



Floral visitors of the *Ageratum conyzoides* in Amani Nature Reserve, Tanzania

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Abstract

Several studies have shown that *Ageratum conyzoides* (*A. conyzoides*) is of beneficial to man in terms of medicine and food, however the floral visitors of this species which are anticipated to be potential pollinators were not known in Amani Nature Reserve. This study aimed at determining the floral visitors and potential pollinators of the species. The individuals observed to probe the flowers were considered potential pollinators, field observation to the flowers at specified time interval was used to determine the floral visitors and time spent. There was no difference between the floral visitors and individual probed and relationship between the visitation and probing with time spent were positive related. This concluded that, the majority of the visitors to *A. conyzoides* were potential pollinators, and rewards like nectar and pollen attracted them. In this case, conservation of the nature reserve is essential with consideration of the pollinators as essential components for the reproductive success of *A. conyzoides*.

Keywords: Floral Visitors; *Ageratum conyzoides*; Amani Nature Reserve

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1. Introduction

Ageratum conyzoides (Ac) is an herb having flower with white petal and purple blue strip under the petals (Murali et al., 2013) (Figure 1). The Ac is known for its vast uses which explain that, this species is very essential in socio-economic needs of humans. For instance, the plant has been observed to be of medicinal importance for many diseases like asthma, bacterial infections like salmonella typhi, fungal infections like candidiasis, antitoxification effect, inflammation and allergies cure (Tillo et al., 2012). Regardless the importance of the herb to the people, the floral visitors which are anticipated to be potential pollinators for this species were rarely documented in Amani Nature Reserve (ANR).

ANR is a home of endemism also termed as last paradise with high degree of endemic flora and fauna (Mtaita, 2012). The reserve has great potential of attracting ecotourism due to high diversity of plants and animals. For instance, it has been noted that, the reserve has animals such as chameleons, lizards, snakes, amphibians, birds and butterflies which are very rare in other parts of the world (Mtaita, 2012). The availability of the largest botanical garden in this reserve increases the potentials of having high diversity of plants. Many plants in this reserve including Ac are of beneficial to humans. The pollination ecology of this important plant species in the reserve needs to be evaluated and documented. Anecdote information is available on the pollination ecology of these plants including Ac, but the scientific fact hasn't been established to which this paper is contributing in alleviation of such gap.

Insects have observed to play great role in terms of ecosystem service provision like pollination, being used as indicators species and food for other species (Ngongolo and Mtoka, 2012; 2013a; 2013b; 2013c; Ngongolo et al., 2014). Some studies have showed that, *Amegilla* sp, *Ceratina* sp, *Thyreus* sp, *Apis dorsata*, *Apis cerana*, *Xylocopa* sp, black ants, butterflies and *Anthidium* sp are good visitors of the flowers (Murali et al., 2013). However in this reserve it was not known if this will be the same case or not. This study aimed at looking the diversity of floral visitors of the Ac through investigating the diversity and abundance in an experiment set in the field.

2. Materials and methods

2.1. Study area

The study took place in ANR, which is located in Tanga, Tanzania at 5°6'S and 38°38'E. ANR is part of the Usambara mountain ecosystem found in the eastern Arc Mountains which are a chain of Precambrian crystalline mountains that stretches from the Taita Hills (in Kenya) to the Northern through Southern Highlands of Tanzania.

2.2. Methods

The study took place for six days in August 2013. The data were collected in the field in time range between 09am to 03pm as suggested by Olotu et al. (2011). The observation point were selected randomly and

monitored for specified time categorical subunit. The day was categorized into subunit time of 20 minutes sessions in every half hour. In the field Ac which were mixed with other plant species, and 8 plants with manipulated flowers to 60 flowers were monitored and recording the floral visitors. Frequent of visiting, number of flower visited number of flower probed, time spent by visitors and species were recorded. The relationships between the number of individual visited and probed were analyzed using GLM, while the differences of number of individual visited to those probed were evaluated using Mann-Whitney U test statistic.



Figure 1: The flowers of *Ageratum conyzoides*

3. Results

3.1. Abundance of floral visitors

A total of 182 visitors were observed during the study. The member of family Hymenoptera (96.296%) visited frequently than other groups. Fewer visitations to the flowers were observed by *Syrphid sp* (0.529%). The 92.593% of the floral visitors to the flowers were observed to probe. Other species observed visiting the flower of Ac were *Cercesis sp*, *Chrysoma sp*, *Componotus sp*, *Hesperida sp* and *Apis mellifera*. The Mann-Whitney U test statistics showed that, the the number of individual visited the flowers were insignificant higher than those probed ($U= 1963.500, P>0.05$), also see Figure 1. The GLM estimate model showed that, the relationship was significantly positive ($r= 0.947, F\text{-ration}= 570.079, P<0.05$).

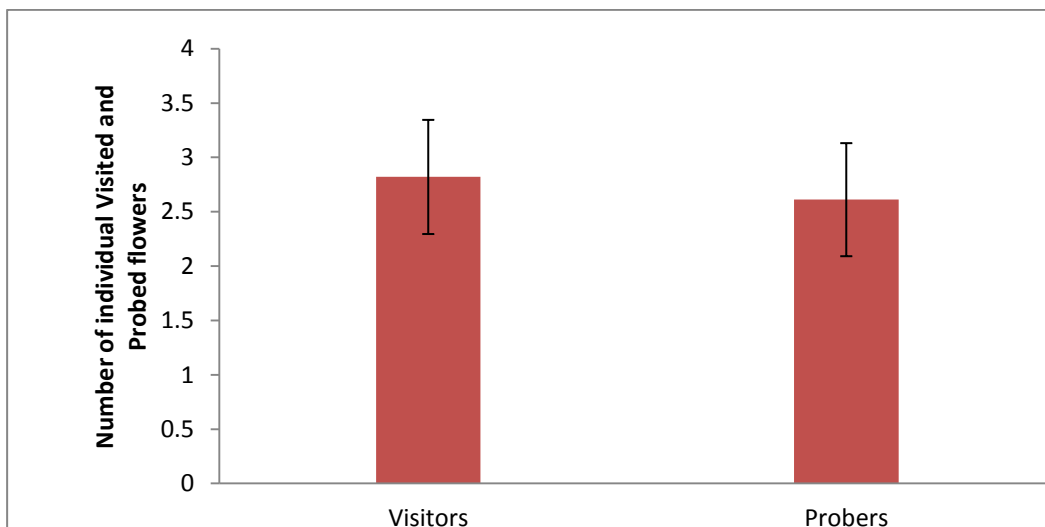


Figure 1. Number of Visitors being insignificant higher than Individual probed the flower (Mean ± S.E, P>0.05, n=67)

3.2. Time spent by the floral visitors

A total of 1917 (Mean= 28.612±4.936, S.D=40.404) minutes were spent by the visitors to the flowers studied with maximum of 180.000Min, Skewness (G1) of 2.152 and Kurtosis (G2) of 3.901. Kolmogorov-Smirnov One Sample Test showed that, time spent among visitors to different flowers varied significantly (P<0.05). The relationship between the time spent and the number of individual visited and probed were significantly positive (P<0.05).

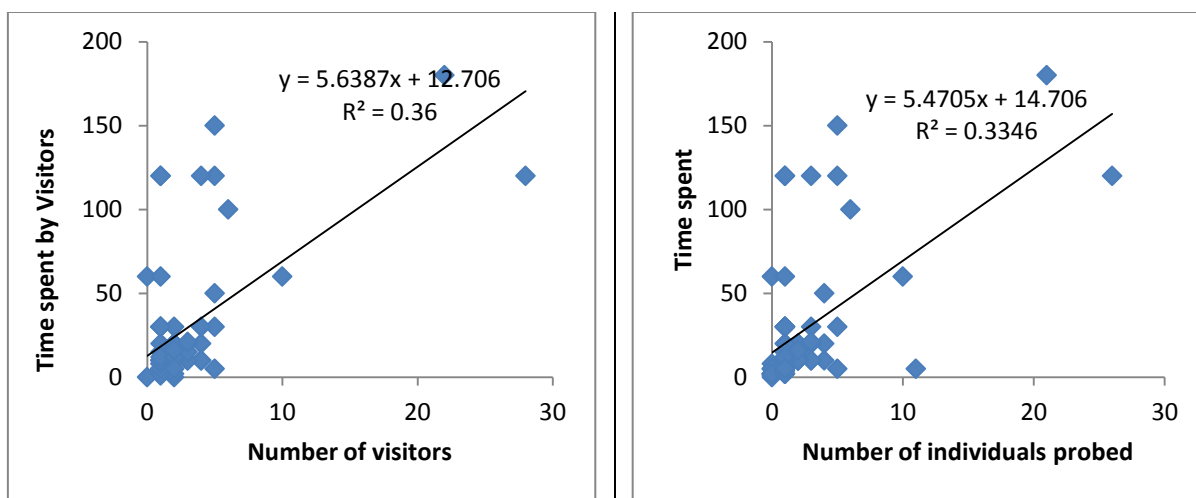


Figure 2. The relation of the time spent by the visitors with the number of individuals visited and probed to the flower under investigation

4. Discussion

Several studies have showed that, visitors of flowers visit for different reasons. For instance, some insects visit the flowers for resting, other to get the rewards offered by the flower while some seek place for shelter and protection. During this study bees (*Apis sp*) were observed to be busy searching for rewards offered by the flowers, with majority probing into the flowers.

4.1. Abundance of floral visitors

The individual visited the flowers were observed to be almost similar with those probing the flower in this study. This can possibly be due to the reason that, most of the individuals visited the flowers were after the rewards offered by the flowers than those seeking resting. Nectar and pollen are among the rewards offered by flowers to many pollinators. In Netherland, it was observed that, nectar and pollen are the major rewards that attracted Bumble bees and other insect to many flowers (Koppert, 2014). The attractant of the flowers for the visitors explains why there was positive relationship between the number of visitors and probers to the flowers.

4.2. Time spent by the floral visitors

The time spent were positively correlated with the number of individuals visited the flowers and those probed. This relationship can be possibly due to the quality and quantity of rewards offered by different flowers. The flowers with high quantity and quality of reward attracted more visitors and allowed most of the visitors to spend much time in the flowers than those having low. For instance, Adler and Irwin (2005) found that the open flowers of the *Gelsemium* which had high nectar alkaloids were highly probed. In addition they concluded that, the number of open flowers passively correlated with the number of probing.

5. Conclusion and recommendation

The number of individual probing, visitation frequency and time spent to the flowers were direct related. This suggests that large percent of individual visiting the flowers were potential pollinators. For example, 92.593% of individual visited the flowers were observed probing.

Survival of the *Ageratum conyzoides* depends on its pollinators too. Conservation of ANR is essential to ensure sustainable supply of pollinators for this plant species. The conservation strategies should be participatory to ensure long term survival of the species and the reserve as the whole as some of the important components such as pollinators may go beyond the reserve boundary. Hence the Amani management, local communities around the reserve and other stakeholders should work together for effective and sustainable conservation of the reserve.

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