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Checklist of Ants (Hymenoptera-Formicidae) with their specific distribution on soybean (*Glycine max*) crop in Nanded District, Maharashtra state, India

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Abstract

Ants are an impressive, dominant, and successful component of the ecosystem and they are strong indicators of ecosystem. The study of ant population, species richness and relative abundance as well as their worldwide dispersion are critical because they are economically significant. Ants are unique amongst the arthropod fauna in terms of behavior, species richness, social tendencies and large densities all of which contribute to the study of ecology. The survey was conducted during the year- 2021, from Nanded district, Maharashtra state, India to assess the diversity and distribution of the ant species on soybean crop fields, Nanded. The study reveals that 17 species of ants from 15 genera and 6 subfamilies have been identified from Nanded region prior to this investigation. Formicinae, Myrmicinae, Ponerinae, Dolichoderinae, Formicidae and Pseudomyrmicinae are the six subfamilies of ants. Most of the genera from tropical, warm, and temperate region are belongs to the subfamily Ponerinae, is described in the Nanded district (MS) region. *Crematogaster* and *Monomorium* are the most commonly seen genera, followed by *Solenopsis* and *Pheidole*.

Keywords: Ant, hymenoptera, Nanded, ponerinae, *Monomorium*

Introduction

Anthropogenic disturbance has increased and appears to be destroying natural vegetation in urban and sub-urban areas, putting natural ecosystems at risk. Natural vegetation is essential source to support biodiversity and contributes to the improvement of urban quality of life. There are about 15,000 living ant species belonging to 296 genera of which 13,379 have been described, all of which fall into single family Formicidae, which is classified into 16 subfamilies (Patkar *et al.*, 2014) [21]. Many ant species are indicators of ecosystem health and functioning, while others are as weeds or even invasive. The abundance and varied ecological roles of ants is influential in agricultural ecosystems around the world (Gadagkar *et al.*, 1993) [2]. In India, ants are one of the least studied groups in terms of taxonomy and ecology. Because of a lack of reference collection and the fact that most of the available keys are either out of print and inaccessible or are restricted to the ant fauna of specific locations, species identification of ants is challenging. Some ant species and populations are at risk of extinction, even appearing on the IUCN Red List, as a result of increased urbanization (Bution *et al.*, 2010). Some invasive species contribute to the extinction of other organisms. (Holldobler and Wilson, 1990; Bharti and Alpert, 2007). Improved knowledge about ants including how to recognize them, where they dwell and what they perform is therefore critical in a society that is evolving sustainably. Perhaps the research of ant diversity, relative abundance, and species richness of Nanded district of Maharashtra reveals some ecologically relevant species.

Methods and Materials

Nanded district is in the Aurangabad division of Maharashtra state. The name Nanded is wide believed to possess originated from 'NANDI' the Vahan of Lord Shiva, who performed penance on the banks of watercourse Godavari. The district is bounded by Nizamabad, Medak and Adilabad districts of Telangana on the east; by Bidar district of Karnataka falls on the south; by Parbhani and Latur districts of Marathwada on the west and Yavatmal District of Vidarbha region on the north.

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The population is 2876259 of that 23.96% is urban. The average rainfall of Nanded district is 953.8mm.

Ant samples were collected from 50 soybean crop fields. Sampling sites and identified species are listed in Table 03. During the day, specimens were collected using the priming method as like bait method, the anthill method and the forcep brush ethanol method. The specimen were first preserved in 70% ethanol before being removed from the collection vial, preserved, and treated with hot brine solution upon arrival in the laboratory. Samples were taken from the sample bottles by brush and gently dipped in hot, almost boiling water after being thoroughly filtered and saturated by adding common salt and boiled in 500 ml beaker. Extension and spreading of antennae and legs of ant due to hot water treatment ensures that the ant specimens are well fixed. It also helps for identification of specimen at species level. By spreading the jaws, legs and straightening hair-like sensory structures on various body parts also happen due to hot water fixation. Sample specimen are preserved in the Zoology collection, Zoological Research Laboratory, S. R. T. M. University, Nanded, State of Maharashtra, India, paratype stored in 70% ethanol.

Results and Discussion

Ant samples were taken from soybean fields of Nanded district like Ardhapur Road, Mahur, Kinwat, Mukhed, Mukhed, Loha, Kandhar, Nanded-Maharashtra State.

Details of the identified ant samples are given in Table 1 and Table 2. The ant samples collected belonged to the superfamily Formicidae of the order Hymenoptera. 17 different species in the family Formicidae, under 6 subfamilies and 15 different genera. *Glycine max* is the host plant used by these ants in the study area. Some of the ants found feeding in the nearby crop fields are foraging intensively and building their colonies near the fields. Ants belong to six different subfamilies including Formicidae, Pseudomyrmecinae, Myrmicinae, Formicinae, Ponerinae and Dolichoderinae. Among these subfamilies, the family Myrmicinae predominates including seven species while Formicinae includes only three species in the sample. Patkar *et al.*, (2014) [21] reported ant species diversity from undisturbed and disturbed habitat of the Great Indian Bustard Wildlife Sanctuary in the state of Maharashtra, India, where total 19 and 16 species were collected respectively, belonging to 5 different subfamilies as Myrmicinae, Formicinae, Pseudomyrmecinae, Ponerinae and Dolichoderinae. Khot *et al.* (2013) [14] Reported diversity of ants in Mumbai, Maharashtra from nature park in 2010-2012 and explained 28 species of ants representing 6 subfamilies like Aenictinae, Dolichoderinae, Formicinae, Myrmicinae, Ponerinae and Pseudomyrmecinae had the greatest diversity exhibited by the subfamily Myrmicinae, while in this study 15 genera were found in the subfamily Dolichoderinae, Myrmicinae, Pseudomyrmecinae, Formicinae, Ponerinae and Formicidae.

Table 1: Species characters of ants found at Soybean Field of Nanded region, Maharashtra State.

Sr. no.	Ant specimen	Petiole	Post petiole	Antenna	Eyes	Acidopore	Bristles	Mouth and jaws	Spine on thorax
1	<i>Solenopsis geminate</i> (Fabricius, 1804)	+	+	12s+2c	S	---	---	Head bilobed	---
2	<i>Syscia augustae</i> (Wheeler, W. M., 1902)	+	---	12s	L	---	Peg like	---	---
3	<i>Solenopsis aurea</i> (Wheeler, W. M., 1906)	+	+	12s+2c	S	---	---	4 teeth	---
4	<i>Pseudomyrmex pallides</i> (Smith, F., 1855)	+	+		L				Single
5	<i>Pheidole hyatii</i> (Emery, 1895)	+	+	12s+3c	S	---	---	Blunt	---
6	<i>Formica pallidefulva</i> (Latreille, 1802)	+	---	12s	---	---	---	---	---
7	<i>Monomorium pharaonic</i> (Linnaeus, 1758)	+	+	12s+3c	S	---	---	---	---
8	<i>Monomorium minimum</i> (Buckley, 1867)	+	+	12s	S	---	---	---	---
9	<i>Pseudomyrmex brunneus</i> (Smith, F., 1877)	+	+	12s+3c	L				Single
10	<i>Dorymyrmex bicolor</i> (Wheeler, W. M., 1906)	+	---	11s	S	---	---	---	---
11	<i>Crematogaster sp.</i> (Lund, 1831)	+	+	10	S	---	---	---	---
12	<i>Myrmecina americana</i> (Emery, 1895)	+	+	12s+2c	S	---	Unarmed pygedium, no sting	---	2
13	<i>Forelius mccoeki</i> (McCook, 1879)	+	---	12	S	---	Unarmed pygedium, no sting	---	---
14	<i>Leptogenys processionalis</i> (Jerdon, 1851)	+	---	10	L	---	---	Unarmed clypus	---
15	<i>Paratrechina zanjensis</i> (LaPolla, Hawes and Fisher 2013)	+	---	12	L		Brissled pygedium	5 Teeth	---
16	<i>Paratrechina longicornis</i> (Latreille, 1802)	+	---	12s	---	---	Brissled pygedium	Maxillary palp	---
17	<i>Pseudolasius diversus</i> (Jerdon, 1851)	+	---	9S	S	---	Brissled pygedium	8 Teeth	---

(S=Small, L=Large, s=Segment, c=Club, +=Present and -=Absent)

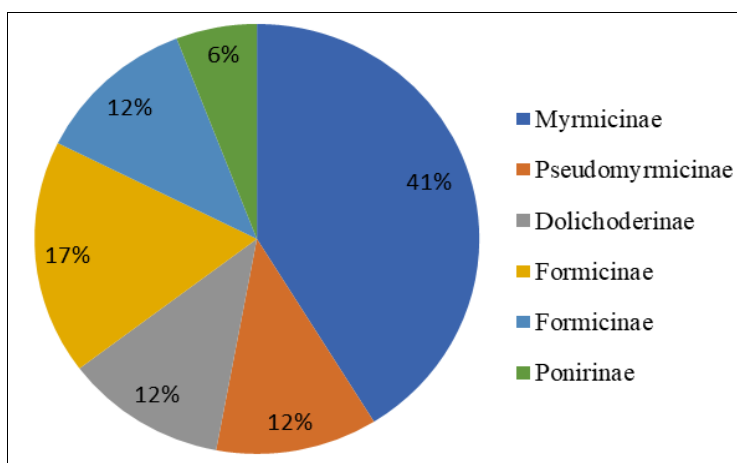


Fig 1: % Distribution of ant families

Table 2: % Distribution of ant families

Sr. No.	Subfamily	Species	Percentage (%)
1	Myrmicinae	7	41%
2	Pseudomyrmicinae	2	12%
3	Dolichoderinae	2	12%
4	Formicinae	3	17%
5	Formicidae	2	12%
6	Ponerinae	1	6%

Table 3: Identified species of ants, along with their habitats and sub-families

Sr. No.	Name of ant species	Sub-Family	Habitat
1	<i>Formica pallidefulva</i> (Latreille, 1802)	Formicidae	Soybean fields of Ardhapur, Nanded
2	<i>Pseudomyrmex pallides</i> (Smith, F., 1855)	Pseudomyrmicinae	Soybean fields of Degloor
3	<i>Solenopsis aurea</i> (Wheeler, W. M., 1906)	Myrmicinae	Soybean fields of Degloor
4	<i>Pheidole hyatti</i> (Emery, 1895)	Myrmicinae	Soybean fields of Kandhar
5	<i>Paratrechina zanjensis</i>	Formicinae	Soybean fields of Mukhed
6	<i>Forelius mccooki</i> (McCook, 1879)	Dolichoderinae	Soybean fields of Kandhar
7	<i>Syscia augustae</i> (Wheeler, W. M., 1902)	Formicidae	Soybean fields of Kinwat
8	<i>Crematogaster</i> sp. (Lund, 1831)	Myrmicinae	Soybean fields of Loha
9	<i>Dorymyrmex bicolor</i> (Wheeler, 1906)	Dolichoderinae	Soybean fields of Nanded
10	<i>Myrmecina Americana</i> (Emery, 1895)	Myrmicinae	Soybean fields of Nanded
11	<i>Pseudomyrmex brunneus</i> (Smith, F., 1877)	Pseudomyrmicinae	Soybean fields of Mukhed
12	<i>Monomorium pharaonis</i> (Linnaeus, 1758)	Myrmicinae	Soybean fields of Mahur
13	<i>Monomorium minimum</i> (Buckley, 1867)	Myrmicinae	Soybean fields of Nanded city
14	<i>Solenopsis geminata</i> (Fabricius, 1804)	Myrmicinae	Soybean fields of Loha
15	<i>Pseudolasius diversus</i> (Jerdon, 1851)	Formicinae	Soybean fields of Mukhed
16	<i>Leptogenys processionalis</i> (Jerdon, 1851)	Ponerinae	Soybean fields of Nanded
17	<i>Paratrechina longicornis</i> (Latreille, 1802)	Formicinae	Soybean fields of Mukhed



Fig 1: *Crematogaster* sp.



Fig 2: *Paratrechina zanjensis*



Fig 5: *Pseudomyrmex brunneus*



Fig 6.: *Pheidole hyatti* (Emery, 1895)



Fig 3: *Myrmecina americana*



Fig 4: *Syscia augustae*



Fig 7: *Monomorium minimum*



Fig 8: *Monomorium pharaonis*



Fig 9: *Forelius mccooki*

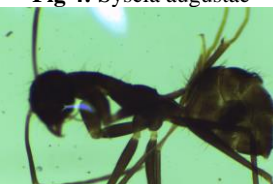


Fig 10: *Leptogenys processionalis*



Fig 11: *Syscia augustae*



Fig 12: *Solenopsis aurea*



Fig 13: *Solenopsis geminata*



Fig 14: *Dorymyrmex bicolor*



Fig 15: *Pseudolasius diversus*



Fig 16: *Leptogenys processionalis*

5. Conclusion

Around Nanded district, 50 soybean field were selected of which 17 species, 15 genera, and 6 subfamilies of the order Hymenoptera have been identified. The Myrmicinae family

was dominant among the surveyed samples. Considering the ant diversity study there may exist rich ant diversity, further research is necessary to plan. The role of these ant species in ecosystem services can also be explored from this region.

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