A focus on honey bees in the tropics*

Honey bees are natural source of a precious product – honey, as a nutritious item for human consumption since ancient times and used in a large number of ayurvedic medicines as a drug vehicle. Because of its natural occurrence, quality, fragrance and known mode of action in the human body, honey is added during formulation of different products. In a few Asian countries (especially in India) new-born babies are fed honey drops as the first natural nutritious food. Scientists have established that during collection of nectar from flowers the cross-pollination by honey bees fetches about 30–80% increase in productivity of agricultural crops. Under the bee-keeping programme, honey is exported to different countries. In the period 1997–98, 170,000 metric tons (m.tons) of honey was marketed at the international level, out of which China's share was to the tune of 55,000 m.tons, Argentina 40,000 m.tons, Mexico 35,000 m.tons and India 424 m.tons (a report from UP Agro-Industrial Corporation Ltd, Noida, India). India can enhance its export potential of honey through bee-keeping, by taking advantage of the large number of farmers and availability of many plant species and flowers throughout the year. Apart from the above-mentioned advantages, bee-keeping provides employment opportunity in developing countries like India.

The tropical bees known for highly industrious production of honey, received the attention of a large community of scientists and industrialists throughout the world at the Seventh International Bee Research Association (IBRA) Conference and Fifth Asian Apiculturists Association (AAA) Conference in Thailand. The aim of the conference was to bring together the international scientific community involved in the study of tropical bees to discuss topics like biodiversity, biotechnology, pesticides and honey bee pathology, acarology, apitherapy and apicultural science.

This conference had ten technical sessions, namely (i) Hive products (apitherapy), (ii) biodiversity of bees, (iii) bee pest and diseases, (iv) tropical bee management, (v) biology of bees, (vi) honey bee in conservation and ecosystem management, (vii) genetic advances, (viii) advances in plant protection, (ix) bees in crop production and (x) international aid and sustainable bee-keeping development. Under the chairmanship of Thomas E. Reinders, five keynote lectures were delivered: (i) Traditional bee-keeping in Asia: some known and unknown aspects of its history by Eva Crane (UK); (ii) Bee and politics by H. Shimanuki (USDA-ARS); (iii) An overview of *Apis cerana* F. genetic diversity in Himalaya by L. R. Verma (India); (iv) Honey bee diversity and management in the new millennium in Thailand by S. Wongsiri (Thailand), (v) An approach to bee-keeping in the new millennium: A view from IBRA by R. Jones (IBRA, UK). Five plenary lectures were delivered by eminent scientists: (i) Hive products – Asian view by M. Matsuka (Japan); (ii) Biogeography of *Apis cerana* and *A. nigrocinta*: Insights from mtDNA sequence studies by Deborach R. Smith (USA), (iii) Worker policies in honey bee by F. L. W. Ratmicks (UK), (iv) Honey bee classification and the tragic consequences of the Linnean system of nomenclature by H. R. He (South Africa), and (v) The social impact of the Africanized honey bee in Brazil by L. S. Conclaves (Brazil).

A summary of all the presentations in different symposia of the conference follows:

Based on experiences in New Zealand and Australia about the mandatory warning statements on all food products containing royal jelly, bee pollen and propolis, it was suggested that more research results on these products need to be published in the mainstream medical journals and not just in the apiculture science literature. There is need for systematic collection and utilization of honey and hive bee products for marketing and export, along with scientific collection of bee products in India where 80% of honey is used directly as medicine and 10% in ayurvedic and pharmaceutical preparations. It was reported that due to standardization of the hives, insulation and ventilation, systematic breeding and use of products, queen bees and management practices, average honey production by commercial bee-keepers in India has increased to 10–15 kg in *A. cerana* and 40–60 kg in *A. mellifera*. A study carried out in Iran on the royal jelly production showed that the manipulator wax cells have had better performance than the natural cells. In China, royal jelly product tool has been improved by artificial queen cell cup. The chemical compositions of royal jelly from *A. cerana indica* have been investigated in Thailand. With a view to therapeutic use of honey, a comparative study showed that treatment of children below 5 years of age having pneumonia with tablet form of 'cotrimoxazole' with honey and syrup form of 'cotrimoxazole' without honey. In Nepal, apitherapy has a great deal to offer, especially in application of honey for infections.

Royal jelly is secreted from the food glands of the 6 to 12-day-old worker bees to feed the developing young larvae and the queen bee in the colony. In Turkey, the royal jelly is used in humans to strengthen the body, to improve appetite in children, elderly and sick people, to prevent aging of skin and for the general well-being of leukemia and cancer patients. In the Solon area of Himachal Pradesh, India, seasonal variations in the amount of pollen trapped from honey bee colonies showed that February to May is the main pollen flow period here.

The diversity of *A. cerana* Fabricious in the Philippines was studied using the morphometric method. Variations in the samples collected from different areas were recorded and separate groups were noticed. Behavioural mating barriers, diversity in mating signs, mandibular gland chemistry, sub-specific classifications, ecology and diversity of stingless bess, biodiversity of honey bees in Thailand, ultrastructure and pheromones of the mandibular glands of honey bee foragers, chemical signalling, co-existence of *A. mellifera* and indigenous *A. cerana japonica* to new habitats were discussed in detail.

In the symposium on the biology of bees, a Japanese study revealed that 2-alkanones (2-heptanone and 2-nonanone

*A report on the 7th International Bee Research Association Conference and 5th Asian Apiculturists Association Conference held at Thailand during 19–25 March 2000, on Tropical Bee: Management and Bio-diversity.

and 3-hydroxy fatty acids (C8 and C10)) were found to be present in the worker mandibular glands as common components. 2-heptanonone is regarded as an alarm pheromone in *Apis* species and hydroxy fatty acids were identified as antifungal agents. Apart from this, topics on flight machinery of honey bees, application of juvenile hormone in division of labour in *A. cerana*, semiochemicals, including social behaviour in honey bee society, cross-breeding techniques, application for the superior strains of bees, production of natural hybrids, habitat selection for colonization, comparative performance of hive bees and comparative mating flight times of bees were discussed. The technique of honey bees in the laboratory was developed by scientists with mixed diet consisting of fresh royal jelly, water, glucose, fructose and on tissue cultural plates for different castes. The bees reared on mixed diets in the laboratory were found to be similar to field colonies.

In the tropical management and beekeeping section of the conference, discussions were mainly on prospects of *A. cerana* bee-keeping and its management. To prevent the weakening of the colonies, seven dietary ratons of pollen substitute showed that pollen substitute with soybean meal resulted in increasing the population size and brooding of the bee colonies.

In the section on bee pests and diseases, the following aspects were discussed: It is estimated that due to attack of *Varroa* mites, sometimes colonies are destroyed to 100%. Initiatives to control the bee mites (*Varroa jacobsoni* and *Acarapis woodi*) were suggested. The seasonal changes in the mite population, pests, predators and bee diseases were highlighted with scientific data and their chemical and biological control measures were suggested. Application of formic acid and formaldehyde was suggested as one of the chemical control measures for the mites. A safe approach to mite control through the use of plant products and secondary metabolites was suggested by this author. This type of approach to control the mites' species was considered superior to the application of synthetic pesticides in honey bee colonies. To check the menace of chalkbrood disease in the colonies of *A. mellifera*, Thailand scientists suggested that the ethanol-plant crude extracts of *Cymbopogon citratus*, *Eugenia carryphyllus*, *Eupatorium odoratum*, *Ocimum sanctum* and *Rhinacanthus nastus* was more effective than other products tested.

Bees play an important role in crop productivity by cross-pollination. It is estimated that about 30% of total agricultural productivity can be enhanced by bee visits in field crops. Colonies of bumble bees and honey bees for the pollination of strawberries in Turkey were found to be very useful. Use of honey bee colonies by farmers growing apples in Nepal and China and cherry, sunflower, pigeon pea (*Cajanus cajan*) and cucurbits in India and in the fields of tomato in Jordan were found beneficial for their higher productivity. Foraging activity of *A. cerana* in different flora was also discussed in detail. Application of *A. mellifera* honey bees for the hybrid seed production of mustard has also been used by Indian scientists. Use of stingless bees as an option for crop pollination, nectar plants of family Labitae in China, namely *Elsoltzia*, *Nepeta*, *Ocimum*, *Rabdosia*, *Scutellaria* and *Leonurus* forage by honey bees provide high quality of honey bees. Similarly, nectar plants in tropic areas in Yunnan and Himalayan region comprising 118 plant species were also noticed.

'Honey bees in conservation and ecosystem management' was also one of the important sections of the conference. The work on traditional management technique for *A. dorsata* in Indonesia, foraging activity of *A. cerana* on different flora in Nepal, habitat selection for colonization in the rock bee (*A. dorsata*) in India, flight activity of workers of *A. mellifera* in Jordan and nectar preferences from different plant species were reported on the basis of work done in Thailand. In this section, a documentary film was also shown to the participants on 'The Magic Tree' of Assam that possessed a number of colonies on the stem of the tree, suitable as attractants for the giant honey bees. The film prepared in November 1999, showed the life of giant honey bees, nest construction, dances, foraging and defence strategies, etc. The film has already received International Awards as stated by G. Kastaberger of Austria. Another magic bee tree (*Kompassia alaccensis*) was reported to bear sixty-nine colonies of giant honey bees (*A. dorsata*) by S. Wongsiri and his group from Thailand. *Dimocarpus longum* (Sapindaceae) is reported to be known as a major honey plant in Thailand.

In the symposium on genetic advances in honey bees, the population genetics of African honey bees based on new insights from microsatellite and mitochondria data showed that out of 514 colonies from 40 localities of Africa, differentiation of Ethiopian and Egyptian honey bees from those of other African bees was analysed. Bee-keeping in Brazil is reported to be advantageous and was considered as a good investment. The Africanized bees are good traits for a bright future in bee-keeping in the entire South America. Brazilian scientists feel that Africanized honey bees are more tolerant to *V. jacobsoni* mite species. The genetic analysis of honey bees, mitochondria DNA polymorphism in *A. cerana*, genetic architecture of *A. dorsata* population, phylogenic relationships in the sub genus *Bambus* (Hymenoptera: Apidae) based on mitochondrial cytochrome oxidase subunit II gene sequence, genetic diversity of honey bees in Japan and Thailand were discussed. Japanese honey bees have invaded from the Asian continent by way of Korean Peninsula, relatively recently in the course of evolution. Under this topic, the current status of transgenic research in honey bees towards the genetic manipulation of honey bee genome (i) DNA delivering system, (ii) possible transposable element vectors for transformations, and (iii) future application of transformation technique for honey bees was discussed in detail, along with risk management in transformed honey bees.

The symposium on advances in plant protection and their impact on honeybees discussed the effect of pesticides on honey bees, effect of some pest-resistance gene products on honey bees, research regulations and education that may reduce the impact of pesticides on bees, etc. Effect of proteins of genetically modified plants on honey bees showed that proteinase inhibitors (Pis) were not detected in nectar or pollen of transformed plants, and no short-term effects on mortality and the behaviour of the bees was found. However, long-term effects of Pis at exceeded doses found in green parts of transgenic plants could affect the bees, as stated by the speaker from France. Metabolic transformation of carbaryl by bacteria inhibiting honey bees and their role in inducing tolerance in bees, latent effects of insecti-

cides on the chromosome of honey bees, chromosomal and cellular abnormalities were recorded along with the latent effect on the genome of the treated bees different, for each of the insecticides. Individual uptake of pesticides by honey bees and stingless bees in orchards in Chiang Main (Thailand) and species-specific LD_{50} tests with hostathion indicated species susceptibility towards insecticides.

In the symposium on international aid and sustainable bee-keeping development, the role of Khadi and Village Industries Commission of India along with different on-going research projects was discussed.

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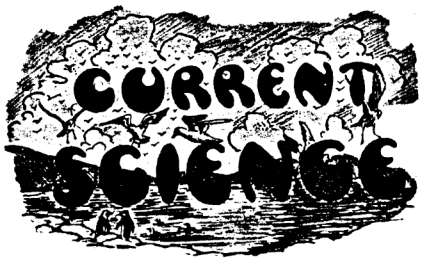
FROM THE ARCHIVES



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Ourselves

With this issue, *Current Science* enters on its third year, so the present is regarded as a suitable occasion to review the progress of the past two years.

It has been generally admitted by scientific workers, both in India and abroad, that the Journal fulfils a long-felt want; that it represents the progress, at any rate, of a large section of Indian science; and that it provides a useful medium for active scientific contact between India and the rest of the world. The popularity of the Journal is evidenced by the large number of contributors and wide circle of readers both in India and elsewhere. Its publications are abstracted and reviewed by various technical Journals in different parts of the world. The original contributions, as also many of the Special Articles, are cited in literature and extracts liberally quoted. It is indeed flattering to note that some of the articles appearing in *Current Science* have been reproduced as such in a number of technical Journals.

From the scientific point of view, the most important section of the Journal is that which relates to Letters to Editor. The value of a science news Journal depends largely on prompt publication of new findings and this fact is recognised by the Editors who are endeavouring to provide all possible facilities in this direction. Letters which are received up to the 9th or 10th of each month are generally included in the issue appearing in about a fortnight from that date. Except in some occasional cases where the referee resides at some considerable distance, or is otherwise unable to deal quickly with the matter, every note is promptly scrutinised and the authors informed of the decisions of the Board as early as possible.

The technical status of a Journal is largely determined by the quality of its matter and this applies more than anything else to the nature of the announcement which figure in correspondence columns. Great care is being exercised therefore in the scrutiny of papers received for publication in this section. In this connection it may be mentioned that acting on the recommendations of their specialist referees, the Editors have on several occasions been obliged either to refuse publications or to return papers to authors for the necessary alterations. This was always done in good faith and with proper courtesy and it is pleasing to record that most authors accepted the decisions in the right spirit.

Taken on the whole, the past two years have witnessed the consolidation of the position of the Journal both in India and abroad, accompanied by steady improvement in various directions. Any little success that has been achieved is largely due to the active support and co-operation of a number of scientific workers in India and abroad. To them as also to our other friends we are thankful for the good start which the Journal has made and the bright outlook for the future.

Even in days of general affluence, scientific journalism was rarely ever a financial success. It need hardly be wondered therefore that in these days of stringency, *Current Science* can hardly hope to run on the comparatively small income derived from subscriptions alone. Fortunately for the venture, a few Universities and scientific institutions have generously come to our assistance. Particular mention may be made of the liberal donations from the Universities of Madras, Mysore, Hyderabad and Nagpur, as also the Indian Science Congress. The Council of the Indian Institute of Science have not only given substantial annual grants but have also provided the Journal with room for its office and other facilities. But for these and other friends who have liberally donated in their private capacities, the Journal would not have been the success that it is to-day.

Even at the time of our writing, the financial position of the Journal is not so strong as one would wish it to be. The income is just about sufficient to meet the liabilities, so there is hardly any margin for fresh developments. It is earnestly hoped therefore that more Universities, scientific institutions and private donors would come forward and help the promoters in their venture. *Current Science* is a national institution standing for the progress of science in India and it is the duty of every one interested in the welfare of the country to rally round and render all possible assistance to make the Journal an international success.