



Mite-microbe gut symbiosis: Novel concept for plastic degradation and waste management

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Plastic is the challenge for every ecosystem and one of the abundant and omnipresent pollutants on the Earth today. Biodegradation of the plastic is a less explored domain of research, limited to the potential of bacteria and fungi as decomposers of few types of plastics. Partial degradation of some types of plastics by bacteria and fungi has been confirmed by studies. Ingestion of microplastics by soil microarthropods has been proposed, but confirmatory evidence on the possibility of plastic degradation by mites is not available. During the last three years of research work, we have collected information on the potential of mite-microbiome combination for targeting plastic degradation and soil fertility enhancement. Few species of oribatid mites have been identified as potential candidates for plastic consumption and digestion in laboratory cultures.

Archezogozetes longisetosus Aoki is a popular oribatid mite with amazing specialities, identified as a model organism for research on mites. Interestingly, this species has been found to be a potential candidate for plastic ingestion. Laboratory investigations on plastic feeding by this mite in food choice experiment confirmed the tendency for plastic ingestion by the developing stages of this mite to a notable extent, even when other food materials are available. Isolation and identification of the microbial flora from the gut of this mite have yielded diverse species of bacteria and fungi reported to have potential in the degradation of plastics. Further studies on the digestion process in *A. longisetosus* and the extent of chemical changes being imparted to the plastic material are ongoing. The effects of plastic consumption on the development, reproduction and population growth of the mite are also under consideration for future investigation. The outcome of this line of research may lead to a new era in the waste management technology.

Keywords: Oribatid mites, plastic, feeding, microbiome, waste management