



Bee keeping for yield enhancement in coconut gardens

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Multiplying bee colonies in coconut plantations enhances the number of bees visiting the inflorescence, pollination rate and thereby productivity of coconut to a tune of 20 per cent.

Coconut, *Cocos nucifera*, is a major crop of Kerala occupying each and every homestead of the state. The average productivity of the crop shows a steady decline over the past few years. Poor management of coconut gardens is the main reason for this failure. Decline in soil fertility, increased infestation by pests and diseases, irrational pesticide use, nutrient imbalance and inadequate pollination are factors attributed to the decline in productivity. Proper management practices like timely plant protection, scientific nutrient and water management along with augmentation of sufficient pollinators could improve the productivity of coconut to the expected levels.

The coconut inflorescence bears unisexual flowers, male and female reproductive organs in separate flowers of the inflorescence and the male and female phases do not coincide. The male phase extends up to 23 days followed by the female phase which extends for 3 -5 days. Hence pollen of the same flower cannot be utilized for its pollination and only cross pollination can bring in fruit set. When the stigma of female flowers is ready to receive the pollen, it exudes a drop of nectar, which attracts the insects. This enables cross pollination by insects especially

honey bees. Wind pollination also occurs to some extent. Honey bees due to their morphological (Pollen collecting legs) and nutritional adaptations (Pollen and nectar feeding) can perform cross pollination in crops very well.

An experiment was conducted by the All India Co-ordinated Research Project on Honeybees and Pollinators, Vellayani Centre on the community analysis of insects visiting coconut inflorescence and their role especially that of honey bees in pollination, ensuring the presence of honeybees in coconut plantations. The study revealed that 30 different species of insects visit the inflorescence. (Table). These visitors comprises of bees, butterflies, beetles, ants, wasps and bugs. Of these honey bees dominate. When compared to other insects honey bees have high floral constancy. They visit the same



Apis mellifera

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Table. Different insect species observed on coconut inflorescence from March 2004 to February 2005

Common name	Scientific name	Family	Order	
Bees	<i>Apis mellifera</i> L.	Apidae	Hymenoptera	
	<i>Apis cerana indica</i> Fabr.	"	"	
	<i>Apis dorsata</i> Fabr.	"	"	
	<i>Trigona iridipennis</i> Smith	"	"	
	<i>Braunsapis</i> sp.	"	"	
	<i>Eupetersia</i> sp.	Halticidae	"	
	Ants	<i>Solenopsis geminata</i> Fabr.	Formicidae	"
		<i>Myrmecaria brunnea</i> Saunders	"	"
		<i>Pheidole spathulifera</i> Forel.	"	"
		<i>Cardiocondyla</i> sp. Forel.	"	"
<i>Monomorium</i> sp.		"	"	
<i>Dolichoderus</i> sp. Jerdon		"	"	
<i>Camponotus rufoglaucus</i> Jerdon		"	"	
<i>Camponotus sericeus</i> F.		"	"	
<i>Oecophylla smaragdina</i> Fabr.		"	"	
Flies <i>Hemipyrellia</i> sp.		Calliphoridae	Diptera	
<i>Bactrocera cucurbitae</i> Coq.	Tephritidae	"		
<i>Bactrocera dorsalis</i> Hendel	"	"		
<i>Musca domestica</i> Linn.	Muscidae	"		
<i>Graptomyza brevisrostris</i> Weidemann	Syrphidae	"		
<i>Sarcophaga</i> sp.	Sarcophagidae	"		
Wasps <i>Chalybion bengalense</i> Dahlbom	Sphecidae	Hymenoptera		
<i>Polistes hebraeus</i> Fabr.	Vespidae	"		
<i>Ropalidia variegata</i> Smith	"	"		
<i>Vespa cincta</i> Fabr.	"	"		
<i>Vespa</i> sp.	"	"		
Moths	<i>Euchromia polymena</i> L.	Amatidae	Lepidoptera	
	<i>Melanitis leda ismene</i> Cramer	Satyriidae	"	
Beetles	<i>Oxycetonia versicolor</i> Linn.	Cetoniidae	Coleoptera	
	<i>Oxycetonia</i> sp.	"	"	



Apis dorsata

growth rate is very high in hives having more storage of pollen.

Studies conducted at AICRP on honeybees and pollinators, Vellayani centre revealed that the colonies kept in coconut plantation during the brood rearing and lean season ensured better growth of colonies. To maintain the colonies in coconut plantation the colonies need to be fed with the sugar syrup (1:1) as artificial food @ 200-250 ml/hive/week for Indian bee colony and 750 ml/hive/week for Italian bee colony. When the colonies were fed with sugar syrup regularly at three days interval, better growth was observed and the colonies could be subjected to three divisions during September, October and December. ie. Five Indian bee colonies kept in coconut plantation during August could be multiplied to ten in September and to twenty during October and again to forty during December. Adoption of this practice will be beneficial to the Bee breeders so that they can multiply the colonies in coconut plantations during brood rearing season

Multiplying bee colonies in coconut plantations enhances the number of bees visiting the inflorescence, pollination rate and

inflorescence repeatedly and maximum bee visit was recorded during 8 to 10 hours of the day. It was observed that even though different honey bee species like Indian bee *Apis cerana indica*, Italian bee *A. mellifera*, Little bee, *A. florea*, rock bee *A. dorsata*, and stingless bee *Trigona iridipennis* visit coconut inflorescence Indian bee is the prime



Apis cerana

pollinator. The hard working nature of honeybees and abundance of pollen in coconut (272 million pollen grains in a single inflorescence) ensures high rate of pollination in coconut palm.

Maintenance of bee colonies in coconut gardens

Honey bee colonies undergo three different phases within a year namely Brood rearing season (August-December), Honey flow season (January-May) and Lean/dearth season (June-November). Maintaining colonies in coconut plantations during Brood Rearing season will ensure continuous supply of pollen to bees. Pollen is highly essential for the growth of the larvae of honeybees. It is seen that the colony



thereby productivity of coconut to a tune of 20 per cent. The fruit set was only 17 per cent when the inflorescence was allowed to pollinate only by wind. When the inflorescence was restricted to the visit of honey bees, button shedding recorded was maximum. Maintaining 5-10 Indian honeybee colonies or 3-6 Italian honeybee colonies per hectare of coconut is advisable to enhance pollination rate and yield.

Bee population can be encouraged in coconut gardens either with judicious application of pesticides or



Trigona iridipennis

no use of pesticides that cause harm to the bees. Care should be taken to avoid pesticide application during peak hours in the morning and

evening when bee foraging commences. For minimal hazard to bees, pesticides should be applied only in the late evening or early morning hours. Neem based formulations and malathion are the insecticides which are relatively safer to bees when compared to carbaryl and chlorpyrifos. The bee keepers are advised to maintain the honey bee colonies in coconut plantations during brood rearing as well as lean season and get it multiplied and then allow the bees to migrate to nearby rubber plantations so as to obtain more honey yield during the honey flow season.

COCONUT DISHES

Coconut Dosa Coconut Dosa

Ingredients:

Raw rice	: 2 cups
Urad dal (black gram)	: ½ cup
Coconut (grated)	: ½
Salt	: to taste

Method of preparation

Wash and soak rice and dal together for 3 to 4 hours. Drain completely. Grind it into a fine paste along with coconut and salt. Remove and keep aside for 8 hours. Spread one laddle of batter on a heated greased tava. Cover for 2-3 minutes till cooked. Remove from tava carefully and serve hot.

Maida Dosa Maida Dosa

Ingredients:

Maida (flour)	: 3 cups
Green chillies	: 3
Table salt	: 1 tsp.
Grated coconut	: 1 cup
Cumin seeds	: ½ tsp.
Mustard seeds	: ½ tsp.
Ghee	: 4 tsp.
Curry leaves	: 1 sprig
Oil	: for frying

Method of preparation

Sieve maida. Chop green chillies. Mix coconut gratings, salt and green chillies together in a vessel. Pour 2 cups

of water in it, and mix the maida, not allowing to form lumps. Add some water to dilute the batter. Season with cumin, mustard and curry leaves in ghee. Place dosa pan on flame. Smear it with oil. Spread batter thinly on pan, when hot. Fry on both sides (Note : If 2 tbsps of wheat rava is added to the batter, simple rava dosai is obtained).

Rava Idli Rava Idli

Ingredients:

Bomba sooji	: 250 g
Sweet curd (thick)	: 500 g.
Ghee	: 5-6 tsp.
Green chillies	: 5
Ginger	: 1 small piece
Coconut (gratings)	: 4 tbsp.
Cashewnuts	: 10-12
Curry leaves	: 1 sprig
Mustard seeds	: ½ tsp.
Salt	: to taste

Method of preparation

Chop ginger and green chillies finely. Prepare seasoning in frying pan with mustard and curry leaves in ghee, and add chopped green chillies. Mix sooji and cashewnut bits with the seasoning and roast for a few minutes (til brown) on low flame. Remove from flame. When cool, transfer the roasted sooji to a vessel. Prepare idli mix by adding coconut gratings, curd and a little salt to the sooji and keep aside for half an hour. Rest of the method is same as for plain idli, except that the idli cups are greased with ghee, instead of oil

- Coconut Recipes Around the World