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## Weed flora sustaining the lives of bees along the east coast agro eco system of Tamil Nadu, India

**SV Hariharan and Dr. S Arivudainambi**

### Abstract

Weeds act as alternate nectar source for honeybees which are now facing problem because of certain external factors. In this study, weeds along the east coastal lines of Tamil Nadu are observed from March 2018 to March 2019 covering Cuddalore, Nagapattinam, Pondicherry. Due to high salinity, sandy soil fails to support any plant life other than weeds. The majority of flowering weeds are observed and only limited number of weed flora is used for nectar measurement based on its nectar quantity. A micropipette is used to extract and measure the quantity of nectar in weed flowers. The highest nectar yielding weed plant is *Cleome viscosa*, which produces nectar of about 7.2µl/flower and the least nectar content per flower is shared by *Phyla nodiflora* and *Abutilon indicum* with the nectar content of 0.3µl/flower.

**Keywords:** Honeybees, weed flora, nectar content, micropipette

### Introduction

Honey bees play a significant role in pollination of agronomical crops. It is evident that more than one third of agronomic crops which people consume nowadays are mainly relied on pollination by honeybees. Their service is not only limited to field crops but also extended towards horticultural crops. On an average it is estimated that in the US more than 80 percent of commercial crops are depend on honeybees. Moreover, in the UK honey bees generate an annual income of about 160 million dollars. In addition to that, in this country bumble bees are also used commercially for the purpose of pollination of food crops. It is effective due to its external structures (Lye *et al.*, 2011)<sup>[4]</sup>. On the other hand, the population of bees is drastically reduced in recent years. The major reasons for this biotic loss are mainly because of human made environments such as farms, agricultural fields, parks cannot support pollinators with enough food for year round due to water scarcity, fallow period and uncontrolled usage of pesticides. According to National Geographic report, it is proved that more than 90 percent of bees are lost in some of the regions due to a phenomenon called “Colony Collapse Disorder” (Julia Jacabo 2019)<sup>[3]</sup>. This massive reduction in bee population may be the sign for ecosystem collapse. In this period weeds come into action and they act as alternate food source by providing nectar. Since weeds can tolerate and grow in any adverse climatic and soil conditions they will be available in the field all-round the year. Weeds also need to reproduce and spread their progeny, for that it needs pollinators. To attract pollinators some weeds use the strategy of secreting nectar in flowers.

Weeds such as *Tridax procumbens* produce nectar and attract butterflies of various families such as Nymphalids 46%, Papilionids 20%, Lycaenids 17%. The way in which butterflies consume nectar was found to benefit the plants to achieve fertilization. About 9.36 microlitre of nectar is present per capitulum [Varalakshmi *et al.*, 2013]<sup>[9]</sup>. In *Abutilon indicum*, *Apis sp* was the most frequent visitor and pollinates the plant effectively [Rubina Abid *et al.*, 2010]<sup>[6]</sup>. Butterflies act as primary pollinators in *Lantana camara* [Schemske 1976]<sup>[7]</sup>. The flowers of *Lantana camara* were visited by butterflies and thrips irrespective of their color (yellow or white). The food searching activities of butterflies result in definite pollination [Aluri and Subba Reddi 1995]<sup>[1]</sup>. It is found that *Lantana camara* contains nectar content of about 0.5 to 1.0 microlitre for one to three flowers [Carrion-Tacuri *et al.*, 2012]<sup>[2]</sup>. *Leucas aspera* attracts several species of insects belonging to Hymenoptera, Lepidoptera, Diptera and the nectar content lies between 0.66 to 0.75 microlitre per Flower [Kulloli 2011]<sup>[8]</sup>. *Apis sp* was mostly attracted to nectar and involved in pollination in *Leucas aspera* [Prasad and Sunoj kumar 2014]<sup>[5]</sup>.

In this study we will be dealing with flowering and nectar yielding weeds in both wet land and

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garden land along the coastal lines of Eastern Tamil Nadu. It also extended to study about the floral visitors of weed species. This study is helpful in evaluating the nectar content in weed species and to give a general idea about the flowering weeds along the East coast of Tamil Nadu.

## Materials and Method

### Study area

For the study of nectar content three districts are chosen in the east coast of Tamil Nadu, which comprises of Cuddalore (11.7480N, 79.7714E) Nagapattinam (10.7656N, 79.8424E) and Pondicherry (11.9416N, 79.8083E). In the above mentioned places, both Cuddalore and Nagapattinam are the districts of Tamil Nadu and Pondicherry is an union territory. East coast has a tropical climate and the average annual temperature is 28.5C and rainfall is about 1200mm. The temperature is usually high on June. These areas have high salt water intrusion and the soil type is mainly sandy and it has poor water storage capacity.

### Survey on weed species

A survey on flowering weeds is undertaken from March 2018 to March 2019 along the east coast covering three major places and all the weeds are identified with the help of agronomist in the Department of Agronomy in the Faculty of

Agriculture in Annamalai University. The data includes flowering weeds in garden lands (Table 1) and wet lands (Table 3). In addition to species identification and habitat the survey is also extended towards season of flowering and color of the flowers. Since the survey is carried out for one complete year all the seasons are covered like rabi and kharif. Importance is given to flowering weeds as it only has the ability to produce nectar. After identification the weeds are checked for nectar content.

### Nectar measurement

To identify the presence of nectar content the flowers are pulled from the calyx and it is pressed against a surface, usually a hard surface, and depending on the quantity of the nectar the flowers are chosen for further study. The flowers with nectar content are showed in the (Table 6). The flowers should be removed only after anthesis. The floral visitors are prevented from nectar collection by a process called bagging. This is done to estimate the accurate value of nectar. After that, the nectar is usually taken from the corolla tube base and it is withdrawn with the help of 5 microlitre calibrated capillary tube. This process should be carried out only after the removal of ovary from the flower base [Kulloli, 2011] [8]. The nectar yielding weed species in garden land and wetland are shown in Table 4 and Table 5 respectively.

**Table 1:** Flowering weeds of garden land in the East coast of Tamil Nadu

S. No	Common Name	Botanical Name	flowering season	Colour of the Flower
1	Indian mallow	<i>Abutilon indicum</i>	Rabi	Yellow
2	Bill goat weed	<i>Ageratum conyzoides</i>	Rabi	Purple
3	Zarar	<i>Biophytum sensitivum</i>	Rabi	Yellow
4	Spreading hog weed	<i>Boerhaavia diffusa</i>	Rabi	Pink
5	Cleome	<i>Cleome viscosa</i>	Rabi	Yellow
6	Butterfly pea	<i>Clitoria ternatea</i>	Rabi	Blue
7	Indian heliotrope	<i>Heliotropium indicum</i>	Rabi	White
8	Large leaf lantana	<i>Lantana camara</i>	Rabi	Orange
9	Touch me not	<i>Mimosa pudica</i>	Rabi	Pink
10	Carrot weed	<i>Parthenium hysterophorus</i>	Rabi	White
11	Bush mint	<i>Hyptis suaveolens</i>	Rabi	Purple

**Table 2:** Flowering weeds of garden land in the East coast of Tamil Nadu

S. No	Common name	Botanical name	Flowering season	Colour of the flower
1	Wild snake gourd	<i>Coccinia indica</i>	kharif	White
2	Field bind weed	<i>Convolvulus arvensis</i>	Kharif	White
3	Jews mallow jute	<i>Corchorus olitorius</i>	Kharif	Yellow
4	Thorn apple	<i>Datura metal</i>	Kharif	White
5	Spider flower	<i>Cleome gynandra</i>	Kharif	White
6	Leucas	<i>Leucas aspera</i>	Kharif	White
7	Indian sorrel	<i>Oxalis corniculata</i>	Kharif	Yellow
8	Black night shade	<i>Solanum nigrum</i>	Kharif	White
9	White horsenettle	<i>Solanum elaeagnifolium</i>	Kharif	Purple
10	Coat button	<i>Tridax procumbens</i>	Kharif	White
11	Indian borage	<i>Tricodesma indicum</i>	Kharif	White

**Table 3:** Flowering weeds of wetland in the East coast of Tamil Nadu

S. No	Common name	Botanical name	Flowering season	Colour of the flower
1	Purple nut sedge	<i>Cyperus rotandus</i>	Rabi	Brown
2	Spreading day flower	<i>Cyanotis axillaris</i>	All	Purple
3	Day flower	<i>Commelina benghalensis</i>	All	Blue
4	False daisy	<i>Eclipta alba</i>	All	White
5	Water primrose	<i>Ludwigia parviflora</i>	All	Yellow
6	Monochoria	<i>Monochoria vaginalis</i>	Rabi	Purple
7	Frog fruit	<i>Phyla nodiflora</i>	All	White
8	Corn spurry	<i>Sphaeranthus indicus</i>	Rabi	Pink
9	Marsh barbell	<i>Asteracantha longifolia</i>	Rabi	Purple
10	Rotala	<i>Rotala densiflora</i>	Kharif	Pink

**Table 4:** Nectar yielding weeds in garden lands in the East coast of Tamil Nadu

S. No	Common name	Botanical name	Flowering season	Colour of the flower
1	Indian mallow	<i>Abutilon indicum</i>	Rabi	Yellow
2	Bill goat weed	<i>Ageratum conyzoides</i>	Rabi	Purple
3	Zarer	<i>Biophytum sensitivum</i>	Rabi	Yellow
4	Spreading hog weed	<i>Boerhaavia diffusa</i>	Rabi	Pink
5	Cleome	<i>Cleome viscosa</i>	Rabi	Yellow
6	Wild snake gourd	<i>Coccinia indica</i>	kharif	White
7	Field bind weed	<i>Convolvulus arvensis</i>	Kharif	White
8	Spider flower	<i>Cleome gynandra</i>	Kharif	White
9	Leucas	<i>Leucas aspera</i>	Kharif	White
10	Indian sorrel	<i>Oxalis corniculata</i>	Kharif	Yellow
11	Carrot weed	<i>Parthenium hysterophorus</i>	Rabi	White
12	Bush mint	<i>Hyptis suaveolens</i>	Rabi	Purple
13	Large leaf lantana	<i>Lantana camara</i>	Rabi	Orange
14	Coat button	<i>Tridax procumbens</i>	Kharif	White

**Table 5:** Nectar yielding weeds in wetlands in the East coast of Tamil Nadu

S. No	Common name	Botanical name	Flowering season	Colour of the flower
1	Purple nut sedge	<i>Cyperus rotandus</i>	Rabi	Brown
2	Frog fruit	<i>Phyla nodiflora</i>	All	White
3	Corn spurry	<i>Sphaeranthus indicus</i>	Rabi	Pink
4	Water primrose	<i>Ludwigia parviflora</i>	All	Yellow

**Table 6:** Weed flora supporting the survival of bees in East coastal lines of Tamil Nadu, India

Common name	Botanical name	Flowering season	Flower Color	Average nectar content ( $\mu$ l)
Indian mallow	<i>Abutilon indicum</i>	Year round	Yellow	0.3/F
Billygoat weed	<i>Ageratum conyzoides</i>	Year round	Purple	4.2/FH
Little tree plant	<i>Biophytum sensitivum</i>	August to January	Yellow	1.3/3F
Spreading hogweed	<i>Boerhavia diffusa</i>	Year round	Pink	5.6/FH
Spiderflower	<i>Cleome viscosa</i>	November to April	Yellow	7.2/FH
Wild snake gourd	<i>Coccinia indica</i>	June to October	White	0.4/F
Field bind weed	<i>Convolvulus arvensis</i>	May to October	White	0.38/F
Thumba	<i>Leucas aspera</i>	September to January	White	0.8/F
Indian sorrel	<i>Oxalis corniculata</i>	June to September	Yellow	0.9/F
Carrot weed	<i>Parthenium hysterophorus</i>	Year round	White	0.4/FH
Bush mint	<i>Hyptis suaveolens</i>	November to April	Purple	0.7/3F
Large leaf lantana	<i>Lantana camara</i>	Year round	Orange	0.66/FH
Coat button	<i>Tridax procumbens</i>	June to October	White	0.36/FH
Purple nut sedge	<i>Cyperus rotandus</i>	November to April	Brown	0.3/FH
Frog fruit	<i>Phyla nodiflora</i>	Year round	White	0.3/F
Corn spurry	<i>Sphaeranthus indicus</i>	November to April	Pink	0.4/F
Water primrose	<i>Ludwigia parviflora</i>	Year round	Yellow	0.5/F

F- Flower; FH – Flower head

## Result

*Abutilon indicum* is a flowering weed, which flowers year round and the nectar content is 0.3 $\mu$ l/flower. The nectar content of purple colour flowering weed *Ageratum conyzoides* is 4.2 $\mu$ l/flower head and the flowering season of this weed is year round. The flowering season of *Biophytum sensitivum* falls between August and January, the nectar content of this yellow colour flowering weed is 1.3 $\mu$ l/3flowers. The year round flowering weed *Boerhavia diffusa* produces nectar of about 5.6 $\mu$ l/ flower head and the flower colour is pink. *Cleome viscosa* flowers during the months of November to April and these yellow flowers secrete nectar of about 7.2 $\mu$ l/flower head.

The flowering weed *Coccinia indica* produces white colour flowers with the nectar content of .4 $\mu$ l/flower and the flowering season lies between June to October. During the months of May to October the white colour flowering weed *Convolvulus arvensis* produces nectar content of about 0.38 $\mu$ l/flower. *Leucas aspera* is a white colour flowering weed with the nectar content of 0.8 $\mu$ l/flower, and the

flowering period of this weed is usually from September to January. *Oxalis corniculata* produces nectar of about 0.9 $\mu$ l/flower and the season of flowering is between June to September with yellow colour flowers. *Parthenium hysterophorus* blooms year round with white colour flowers and the nectar content of this weed is about 0.4 $\mu$ l/flower head. The purple color flowering weed, *Hyptis suaveolens* secretes nectar of about 0.7 $\mu$ l/3 flowers during the months of November to April. The flowers of *Lantana camara* are orange in colour with the nectar content of 0.66 $\mu$ l/flower head and its a year round blooming weed. The flowering weed *Tridax procumbens* produces white colour flowers from June to October and the nectar content is 0.36 $\mu$ l/flower head. The flowering season of *Cyperus rotandus* falls between November to April and the nectar content of these brown flowers are 0.3 $\mu$ l/flower head. The year round flowering weed *Phyla nodiflora* produces white colour flowers with the nectar content of 0.3 $\mu$ l/flower. The flowering weed *Sphaeranthus indicus* blooms pink in colour during the months of November to April and the nectar content is about

0.4µl/flower. The flowering weed *Ludwigia parviflora* produces yellow colour flowers year round with the nectar content of 0.5µl/flower.

### Discussion

The nectar content of the flowers varies depending on their nature and the number of flowers. *Leucas aspera* has a nectar content of 0.6µl/flower as per the research done by Kulloli (2010) <sup>[8]</sup> which proves the study of present authors. The research done by Aluri and Subba Reddi (1995) <sup>[1]</sup> explains that *Lantana camara* produces flower round the year and yellow flowers shift its color from yellow to orange or red color which also matches with the current study. The nectar volume of *Lantana camara* was recorded by Carrion-Tacuri *et al.*, (2012) <sup>[2]</sup> and it explains that the volume lies between 0.5 to 1µl for one to three flowers was in line with the present findings. *Leucas aspera* is a nectar producing weed and its flowering season lies between June to February and the color is white. This was observed by Kulloli (2011) <sup>[8]</sup> in his research which was in correspondence with present studies. *Tridax procumbens* has a nectar volume of about 9.36µl /capitulum which contradicts the findings of present authors.

### Conclusion

Finally, it is clear that, weeds act as alternate nectar sources for honeybees during dry season periods. More than seven weed species bloom throughout the year and provide nectar to bees in the east coast of Tamil Nadu. The plant with highest nectar content is *Cleome viscosa* and its period of flowering lies between November to April. The presence of weeds in the coastal areas not only prevents soil erosion but also act as food source for the honeybees.

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