



## Beneficial Roles of Ants in Agri-Horti Ecosystem

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Ants are eusocial insects belonging to the family Formicidae with about 15000 species/subspecies worldwide. They are ubiquitous and so abundant that the biomass of all ants is more than the combined biomass of wild birds and mammals, and equals 20% of the human biomass (Schultheiss et al., 2022). Ants are ecologically dominant, principal predators and scavengers in almost all types of terrestrial habitats. Worldwide they turn and enrich more soil than earthworms. They are associated with the management of pests, pollination of some crops, and increasing soil fertility in the different agri-horti ecosystems.

### Ants as biocontrol agents

Ants have been extensively reported to control herbivores in numerous crops for centuries, especially in horticultural crops worldwide. They can be an important pest management tool in IPM for sustainable crop production with less reliance on toxic pesticides. Weaver ant, *Oecophylla smaragdina* Smith, F. has been used in China from centuries for the control of different pests in citrus orchards and it represent the first example of a biological agent used for the control of insect pests. At present, weaver ants have been reported to control insect pests in agri-horti ecosystems from different regions of the world. The trees with weaver ant nests produced higher yields of citrus and mango in India, as reported by Bharti and Silla (2011). In Tanzania (Africa), the cashew crop was significantly protected from mirid (*Helopeltis* sp.) and coreid (*Pseudotheraptus wayi* Brown) bugs by African weaver ant *Oecophylla longinoda* Latreille (Olotu et al., 2013). Moreover, numerous ant genera, besides weaver ants, have been documented to manage pests. Over a decade of extensive research on Mexican coffee have shown spatial dynamics of ants, *Azteca instabilis* (Smith, F.) populations, their lower and higher order interactions that lead to ecological homeostasis and prevent outbreaks of four potential coffee pests viz., the coffee berry borer, *Hypothenemus hampei* (Ferrari); coffee rust disease, *Hemileia vastatrix* Berk. and Broome; leaf miner, *Leucoptera coffeella* (Guérin-Méneville) and green coffee scale, *Coccus viridis* (Green). Furthermore, it has been proposed that *Solenopsis geminata* (Fabricius) and *Camponotus sexguttatus* (Fabricius) act as biocontrol agents against the banana weevil *Cosmopolites sordidus* (Germar) in Martinique Island (France) banana farms. With the addition of cover crops to the plantation, the density of *S. geminata* increased about fivefold, increasing predation on weevil eggs from 8% to 70% (Offenberg, 2015).

Ant's innate ability to protect themselves and their environment from pathogens by mechanical mechanisms, exocrine gland secretions, and microbial ectosymbionts, etc. provides indirect protection to crops from their pathogens. During a two-year study in apple plantation, it was found that wood ant (*Formica polyctena* Förster) significantly reduced the numbers of winter moth larvae, *Operophtera brumata* (Linnaeus); increased magnesium content in leaves; and reduced the number of apples infected with apple brown rot, *Monilia fructigena* Honey and scab, *Venturia inaequalis* (Cooke) (Offenberg et al., 2019).

## Ant-Pollination and soil fertility enhancement

Mango trees have been reported to be pollinated by ants in northern Australia (Anderson *et al.*, 1982). Ants were the most abundant pollinators in *Jatropha curcas* L. and resulted in almost 60% fruit set. Among different ant species, *Tapinoma melanocephalum* (F.) was always the most abundant. Thus, ants could play a major role in the pollination of *J. curcas* if winged insects are absent (Luo *et al.*, 2012). Further, the role of ants in soil processes has been well documented. Ants influence soil movement, nutrient cycling, water availability throughout their habitats, increases cation exchange, may neutralize soil pH (Frouz and Jilková, 2008), and increase the soil organic material. This creates ideal habitats for a variety of biota in agri-horti ecosystems.

## Conclusion

It is evident from the published reports that ants play important beneficial roles in the agri-horti ecosystem. They protect plants from herbivores, pathogens and enrich soil with negligible impact on natural enemies. Ants can be utilized in IPM programs, especially in horticultural crops with proper consideration of their services and disservices.

## References

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