# Disposed paper cups and declining bees

Colony collapse disaster (CCD) was reported as a major cause for decline in bee population and subsequent agricultural productivity from many parts of the world[1]. Many biological and physical factors such as diseases, insecticides, environmental stresses or a combination of all these are attributed as reasons for bee collapse. However, clear-cut facts on bee collapse are yet to emerge[2,3] and available information strongly suggests the involvement of more factors and bee collapse as an under-explored area. Here we report qualitative and quantitative data on foraging shift of honey bees and subsequent loss of adult worker population.

The change in lifestyle pattern and increased awareness on environment have enhanced the usage of disposable paper cups rather than glass and plastic cups invariably in coffee shops and juice centres in urban, semi-urban, rural and biodiversity protected areas. The sugary residue attracts the honey bees to visit the disposed cups. The bees neglect visiting flowers and are attracted by the rich residual sugar in the cups as an alternative food resource (Figure 1 *a*). This kind of foraging shift is common in honey bees, which enjoy short-term memory that acts as a fast adaptation to changing profitability of food sources[4]. A considerable population of honey bees that visited to these 'cup flowers' never returned to the bee hives. These cups act as 'death traps' for them.

The visiting of the honey-bee populations lured by sugar in disposed cups in commercial coffee bars was observed for a period of one year since May 2010. Five commercial coffee bars using disposable cups located in rural and urban areas were selected. The number of cups in these bars ranges from 160 to 7000 approximately, with an average of about 1225 cups in a day. The bees while competing for collecting sugar, fell into the cups containing the residual beverage (coffee/tea/milk) and were unable to fly (Figure 1 *b*). This leads to the death of bees (168 bees/day/shop; Figure 1 *c*). We recorded 25,211 dead bees in the coffee bars studied in 30 days. The mean death rate varies with the depth of the waste bin with cups, quantity of residual beverages, location of the sampled bars and visiting time. Maximum mortality (23%) was recorded between 10 : 00 and 14 : 00 h in the cups with 3–6 ml beverage remains found at a depth of 20–40 cm in waste bins. The bees trapped at the bottom (60 cm) of the bin atmost successfully escaped to the middle zone only. Latter the cups are sent to the recycling yard, where about 680 bees/day are killed manually in order to escape stinging. Our observation also revealed that bees need large quantities (~ 300 cups) of sugar-coated cups and longer duration (120–150 days) of display to select new coffee bars as foraging sites. But once visited, they continue to do so regularly.


**Figure 1.** ***a***, Bees visiting and collecting residual sugar from the bottom of the disposed cups. ***b***, Mass death of bees at the bottom of the disposed cups, a few attempting to escape. ***c***, Bees dying in the cups used for drinking beverages.

The increasing trend in urbanization and subsequent increase in beverage bars may aggravate the mortality of bees that inhabit in and around urban and semi-urban ecosystems. There are about 1.3 billion and 800 million cups of coffee and tea consumed daily around the world by using millions of disposable cups. This may lead to bee collapse in future and reduction in agricultural productivity throughout the world. Even though bee collapse has been reported in many countries in the past, there is no scientific data and even awareness on this issue in developing counties like India. What we observed could be one way of bee collapse in India.

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