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Short Communication

Mexican creeper, *Antigonon leptopus* hook. and arn : An effective bee forage plant to conserve honey bees

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ABSTRACT

Decline in honey bee populations has become a matter of concern and their conservation is very essential to sustain essential ecosystem services. They provide making available continuous supply of floral resources is of immense value in conserving honey bees. The effectiveness of an ornamental creeper, *Antigonon leptopus* Hook. & Arn as a sustainable bee forage plant was evaluated. It attracts four major native species of honey bees *viz*., *Apis cerana, A. florea, A. dorsata* and *Tetragonula iridipennis*. The wild little bee, *A. florea* was the most dominant forager followed by the Indian bee, *A. cerana*. The plant is amenable for easy multiplication through seeds as well as cuttings and meets both aesthetic and ecological needs. Using *Antigonon*, different studies related to honey bees like assessing species diversity, foraging behaviour, temperature driven shifts etc. can be carried out. Popularising perennial bee flora like *Antigonon* would help in conserving honey bees in both natural and urban habitats. Since *Antigonon* attracts all species of honey bees throughout the year, it could be utilized as a potential bioindicator of honey bee populations in a given environment.

Keywords: *Antigonon*, *Apis* spp., Bee flora, Honey bees and Ornamental creeper

Uninterrupted availability of pollen and nectar sources is essential for sustaining honey bee colonies and to take maximum advantage of their ecosystem services like pollination and honey production. Destruction of natural habitats and lack of adequate floral resources have led to significant decline in bee populations both in wild and agro ecosystems. As per an estimate, there was about 40% decline in honey bee populations in India during the last 25 years (Gallai *et al*. 2009). With the advent of intensive agriculture characterized by mono-cropping, clean cultivation and large-scale use of pesticides and ever growing urbanisation, honey bees are deprived of adequate foraging plants as well as congenial nesting sites (Reddy *et al*. 2012). Decline in honey bee populations results in poor pollination and reduced productivity of several food crops including fruits, vegetable and oil seeds as majority of them are dependent on honey bees for pollination. In order to conserve and sustain both wild and managed pollinator populations in cropping as well as urban and peri-urban ecosystems, it is imperative to have bee flora which could provide nectar and pollen and help bees survive during off-season. A large number of flowering plants comprising herbs, shrubs, creepers and trees are credited as bee foraging plants. However, majority of them either have very short blossom period or are not adaptable to wider agro-climatic conditions. Under such circumstances, an ideal bee forage plant is the one which flowers almost throughout the year and produces copious amounts of nectar. At the same time, it should not compete with agriculturally important plants for land and other resources. Having an aesthetically pleasing blossom would be an added advantage. Such bee forage plants can be grown in open fields as well as in urban habitats like parks, boundary walls of institutions or within individual house premises.

This paper reports the efficacy of *Antigonon leptopus* Hook. & Arn, a creeper, (Family: Polygonesiae) as one such plant species which attracts a large number of honey bees besides other beneficial

insects. Commonly called Coral vine or Mexican creeper or bee bush, *A. leptopus* is a climber, native to Central America. It produces indeterminate axillary racemes of attractive pink flowers of 20-25 mm diameter and blossoms almost throughout the year. Flowers are an abundant source of nectar and pollen to honey bees. Each flower is estimated to produce 1-1.5 µL of nectar with 26-28% sugar and 0.025-0.036 mg of pollen and attracts a wide range of floral visitors mainly social bees (Raju *et al*., 2001; Abrol, 2003). There is also a variant of the same species which produces white flowers but occurs at a low frequency. The plant is also known to possess a wide range of phytochemicals like alkaloids, phenolic compounds, saponins, triterpenoids and glycosides in different parts and is valued for its medicinal properties (Rakshit and Raghavendra, 2018).

Antigonon leptopus can be propagated through seeds as well as semi-hard wood cuttings. The dual reproductive behavior of *A. leptopus* is considered as an adaptation for successful survival in tropical environments (Raju *et al.,* 2001). Our experience shows seeds to be a better means of multiplication. The germination rate was fairly high (80-85%). Seeds were sown in pro trays and a month-old seedlings were planted along the boundary wall of the experimental field of ICAR-Indian Institute of Horticultural Research (ICAR-IIHR), Hesaraghatta, Bengaluru (Fig. 1).

Fig. 1. *Antigonon* creeper grown on the compound wall of IIHR, Bengaluru

The success rate of establishment was more than 90% and seedlings reached flowering stage within five to six months after planting. The plants do not require any special attention except for 3-4 irrigations in summer months in the first year. The *Antigonon* creepers planted at ICAR-IIHR as well as those in a nearby wild habitat were continuously monitored for flowering and honey bee activity for a year. The duration of blooming and species diversity and abundance were recorded. It was observed that the creepers were in peak flowering for 8-10 months with a relatively lower flower density during December – February.

At ICAR-IIHR campus in Hesaraghatta and surrounding places near Bengaluru (13.13° N, 77.47°E), four species of honey bees *viz*., Indian honey bee, *Apis cerana indica* Fab., little bee, *A. florea* Fab., rock bee, *A. dorsata* Fab. and stingless bee, *Tetragonula iridipennis* Smith were found foraging on *Antigonon* flowers throughout the year (Fig. 2). The proportion of different species foraging at a given time was calculated by visually counting different species from 10 plants during peak foraging hours. Among all insects visited flowers of *Antigonon*, honey bees constituted 89.09 per cent while all other insects together (butterflies, moths, wasps, syrphids, calliphorids and ants) constituted the remaining 10.91 per cent. Within four species of honey bees foraged on *Antigonon*, *A. florea* was the most dominant forager (constituting 34.06% of total foragers) followed by *A. cerana* (27.18%), *A. dorsata* (21.34%) and *T. iridipennis* (5.51%). Diurnal variations in foraging activity of different species indicate that though bees were found visiting flowers throughout the day, there were significant variations in the number of worker bees foraging at different periods of the day. The major peak activity was recorded between 6.00 – 10.00 AM followed by a minor peak between 4.00 and 6.00PM. Among three *Apis* species, the wild rock bee was found to maintain relative consistency throughout the day with least variations in their numbers while the foraging activity of other two species had significantly come down during afternoon hours till evening. This is an indication of their sensitivity to higher temperatures. In a related study by Reddy *et al*. (2015), increase in maximum temperature was reported to adversely affect the foraging activity of *A. cerana*.

The major advantage of the creeper is that it flowers throughout the year especially during rainy season (June – September) which is considered as dearth period for honey bees and when desertion rate is high. To save colonies, apiarists generally resort to feed the colonies with sugar syrup and *Antigonon* could

Little bee (*Apis florea*)

Indian bee (*Apis cerana indica*)

Rock bee (*Apis dorsata*)

Stingless bee (*Tetragonula iridipennis*)

Fig 2. Different species of honey bees foraging on *Antigonon* flowers

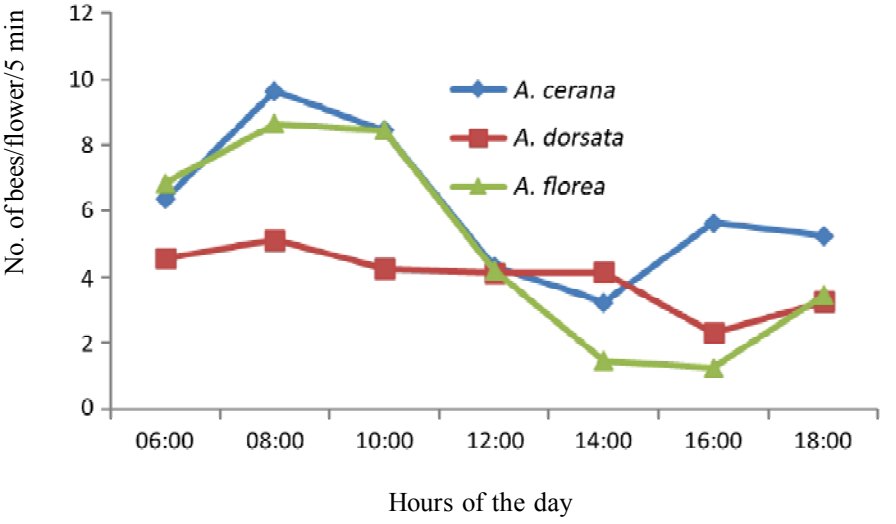

Fig 1. Diurnal variations in the foraging activity of three *Apis* species of honey bees on *Antigonon* flowers

help in saving cost and time of sugar feeding. Pruning once a year helps in preventing creeper from over growing and retaining aesthetic value. Planting of bee plants is all the more important in urban localities as it is a common sight to find bees dying while trying to feed on sweet liquid substances like soft drinks and leftover tea or coffee in paper cups. A study by Chandrasekharan *et al*. (2011) established the detrimental effect of these factors on honey bees in the absence of sufficient floral resources. The Mexican creeper not only adds beauty to premises but also helps in sustaining beneficial insect diversity in general and honey bees in particular. The Mexican creeper is also credited as a beneficial plant attractive to parasitoids of oil palm pests and is preferred to be planted around oil palm plantations (Kamarudin and Arshad, 2016).

Based on data related to species diversity and flowering duration recorded, it could be possible that *Antigonon* creeper could also be used as a bioindicator to monitor honey bee populations and species diversity in a particular location. This can also be used to conduct certain specific studies like fluctuations in bee numbers in relation to seasonal and diurnal variations, temperature influenced shifts in foraging behavior and species-specific foraging behavior. For instance, Gross et al. (2019) used *A. leptopus* to study the interspecific interactions and aggression pattern during foraging of *A. cerana* and *A. mellifera.* Hence *A. leptopus* can be planted and popularized in different landscapes wherever possible to conserve and sustain honey bees.

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