POPULATION DIVERSITY OF SOIL COLLEMBOLA IN AGRA DISTRICT OF UTTAR PRADESH, INDIA

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ABSTRACT: The present study was conducted to study the Collembola fauna from Agra regions during June 2014 to November 2014. There were sampled collembolan species from a variety of habitats in the urban area of Agra. Soil Collembola were extracted using dynamic behavioural modified Tullgren funnel type extractor and identified to the genus level. 279 specimens of 28 Collembolan species were collected from the different study areas. The species distribution of collembolan in Agra regions of Isotomidae (31%), Entomobryidae (29%), Hypogastruridae, (27%), Sminthuridae (7%) and Tomoceridae (6%) were observed. The species composition clearly reflected the microclimatic characters of the individual habitats. The study area as a less polluted natural environment can be considerable available for selection a conservation territory. It seems to be especially important to protect this particular mosaic like habitats for sustaining their high animal taxonomic and functional biodiversity.

KEY WORDS: Collembolans, species distribution, India

Springtails have derived their name because of the presence of forked tail-like appendage or furcula or springing organ, on the underside of the 4th abdominal segment. With the help of furcula, most Springtails jump as far as 10- 15cms. Collembola are extremely abundant in soil and leaf litter. In most terrestrial ecosystems they occur in high numbers, typically between 104 and 105 m−2. Densities of springtails of more than 105 m−2 have been found in pine forests in India and Japan, moorland in England, and dry meadows in Norway. Collembola are particularly abundant in agricultural soils that are farmed "organically". In the rain forests, Collembola comprise about 20% of the total number of arthropods on tree trunks and 50% and 60% of the total from soil and leaf litter, respectively ace-dwelling species to those that live out all their lives in the depths of the soil. The majority of springtails feed on fungal hyphae or decaying plant material. In the soil, they may influence the growth of mycorrhizae and control fungal diseases of some plants (Lubbock, 1973). Soil conditions and vegetation cover influence the activities of diverse soil organisms including Springtail (Hansen, 2001). Collembolan communities have been shown to vary in abundance and diversity negatively according to changes in vegetation, quality of litter materials, habitat structure and human induced disturbances related to land use practices (Bengtsson et al., 2000; Ponge et al., 2003; Jose et al., 2004, 2005). Adequate knowledge of spatial pattern and seasonal population build up of such fauna is considered desirable for understanding their ecology and role in decomposition process in major land use system of a region for understanding the sustainability issues (Badejo et al., 1997). Present investigation was carried out to study the population diversity and distribution of Soil Collembola in Agra Region.

MATERIALS AND METHODS

Soil samples have been regularly collected during (June 2014 to November 2014) from different area [Sikandra (S1), Paiwal park (S_2), Victoria garden (S_3), Keetham (S_4)] of Agra regions between 08.00 to 09.00 hrs and sites. Sample areas on each sampling taken at random with stainless steel soil augur (2.5cm diameter) at a depth of 10 cm. These samples were immediately transferred to polythene bags then sealed and brought to laboratory. The extraction was done using Tullgren funnel type extractor (as modified by Murphy (1962) under 25W electric bulb. The extracted micro-arthropods were collected in specimen tube containing 70% ethanol. After identification of major taxonomic unit all the specimens were preserved in 70% ethanol separately. Prior to identification of collembola, specimens were mounted in Hoyer's solution mounting media and identified by using face contrast microscope with an enlarged view of 10x X 100x. All soil micro-arthropods were identified up to the level of their order or, family using a range of taxonomic keys (O'Connell and Bolger, 1994).

RESULTS AND DISCUSSION

279 specimens of 28 Collembolan species were collected from the different study areas. Identified species of collembolan mentioned in Table 1. During this study, the richest families were observed Isotomidae, Entomobryidae and then Hypogastruridae. The species distribution of collembolan in Agra regions of Isotomidae (31%), Entomobryidae (29%),Hypogastruridae, (27%), Sminthuridae (7%) and Tomoceridae (6%) showed in fig 2. In this fig., the highest species distribution of Isotomidae family (37%), while very numerous species belong to Tomoceridae family (6%). Fig. 2 showed population study site I proved to be the most diverse one. Collembolan species highest in study site I and lowest in study site II. The largest similarity is seen between Sikandra (S_1), Victoria garden (S_3), Keetham (S_4) area. The largest difference turned out to be between study area Sikandra (S_1), and Paliwal Park (S_2) area. Collembolans are represented numerously in soils of forest ecosystems. Agrocoenoses can support similar or slightly lower densities of springtails than natural ecosystems situated on the same type of soil. Increasing intensity of management, using of pest control chemicals, herbicides and large doses of mineral fertilizers drastically reduce Collembolan densities in the field soil (Verma and Paliwal, 2010).

CONCLUSION

This study concluded that the total number of collembola was higher throughout the summer than during the winter. Isotomidae were most active in early and late winter, while Entomobryidae Hypogastruridae and dominated in mid-winter, probably because these families are more bound to the soil than the other families, which are more active on the soil surface.

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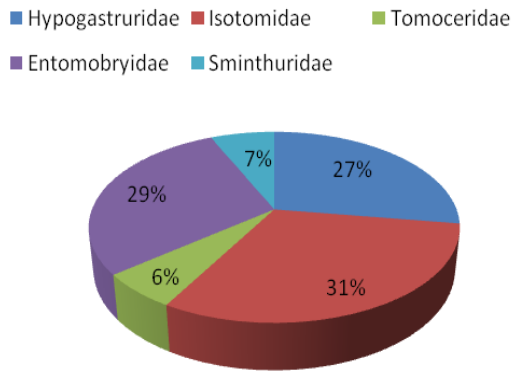

Figure 1. Species distribution of Collembola in Agra region.

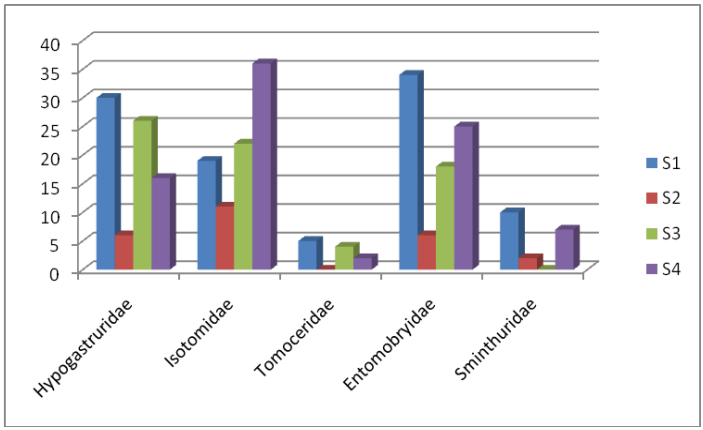

Figure 2. Population of collembola from different study areas of Agra region.

Table 1. Identified species of Collembola from different study areas of Agra region during June 2014 to November 2014.

Species	Study site				
	S_1	S_2	S_3	S_4	Total
Family Hypogastruridae Börner, 1906	**30**	**6**	**26**	**16**	**78**
Hypogastrura denticulata (Begnall, 1941)	6	1	8	3	
Ceratophysella indovaria (Salmon, 1970)	8	2	4	3	
Hypogastrura vernalis (Carl, 1901)	4	1	6	4	
Xenylla maritima Tullberg, 1869	6	2	3	4	
Friesea mirabilis (Tullberg, 1871)	4	*	3	1	
Neanura conjuncta (Stach, 1922)	2	*	2	1	
Family Isotomidae Schäffer, 1896	**19**	**11**	**22**	**36**	**88**
Folsomia nana (Gisin, 1957)	3	2	5	3	
Folsomia candida (Willem, 1902)	4	3	2	7	
Isotomiella minor (Schaffer, 1896)	2	1	3	6	
Isotomina bipunctata (Axelson, 1903)	1	3	5	2	
*Proisotoma crassicauda (*Tullberg, 1871)	3	*	2	4	
Proisotoma minuta (Tullberg, 1871)	1	1	4	6	
Isotoma notabilis (Schaffer, 1896)	5	1	1	8	
Family Tomoceridae Schäffer, 1896	**5**	*	**4**	**2**	**11**
Tomoceris vulgaris (Tullberg, 1871)	5	*	4	2	
Family Entomobryidae Schäffer, 1896	**34**	**6**	**18**	**25**	**83**
Entomobrya handschini (Stach, 1922)	4	1	2	3	
Entomobrya lanuginose (Nicolet, 1841)	9	2	*	1	
Entomobrya marginata (Tullberg, 1871)	3	*	1	2	
Entomobrya multifasciata (Tullberg, 1871)	4	*	1	3	
Orchesella flavescens (Bourlet, 1839)	2	*	*	1	
Orchesella cincta (Nicolet, 1841)	1	*	3	2	
Pseudosinella wahlgreni (Borner, 1907)	2	*	4	6	
Heteromurus nitidus (Templeton, 1835)	1	1	2	2	
Lepidocyrtus lanuginoosus (Gmelin)	3	1	2	2	
Lepidocyrtus cyaneus (Tullberg, 1871)	3	1	2	1	
Lepidocyrtus paradoxus (Uzel, 1891)	2	*	1	2	
Family Sminthuridae Lubbock, 1862	**10**	**2**	*	**7**	**19**
Sminthurides malmgreni (Tullberg, 1871)	6	*	*	2	
Bourletiella insignis (Reuter, 1876)	2	*	*	4	
Sminthurus lubbocki (Tullberg, 1871)	2	2	*	1	