A Review:

Epidemiology and Management of *Varroa* Mite

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The rewiew contains the available literature in the light of *Varroa* mite epidemic and its management in the world considering the aspects like; impact of management technique on the honeybee colony members, their biology, mode of action, disease level, efficacy of dose applied, release of active in gradient in per unit of time, use of individual or integrated method, their compatability and efficacy, resistance to insecticides etc.The physical environment as, temperature, season, location where bees were reared, hygiene of the hive, space for application and threshold levels etc. affecting the methods for their suitability.

Varroa mite, a serious pest of honeybees attacks as an ectoparasite present in different parts of the world in localized virulent species or strains except Australian continent has created a threat to honeybee industry. In India, the mite epidemic had been a matter of little concern till 2005. Due to its outbreak in recent years' up to 20 per cent dwindling of colonies has been reported in various parts of the country (Kumar and Surender, 2005). Beekeeping scientists around the world have evaluated and reported different management or control techniques but these become unfeasible in other continents or locations. Though, the chemical control measures proved better but persistence of residues in bee products, unsuitability to hived bees have been reported as the major drawback. The botanicals, biotechnical/ behavioral methods, integrated management techniques have been devised in the different countries. The objective of the paper considering the seriousness of the pest is to compile the varroa mite related knowledge and reports in a summarized way to devise the most practical management technique (may be an integration) for particular location.

Morphology and distribution:

Oudemans, 1904 described *Varroa jacobsoni*, based on 4 female mites found on *Apis indica* (=*cerana*) from Semarang, Java. Delfinado-Baker and Aggarwal, 1974 recorded a new species as *Varroa underwoodi* while collecting samples for *Varroa jacobsoni* in *Apis cerana* colonies from Nepal. Delaplane, 2001 reported *V. jacobsoni*, a crytic species (as a complex of atleast two species) as *V. destructor* with different genotypes but Korean genotype, a most virulent genotype. Delfinado-Baker and Houck, 1989 recorded significant variations in thirteen morphological characters among mites of *Apis cerana* and *A. mellifera* in *Varroa jacobsoni* collected from 17 countries and named them as geographical strains. The genus *Varroa* was defined in detail with the description of nymphal stages and males as it comprises of two species as, *jacobsoni* and *underwoodi* with *Apis cerana* as the original honeybee host (Delfinado-Baker, 1984). Matheson (1995) listed the strains from 49 countries of *Varroa jacobsoni* outside Asia by review of literature. The most pandemic strain was identified as *Varroa destructor* in Europe for the first time with its resistance to synthetically prepared substances (Hovorka and Hascik, 2004).

Biology:

Delfinado-Baker and Aggarwal, 1974 described unique smaller size having long female lateral marginal setae radiating outwards and feeding on bee brood as the major distinguishing characters of *Varroa underwoodi*. Naim and Bisht, 1987 reported that mites live on worker and drone bees under the abdominal sclerites and occasionally under thorax to feed on haemolymph, larvae and pupae. Female lays upto 12 eggs in worker while upto 21 eggs in drone cell. Males develop in 6-7 days and females in 8-9 days. Mites live in temperate region upto 2 months and a colony may have 3000 to 11000 mites. Ifantidis, 1983 recorded ontogenetic aspects of varroa mite in *Apis mellifera* honeybees; female mite lay atleast 7 eggs in drone cell and 6 in woker cell, egg laying starts after invading cell after 6 hours which were laid after an interval of 30 minutes. It lasts in 7.5 day in female and 5.5 days in male. Boot *et al.*, 1995 reported that on 2nd day 48% of varroa mite climbed on bees and