymenoptera - Family Formicidae; Orthoptera - Family Tettigoniidae.

Most of all the insects collected visited flowers during the morning, from 9 a.m. to 3 p.m., with the highest peak between 10 to 12 a.m.

Due to the presence of tubulous anthers with spontaneous opening through pores, an eventual pollinizer may be found in the family Apidae, subfamily Xylocopinae. The species *Xylocopa brasilianorum* (bumble bee) has been observed on *T. heteromalla*. These are mainly female collectors which embrace the anthers with the front legs and through vibratory movements caused by the contraction and relaxing of flight muscles (7), bring about the spontaneous and profuse release of pollen from the wing cases.

In evolution, the differentiation of anthers to an elongated tube-shape and spontaneous opening through pores were responses to the mechanism of vibratory pollinization (14). (12) suggested that flowers pollinated by vibratory movements evolved from polyandrous, nectariferous flowers with a reduced number of stamens (and consequently producing little pollen), and which, in time, even stopped producing nectar.

According to (38), in the Melastomataceae, vibratory pollinization is so efficient that, once established, it is difficult for any alternative pollinating mechanism to evolve, even in groups very rich in species. The basic type of flowers in the Melastomataceae would probably be the result of co-evolution between old ancestors and bees (39).

According to (14), pore-opening anthers afford greater protection for pollen and diminish loss, since grains are guided towards the pollinator's body, besides limiting the number of visitors, as only certain groups of bees are capable of vibrating anthers.

Specimens of *Xylocopa brasilianorum* also visited open flowers, as in pre-anthesis (flower buds about to open), opening them with the legs. The specimen collected and analyzed in the laboratory revealed pollen grains stuck to the back of the thorax and on the head.

The flower of *T. heteromalla*, through being relatively small-sized is propitious for *Xylocopa brasilianorum*, since, according to (46) it has a short tongue, thus does not have the capacity to reach the base of long-sized flowers.

As *T. heteromalla* flowering is asynchronous, not all are fully in flower simultaneously, thereby forcing pollinizer movement among the various widely separated individuals. This behavior promotes cross-pollinization, consequently guaranteeing more intense gene flux (33). In this manner, during the months in which *T. heteromalla* flowers remain open, bee species visit these seeking pollen and thus promoting both cross- as well as self-pollinization of the species.

Ants (Formicidae) were encountered throughout most of the day moving and foraging all over the plant, auspiciously offering protection. Hostility, on the part of the ant towards other floral visitors was noted, as was the case of an insect of the family Tettigoniidae, which the ant forced to withdraw and move to another floral bud. This was often noted.

The behavior of another individual of the same family (Tettigoniidae) was observed. This remained on the flower for 20 minutes, collecting pollen from the anthers of all the antesepal stamens. No part of the insect body entered in contact with the stigma at any moment during collection, which can be partly explained by hercogamy, an instance of spatial separation between stigma and anther. From reports, it appears that this same occurrence was noted in other species of the family Melastomataceae, as *Miconia ciliata* and *Miconia discolor* (32), and *Cambessedesia hilariana* (19). According to (15) and (38), this mechanism is recognized as being one of those responsible for impeding spontaneous self-pollinization in hermaphroditic species.

Tibouchina heteromalla, although self-compatible, requires a pollen vector for successful reproduction. The system of cross-pollinization of a species can be influenced by pollinizer activity and flower density. In populations of low floral density, there is an increase in pollen dispersion and a lower incidence of self-pollinization (29). In plant-pollinizer interactions, the space between neighboring plants appears to be an important factor towards success. (28). As *T. heteromalla* is self-compatible, the efficiency of cross-pollinization may also be defined by plant behavior, the spatial distribution of individuals and the number of simultaneously available flowers on the plant.

The number of visitors observed, both quantitatively and qualitatively, was low. (20), on studying pollinization biology in high level fields, noted that in rocky areas, gene flux is lower due to the scant possibility of pollinizers roaming over long distances. According to (6), reproduction in insects, in general associated to regional seasonality, normally occurs from October to March, followed by a diapause until the following summer.

As evidently shown, *Tibouchina heteromalla* is characterized by a self-compatible facultative xenogamic sexual system, changes in petal coloration, and androecium and gynaecium related to the initial phase of senescence. The stigma remains feasible during two days following floral anthesis, morning being the period of greater feasibility. The effective pollinizer was *Xylocopa brasilianorum*, through vibratory pollinization when collecting. It was also noted that disposable feeding resources for floral visitors and pollinizers are pollen grains, probably from glandular trichomes located on the stamens and even the stamens themselves, seeing that some insects feed on floral parts.

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RESUMO

Biologia Floral e Mecanismos Reprodutivos de *Tibouchina heteromalla* Cogn. em afloramentos rochosos no sul de Minas Gerais. *Tibouchina heteromalla* Cogn. (Melastomataceae) tem sido explorada com fins ornamentais e utilizada na recuperação e reflorestamento de áreas degradadas. O estudo da biologia floral, sistema reprodutivo, potenciais polinizadores e visitantes florais foi realizado no Parque Ecológico Quedas do Rio Bonito (PEQRB), Lavras – MG. Vinte indivíduos da população foram selecionados, marcados e acompanhados eventos fenológicos de floração e frutificação. O sistema reprodutivo foi avaliado com polinizações manuais e cálculo da eficácia reprodutiva. Os tratamentos de polinização manual indicaram a espécie como xenógama facultativa com maior formação de frutos por polinização cruzada (44,6%) do que por autopolinização (12,7%). Flores emasculadas para agamospermia não formaram frutos, bem como flores com autopolinização espontânea. A baixa formação de frutos-controle (29,2%) pode ser explicada pela escassez de visitantes florais. A protusão da radícula ocorreu no 6º dia com 56% de germinação. A floração estendeu-se de janeiro a junho, e o amadurecimento dos frutos, entre abril e setembro. Os recursos alimentares oferecidos aos visitantes florais e polinizadores foram o grão de pólen, provavelmente os tricomas glandulares localizados nos estames e os próprios estames. Os visitantes mais freqüentes foram espécimes das famílias Aphididae; Curculionidae; Formicidae; Tettigonidae. *Xylocopa brasilianorum* foi indicado como principal polinizador da espécie.

Palavras-chave: Melastomataceae, sistema reprodutivo, *Tibouchina*, campo rupestre, polinização cruzada.