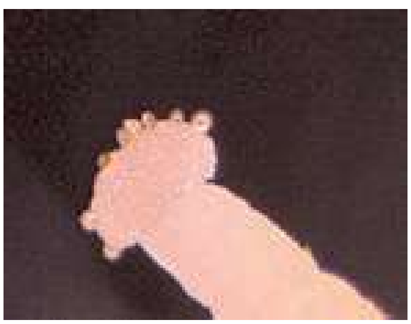
Native bees a – potential pollinatiors of cashew

Cashew (*Anacardium occidentale* L. Family: Anacardiaceae), a commercial tree crop, is andromonoecious having sticky pollen. Each flower has a long stamen and 7-9 staminoids. In the hermaphrodite flowers, style is longer than the large stamen and assumes the same position, thus makes self-pollination difficult and requires cross pollination by insects. Fruit set in cashew is mainly influenced by the activity of pollinators and not the wind. Cashew flowers are visited by a diverse group of insects and its yield is often pollinator-dependent. Bees, ants, wasps, butterflies, flies, and moths have been reported as pollinators in different cashew growing regions of the world.

Pollinators of cashew **a.** *Apis cerana indica*, **b.** *Braunsapis picitarsus*, **c.** *Tetragonula* sp., **d.** *Pseudapis oxybeloides* **e.** *Ceratina hieroglyphica*, **f.** *Seledonia* sp.

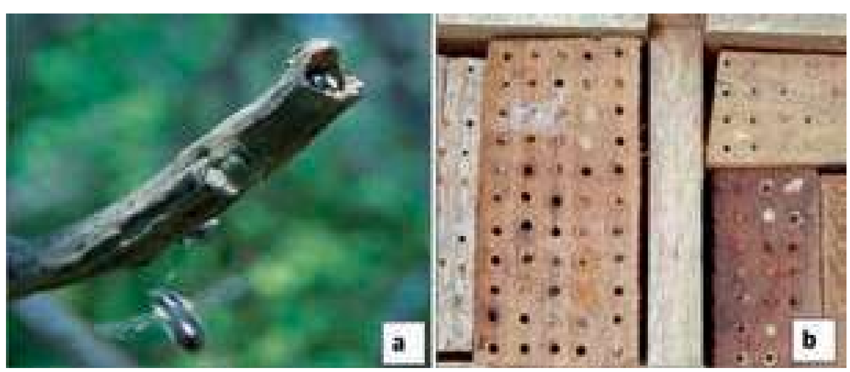


Pollen grains deposited on cashew stigma by bees

Each region has its own native bees which are very important for crop pollination and need to be studied thoroughly. Among the 40 species recorded as flower visitors of cashew at ICAR-Directorate of Cashew Research, Puttur, Karnataka, 64% comprised of bees of families Apidae and Halictidae, while the rest were megachilids, scolids, bombylids, syrphids, sciarids, calliphorids, and butterflies. Among them, 8 species of Apidae and 5 species of Halictidae were recorded as pollinators of cashew. Species abundance was high for *Braunsapis picitarus* (Cameron) (20.0%) followed by *Pseudapis oxybeloides* Smith (17.6%) and *Apis cerana indica* F. (16.7%).

Peak foraging period of pollinators occurred during 11.00 - 13.00 hrs when much of the hermaphrodite flowers remained open and a high proportion of anther dehiscence was seen in male flowers, which is advantageous for effective pollination in cashew. Certain bee species visited cashew flowers mainly for pollen, while, few visit for nectar and extra floral nectarines. Nectar was the major foraging reward for *A. c. indica* and *Apis florea*, while, it was pollen for *B. picitarsus*, *P. oxybeloides*, *Ceratina hierogyphica*, *Lasiolossum* sp. and *Seledonia* sp. But for *Tetragonula* sp., the foraging reward was nectar from extra floral nectarines followed by pollen and nectar. Fresh flowers were mostly preferred by all the bee species.

Nevertheless, multiple bee species visited the same hermaphrodite flower multiple times thus ensuring pollination in field. The mean number of pollen grains deposited per stigma upon bee visit was 0.2 during 10.00-10.30 hrs and 2.65 during 16.00 to 16.30 hrs indicating



a. Natural nest of *B. picitarsus*, **b.** Artificial nesting sites of *B. picitarsus* multiple bee visits during the day. However, it was noticed that around 42% cashew flowers opened on the same day were devoid of any pollen even at the end of the day indicating pollination deficit in cashew in the study region. Mean pollen count per bee collected after multiple visits was high for *P. oxybeloides* (786.6) followed by *B. picitarsus* (804.9), *Seledonia* sp. (786.6) and *C. hieroglyphica* (187.1) compared to *A. c. indica*. These bees exhibited strong affinity to cashew flowers and collected more pollen during peak flowering period and hence could be efficient pollinators of cashew.

Controlled exposure of bees to inflorescences of cashew variety, Bhaskara during different time periods indicated the maximum nut set under combined hand pollination and open pollination followed by inflorescences exposed to bees between 11.00 and 13.00 hrs. While there was no nut set in the caged ones and those exposed between 16.00 hrs - 08.00 hrs. Further, observations on the nesting biology of *B. picitarsus* helped in developing suitable artificial nesting sites for breeding and conservation of these promising native bees.

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ICAR initiatives on Antimicrobial Resistance

Antimicrobial agents, the wonder drug, has become an indispensable choice of modern medicine, since the introduction of penicillin in clinical practice in 1942. Over the years, this magic bullet has saved millions and helped us tame the killer diseases once thought invincible. But the time has come when resistance started to crop up and spread among the pathogens against even newer and higher generation antibiotics making them in effective. Antimicrobial resistance (AMR) is considered as one of the biggest threats to modern civilization which can jeopardize global health, economy and human development. It has been pointed out atvarious global forum that antibiotics are rapidly losing their potency and efficacy to fight infection; the possibility of the reemergence of once subdued killer diseases as a global annihilator cannot be thus excluded. Even today, AMR has the enviable positionfor being one of the leading infectious causes of mortality in human. We are indeed heading towards a point-of-no-return which was described by many as “post-antibiotic apocalypse” when the minor infection and surgeries which have been manageable and treatable for all these years, will turn out to be lethal. WHO Director-General, Dr Margaret Chan rightly said “The world is on the brink of losing these miracle cures,” when she referred to this rising menace of global health. Considering the dimension and magnitude of the problem, the issue was discussed in United Nations General Assembly in New York in September 2016. AMR is the fourth health-related issued to be discussed at the General Assembly preceded by HIV, non-communicable diseases, and Ebola.

Inadvertent and irrational use of antimicrobials is considered as the single most important driver for development of antimicrobial resistance. There are

various factors which are crucial in development and dissemination of bugs apart from overuse of antimicrobials in human health, agriculture, livestock rearing and aquaculture. Persistence of antimicrobial residues in the refusals of the pharmaceutical production units, population, overcrowding, poor bio-security measures, lack of personal hygiene – all these are implicated in AMR in one way or other. The impact of AMR is not limited within the health sector, as generally presumed, but it has a far-reaching consequence to cause irreversible damage to global economy and food security. The famous report on AMR by O’Neill, in 2016 was an eye-opener in this context.

Currently, AMR is responsible for about 700,000 deaths annually world wide and is expected to reach 10 million by 2050, if adequate measures are not taken. AMR will have a shattering impact over world economy causing a loss of $100 trillion by 2050, thereby decreasing the global GDP by 3.5%. It is the AMR for which around 28 million people will be slipped under poverty, as the World Bank