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Distribution of soil macro fauna around dry (Rosa fields) and wet (fish farm) territory under the ecological conditions of district Faisalabad (Punjab), Pakistan

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Abstract
During present study, from both sites, total 556 specimens were collected during entire sampling and maximum population was recorded from dry land (rosa fields) 51.33% (N=290), and least population was recorded from wet territory (fish farm) 48.67% (N=275). In case of rosa fields, total 23 species were recorded belonging to 11 orders, 20 families and 22 genera; whereas, at fish farm, total 26 species were recorded belonging to 9 orders, 15 families and 21 genera. Wherein in case of rose fields (dry land), maximum population was recorded during (3rd sampling) 41±11.90 and least values were recorded during 5th sampling (12±8.61); species abundance was recorded utmost in 7th and 9th sample (11) species at temperature 24 ºC and 71% humidity and least was recorded during 5th sampling i.e. 4 species at 27ºC temperature and 75% humidity. In case of fish farm (wet land), maximum population was recorded during 10th sampling (37±9.96) and least values were recorded during 1st and 12th sampling (11±8.43); species abundance was recorded utmost in 7th sampling (10 species) at temperature 24ºC and 71% humidity and least was recorded during 1st sampling i.e. 3 species at 29 ºC temperature and 75% (humidity). From dry land (rosa fields), *Lumbricus terristris* (Lumbricidae) was recorded abundantly with relative abundance of 32.07% (N=93) and from wetland, *Oniscus asellus* (Oniscidae) was recorded as an extraordinary contributing species with relative abundance of 26.91% (N=74); diversity was recorded maximum from dry land (0.0725) and least from wet land (0.0683). Evenness ratio was also recorded in same context (0.0294 and 0.0280 respectively). Analysis of Variance among both territories showed non-significant results (F=0.01; P=0.9153).

Keywords: Soil macro-fauna, dry and wet territory

Introduction
All biological diversity is composed by nature and it is universal fact that soil is the most distinct habitat on earth that supports utmost to sustain and conserve it – because a single gram of soil contains million of living organisms [38, 26, 31]. It also experienced biologically diverse communities to run the functional tasks, because each species plays variable role in each food web. It has been cosmopolitan acknowldged that exiting species and their trophic groups, are the fundamental units for biology and ecology studies [6, 3].

Soil-invertebrates are classified into micro, meso and macro-fauna. Among them, macro-fauna attain main focus. They comprises of species having burrowing and feeding nature with size 2mm to 20 mm wide e.g. Diplopoda (milipeds), Isopoda (woodlice), Annelida: Megadrilli (earthworms), Coleoptera (beetles), Isoptera (termites), Diptera (flies), mollusks and Hymanoptera (ants). Their presence is patent e.g. large nest structures of the fungus-growing termites which may be 10m high, while in some hydro-morphic soils, earthworms may set down up to 200 t/ha of casts at the soil surface [18, 2, 26, 31].

Integrated studies of the relationship between ecosystem and biodiversity of soil functioning are worthful to overcome the scarcity of basic taxonomic knowledge about soil organisms and their services for ecosystem functioning. It is obvious that in any dynamic of macrofauna, functional diversity can control essential soil processes e.g. degradation, decomposition and turn over [13, 27, 31].

To manage soil plant cover, soil macro-faunal communities are eminent. Their idyllic existence and diversity are widely concealed by the cropping systems, removal of permanent

soil cover and redundant disturbance. For example, pastures support earthworm abundance to diminish over all macro-faunal diversity [21, 29]. Owing to this, cosmopolitan managing of soil faunal communities for farming systems and land remediation is principal apprehension in ecosystem sustainability – that seems, the rise in richness of species is fundamental for soil resoluteness [8].

Wherein our knowledge about the soil biodiversity is much poor and in the tropics, it deserve particular attention for many reasons. The majority of research has been concentrated on soils of temperate regions, yet there is evidence that diversity of soil invertebrates is greater in tropics than at equator [35, 36].

Whereas, structure and function of soil food web has been suggested as a prime indicator of ecosystem health [16]. Under the natural forest vegetation cover, macro-invertebrates e.g. earthworms ingest soil and organic matter, and create a network of macro-pores in the top soil layer. The soil surface under soil litter is frequently covered with earthworm castings and by-products of their burrowing activity. The layer of worms casting may be 2-5 cm thick. The variety of earthworms found in the topsoil ranges 33 to 68 m^{-2} in a soil under tropical rainforest [24]. Furthermore, soil and litter arthropods are useful bio indicators for land management, nutrient dynamics and site productivity [7]. Type of irrigation and nature of crop maintains the soil profile and support the related macro-fauna. While, nature of ecosystem alter the occurrence of soil macro-fauna, accordingly, the present was conducted to evaluate the composition and diversity of soil macro-fauna in rosa fields (dry land) and wetland area (fish farm) on an ecological basis for conservational efforts. W

Materials and Methods

The present study was conducted pertaining to the comparison of soil macro-fauna of wet and dry territory at (Fishries Research Farm, UAF) and (Horticulture Rose Fields at University of Agriculture, Faisalabad, Pakistan during the season 2015-2016 from July to December.

Study Area

Faisalabad is the 3rd largest city of Pakistan located in the central part of Punjab province; lies at 30º-40 to 31º-47 N latitudes and 72º-42 to 73º-40 E longitudes having cultivation of different crops. The whole district is comprises of 5,856 km^2 with an estimated population of 2.6 million [28].

Collection of Data

Soil samples from the selected areas were taken to collect soil macro-fauna measuring one cubic ft. from five different locations of the field spaced by 5 m along a linear transect. Various groups representing the soil macro-fauna were sorted through hand sorting, direct hand picking and with the help of forcep. However, humidity and temperature of the field was also recorded for inferences.

Preservation

The collected specimens were preserved in 70:30% alcohol and glycerine solution and brought to the Biodiversity Laboratory, Department of Zoology, Wildlife and Fisheries, University of Agriculture, Faisalabad for identification. All the specimens were sorted and preserved in glass vials containing 70:30% alcohol and glycerin solution and each vial was labeled according to site, date and time of collection and nature of habitat.

Taxonomic keys for identification

The purpose of a taxonomic key is to facilitate identification of a specimen. The goal was achieved by presenting subsequent appropriate diagnostic characters in a series of alternative choices with dichotomous characters. The collected invertebrate fauna were identified up to species level by using taxonomic keys [4, 5, 17] as well as available online electronic keys (Google Scholar and *https://en.wikipedia.org*). After identification, the specimens were arranged in tables form according to their orders, families and species. Specimens belonging to different species were preserved in separate vials.

Shannon's Index of Diversity (H′)

Collected data were analyzed statistically to determine species diversity, species richness and species evenness with with Shannon Diversity Index (H′) [22].

Results & Discussion

Mankind is a congenial to acknowledge the significance of other living communities on this earth biosphere by developing various scientific techniques to control physical environment and resultantly, they have developed an exaggerated views about their importance in food web. Whereas, they also provide us recreational and biological values to run our lives. Additionally, they also sustain our metabolic tricks by providing natural fiber for ideal growth body parts [1, 23]. In connection to plants life histories, insects are key motor of an ecosystem function and they can live in various ecological circumstances e.g. variations temperature, humidity, and desiccation [12]. Ecological co-relation toward their diversity and density for primary production and ideal ecosystem functioning have been acknowledged by many researchers [1, 7, 23]. Their distribution around dry (Rosa fields) and wet territory (Fish Farm) were assessed during present research. Taxa composition was recorded as follow: in case of rose fields, total 23 species were recorded belonging to 11 orders, 20 families and 22 genera; whereas, at fish farm, total 26 species were recorded belonging to 09 orders, 15 families and 21 genera. Among both sites, total 556 specimens were collected during entire sampling (12 sampling from each category) and maximum population was recorded from rose fields 51.33% (N=290), while least population was recorded from fish farm 48.67% (N=275). Wherein, in case of rosa fields (dry land) maximum population was recorded during (3rd sampling) 41±11.90, followed by 39±10.49 (2nd sampling), 28±2.71 (7th sampling), 27±2.00 (9th sampling) and so on. While, least values were recorded during 5th sampling (12±8.61). Whereas, species abundance was recorded utmost in 7th and 9th sample (11) species at temperature 24 ºC and 71% humidity. However, least species abundance was recorded during 5th sampling i.e. 4 species at 27ºC temperature and 75% humidity. In case of fish farm (wet land), maximum population was recorded during 10th sampling (37±9.96), followed by 30±5.01 (2nd and 4th sampling), 28±3.59 (3rd sampling), 27±2.88 (9th sampling) and so on. While least values were recorded during 1st and 12th sampling (11±8.43). Whereas specie abundance was recorded utmost in 7th sample (10) species at temperature 24ºC and 71% humidity. However, least species abundance was recorded during 1st sampling i.e. 03 species at 29ºC temperature and 75% (humidity) (Table 1).

Table 1: Record of Population Mean ± SD, Species Abundance, Temperature and Humidity recorded from Wetland and Dry land territory

Sampling No.	Rosa Fields	Species	Temperature (°C)	Humidity (%)	Fish Farm	Species	Temperature (°C)	Humidity (%)
	Mean ± SD				Mean ± SD			
1	18±4.36	7	29	75	11±8.43	3	29	75
2	39±10.49	7	29	78	30±5.01	6	29	78
3	41±11.90	10	28	79	28±3.59	7	28	79
4	22±1.53	4	28	77	30±5.01	6	28	77
5	12±8.61	4	27	75	25±1.47	9	27	75
6	24±0.12	5	25	73	18±3.48	7	25	73
7	28±2.71	11	24	71	25±1.47	10	24	71
8	19±3.66	8	18	71	14±6.31	7	18	71
9	27±2.00	11	18	60	27±2.88	9	18	60
10	14±7.19	8	21	56	37±9.96	7	21	56
11	25±0.59	6	19	70	19±2.77	6	19	70
12	21±2.24	5	20	72	11±8.43	6	20	72

Whereas, comparative relative abundance of each species from each habitat was recorded heterogeneously (Table 2), because overall relative abundance of each species was vary from each other and between each habitat; some species were recorded more abundantly in one field while other habitat were devoid off by them or exist with very lest abundance. A lot of species representing one habitat instead of overall representation. For example, in case of wetland, *Oniscus asellus* (Oniscidae) was recorded as an extraordinary contributing species with relative abundance of 26.91% (N=74). Thereafter, *Melontha melontha* (Scarabaeidae) was recorded as an extra ordinary species 12.00% (N=33), followed by *Allopeas gracile* (Subulinidae) 8.36% (N=23), *Formica subsericea (*Scoliidae) 7.27% (N=20), *Porcellio scaraber* (Porcellionidae) 6.91% (N=19), *Odontatermis obesus* (Termitidae) 5.45% (N=15), *Porcellio dilatatus* (Porcellionidae) 5.09% (N=14), *Phyllophaga* spp. (Scarabaeidae) 4.00% (N=11), *Mastus olivaceus* (Enidae) 3.27% (N=09), *Rumina decollate* (Humboldtianiadae) 2.55% (N=07). However, least relative abundance (N≤05) was recorded for *Lasius flavus* (Formicidae), *Chlorochroa senilis* (Pentatomidae), *Buliminus halepensis* (Enidae), *Humboldtiana pilsbry* (Humboldtianiadae), *Selenopsis xyloni, Selenopsis invicta, Componotus ligniperds* (Formicidae), *Xerosecta cespitum* (Hygromiidae), *Leucomochala* spp. (Cossidae), *Mastotermes darwiniensis* (Mastotermitidae), *Cochliaella barbara* (Cochlicellidae), *Humboldtiana nuevoleonis* (Humboldtianiadae), *Forficula auricullaria* (Forificlidae), and *Gryllus assimilus, Gryllus bimaculatus, Acheta domesticus* (Gryllidae). While, *Lumbricus terrestris* (Lumbricidae), *Ancyronyx schillhameri* (Elmidae), *Dyscinetus morator* (Fabricus), *Lasius nearcticus* (Formicidae), *Megascolia maculate* (Scoliidae), *Prototermes adamsoni* (Rhinotermitidae), *Cochlicopa lubricella* (Cochlicopidae), *Helicella profuga* (Hygromiidae), *Labia minor* (Labiidae), *Gryllus pensylvanicus* (Gryllidae), *Gryllotalpa gryllotalpa* (Gryllotalpidae), *Geophillus flavus, Geophillus vattatus* (Geophilidae) and *Scolopendra cingulata* (Craterostigmidae) were not recorded from wetland (Fish Farm).

From dry land (rosa fields), *Lumbricus terristris* (Lumbricidae) was recorded abundantly with relative abundance of 32.07% (N=93). Thereafter, *Oniscus asellus* (Oniscidae) 22.76% (N=66), followed by *Formica subsericea* (Scoliidae) 8.28% (N=24), *Porcellio dilatatus* (Porcellionidae) 6.90% (N=20), *Phyllophaga* spp. (Scarabaeidae) 6.21% (N=18), *Odontatermis obesus* (Termitidae) 5.52% (N=16), *Geophillus flavus* (Geophilidae) 3.10% (N=09), and *Prototermes adamsoni* (Rhinotermitidae) 2.07% (N=06). However, least relative abundance (N≤05) was recorded for *Helicella profuga* (Hygromiidae), *Chlorochroa senilis* (Pentatomidae), *Forficula auricullaria* (Forificlidae), *Gryllus pensylvanicus* (Gryllidae), *Dyscinetus morator* (Fabricus), *Componotus ligniperds* (Formicidae), *Labia minor* (Labiidae), *Gryllotalpa gryllotalpa* (Gryllotalpidae), *Lasius nearcticus* (Formicidae), *Cochlicopa lubricella* (Cochlicopidae), *Melontha melontha* (Scarabaeidae), *Ancyronyx schillhameri* (Elmidae), *Megascolia maculate* (Scoliidae), *Geophillus vattatus* (Geophilidae) and *Scolopendra cingulata* (Craterostigmidae). While, *Porcellio scaraber* (Porcellionidae), *Lasius flavus, Selenopsis xyloni, Selenopsis invicta,* (Formicidae), *Mastotermes darwiniensis* (Mastotermitidae), *Cochliaella Barbara* (Cochlicellidae), *Mastus olivaceus, Buliminus halepensis* (Enidae), *Humboldtiana pilsbry, Humboldtiana nuevoleonis, Rumina decollate* (Humboldtianiadae), *Xerosecta cespitum* (Hygromiidae), *Allopeas gracile* (Subulinidae), *Leucomochala* spp. (Cossidae), *Gryllus bimaculatus, Gryllus assimilus, Acheta domesticus* (Gryllidae) were not recorded from dry land (rose fields). Previously ([18]) reported that tillage system affect the soil physical (change soil water content, temperature, aeration and the degree of mixing of crop residues within the soil matrix) and chemical environment directly or indirectly affect soil organisms but different groups in different ways. However, soil organisms perform important functions in soil, including structure improvement, nutrient cycling, and organic matter decomposition. Large organisms in general appear to be most sensitive to tillage operations than smaller organisms, due to the physical disruptions of the soil, burial of crop residues, and the change in soil water and temperature, resulting from residue incorporation. Furthermore, our findings are an acknowledgement with previous reports [10, 39, 18, 7].

Table 2: Comparative Relative Abundance of recorded Species from Wetland and Dry land territory

Order	Family	Species	Relative Abundance (%)	
			Wetland	Dry land
Isopoda	Oniscidae	*Oniscus asellus*	26.91(74)	22.76(66)
	Porcellionidae	*Porcellio dilatatus*	5.09(14)	6.90(20)
	Porcellionidae	*Porcellio scaraber*	6.91(19)	0.00(0)
Haplotaxida	Lumbricidae	*lumbricus terrestris*	0.00(0)	32.07(93)
Coleoptera	Scarabaeidae	*Phyllophaga* spp	4.00(11)	6.21(18)
		Melontha melontha	12.00(33)	0.34(1)
	Elmidae	*Ancyronyx schillhameri*	0.00(0)	0.34(1)
	Fabricus	*Dyscinetus morator*	0.00(0)	1.03(3)
Hymenoptera	Formicidae	*Lasius flavus*	1.82(5)	0.00(0)
		Lasius nearcticus	0.00(0)	0.69(2)
		Selenopsis xyloni	1.09(3)	0.00(0)
		Selenopsis invicta	1.45(4)	0.00(0)
		Componotus ligniperds	1.45(4)	1.03(3)
	Scoliidae	*Megascolia maculate*	0.00(0)	0.34(1)
		Formica subsericea	7.27(20)	8.28(24)
Hemiptera	Pentatomidae	*Chlorochroa senilis*	1.82(5)	1.38(4)
Isoptera	Termitidae	*Odontatermis obesus*	5.45(15)	5.52(16)
	Rhinotermitidae	*Prototermes adamsoni*	0.00(0)	2.07(6)
	Mastotermitidae	*Mastotermes darwiniensis*	0.73(2)	0.00(0)
Plmonata	Cochlicellidae	*Cochliaella Barbara*	0.73(2)	0.00(0)
	Cochlicopidae	*Cochlicopa lubricella*	0.00(0)	0.69(2)
	Enidae	*Mastus olivaceus*	3.27(9)	0.00(0)
		Buliminus halepensis	1.82(5)	0.00(0)
	Humboldtianiadae	*Humboldtiana pilsbry*	1.82(5)	0.00(0)
		Humboldtiana nuevoleonis	0.73(2)	0.00(0)
		Rumina decollate	2.55(7)	0.00(0)
	Hygromiidae	*Xerosecta cespitum*	1.09(3)	0.00(0)
		Helicella profuga	0.00(0)	1.72(5)
	Subulinidae	*Allopeas gracile*	8.36(23)	0.00(0)
Dermaptera	Forificlidae	*Forficula auricullaria*	0.73(2)	1.38(4)
	Labiidae	*Labia minor*	0.00(0)	1.03(3)
Lapidoptera	Cossidae	*Leucomochala* spp	1.45(4)	0.00(0)
Orthoptera	Gryllidae	*Gryllus bimaculatus*	0.36(1)	0.00(0)
		Gryllus assimilus	0.73(2)	0.00(0)
		Acheta domesticus	0.36(1)	0.00(0)
		Gryllus pensylvanicus	0.00(0)	1.38(4)
	Gryllotalpidae	*Gryllotalpa gryllotalpa*	0.00(0)	1.03(3)
Geophilomorpha	Geophilidae	*Geophillus vattatus*	0.00(0)	0.34(1)
	Geophilidae	*Geophillus flavus*	0.00(0)	3.10(9)
	Geophilidae	*Geophillus vattatus*	0.00(0)	0.34(1)
Craterostigmomorpha	Craterostigmidae	*Scolopendra cingulata*	0.00(0)	0.34(1)
Total			**275**	**290**

From wetland, relative abundance was recorded extraordinary for genus *Oniscus* (26.91%: N= 74), *Porcellio*, *Melontha* (12.00%: N=33), *Allopeas* (8.36%: N=23), *Formica* (7.27%: N=20), *Odontatermis* (3.45%: N=15), *Phyllophaga* (4.00%: N=11), *Mastus* (3.27%: N=09), and *Selenopsis*, *Humboldtiana*, *Rumina* (2.55%: N=07). Wherein from dry land (rosa fields), genus *Lumbricus* was recorded as an extra contributing genus with relative abundance (32.07%: N=93). Thereafter, genus *Oniscus* recorded with utmost relative abundance (22.76%: N=66), followed by *Formica* (8.28%: N=24), *Porcellio* (6.90%: N=20), *Phyllophaga* (6.21%: N=18), *Odontatermis* (5.52%: N=16), *Geophillus* (3.10%: N=09), and *Prototermes* (2.07%: N=06).

From total of (25) recorded families, 15 families were recorded from wetland and among them, extra ordinary relative abundance was recorded for family Oniscidae (26.91%; N=74) and then maximum relative abundance was recorded for Scarabaeidae (16.00%; N=44), followed by Porcellionidae (12.00%; N=33), Subulinidae (8.36%; N=23), Scoliidae (7.27%; N=20), Formicidae (5.82%; N=16), Termitidae (5.45%; N=15), and Enidae, Humboldtianiadae (5.09%; N=14). From total of (25) recorded families, 20 were recorded from dry land and among them, relatively higher abundance (32. 07%; N= 93) was recorded for Lumbricidae family. Thereafter, relative abundance was recorded for Oniscidae (22.76%; N= 66), followed by Scoliidae (8.62%; N=25), Porcellionidae (6.90%; N=20) Scarabaeidae (6.55%; N=19), and Termitidae (5.52%; N=16).

Total 12 orders were recorded from wetland territory (fish farm) and among them (Table 3), higher relative abundance (38.91%; N=107) was recorded for order Isopoda, followed by Pulmonata (19.64%; N=54), Coleoptera (16.00%; N=44), Hymenoptera (13.09%; N=36), and Isoptera (6.18%; N=17). However, least relative abundance (N≤10) was recorded for order Hemiptera, Lepidoptera, Orthopetra and Dermaptera. From total of 12 of recorded orders, 11 orders were recorded from dry land and among them higher relative abundance (32.07%; N=93) was recorded for order Haplotaxida, followed by Isopoda (29.66%; N=86), Hymenoptera (9.66%; N=28), Coleoptera (7.93%; N=23) and Isoptera (7.59%; N=22). However, least relative abundance (N≤10) was recorded for order Geophilomorpha, Pulmonata, Dermaptera, Orthopera, Hemiptera and Craterostigmomorpha.Whereas, order Lepidoptera was not recorded from dry land. These findingis were analogous to previous reports [7, 10, 39, 18].

Table 3: Relative Abundance of recorded Orders from Wetland and Dry land territory

Order	Relative Abundance (%)	
	Wetland	Dry land
Isopoda	38.91(107)	29.66(86)
Haplotaxida	0.00(0)	32.07(93)
Coleoptera	16.00(44)	7.93(23)
Hymenoptera	13.09(36)	9.66(28)
Hemiptera	1.82(5)	1.38(4)
Isoptera	6.18(17)	7.59(22)
Plmonata	19.64(54)	3.10(9)
Dermaptera	0.73(2)	2.41(7)
Lapidoptera	1.45(4)	0.00(0)
Orthoptera	1.45(4)	2.41(7)
Geophilomorpha	0.00(0)	3.45(10)
Craterostigmomorpha	0.00(0)	0.34(1)
Total	275	290

Diversity index are key components to draw the natural lines regarding taxa composition pertaining to any managed or unmanaged landscaping. They consist of diversity, evenness, dominance and richness of inhabiting taxa in that particular area. So, keeping in view the importance of these aspects, calculations were made as per Shannon Diversity Index. Diversity was recorded maximum among dry land (0.0725) and least bamong wet land (0.0683). Diversity maximum was also higher among dry land (2.4624) and least among wet land (2.4362). Evenness ratio was also recorded in same context (0.0294, and 0.0280 respectively). Dominance was recorded maximum from dry land (1.0294) least among wet land (1.0280) However, richness was a little bit recorded high among dry land (9.2317) least among wet land (7.3438) (Table 4).

Table 4: Diversity Indices recorded from Wetland and Dry land territory

Diversity Indices	Wetland	Dry land
Diversity (H′)	0.0683	0.0725
Evenness (J)	0.0280	0.0294
Dominance (D)	1.0280	1.0294
Richness (R)	7.3438	9.2317

Equilibrium constant of a particular ecosystem is always depending upon the energy flow in food chain. We say ideal and sustainable ecosystem to that which have balanced economy of energy. It can be possible only in the situation when all the components (abiotic and biotic) of the under reference ecosystem working with zeal and passion for smooth flowing and constant outcomes pertaining to Law of Entropy. The organisms those play role for above mentioned functions usually inhabited by; predator, prey, pest, parasite, deterivorus, scavenger and consumers etc. Enlisting of all these contributors is called trosphic level of the food chain in that particular ecosystem and their overall role and rate of energy transferring in that particular ecosystem is called "ecological efficiency" [32, 36, 37, 15, 34, 30, 9, 15, 11]. Presently, trophic structure of recorded taxa from wetland and dry lanad was recorded as follow:

From the total of recorded population, 35.27% (N=97) was recorded as pest from wetland comprising of following taxa: *Oniscus asillus, Porcellio dilatatus, Chlorochroa senilis, Mastotermes darwiniensis* and *Cochliaella barbara*. Whereas, population density of pest among dry land was recorded as 31.03% (N=90) consisting of; *Oniscus asillus, Porcellio dilataus* and *Chlorochroa senilis*. However, from the total of recorded population, 8.72% (N=24) was recorded as detrivores from wetland pertaining to: *Porcellio scaber, Buliminus halepensis, Cochlicopa lubricella* and *Helicella profuga*. Whereas, population density of detrivores among dry land was recorded as 2.41% (N=7) pertaining to following taxa; *Porcellio scaber, Buliminus halepensis, Cochlicopa lubricella* and *Helicella profuga*. While, from the total of recorded population, 1.09% (N=03) was recorded as predators from wetland with regarding *Selenopsis xyloni*; whereas, population density of predators in dry land was recorded nil. Wherein from the total of recorded population, 32.06% (N=93) was recorded as decomposer among dry land pertaining to following taxa: *Lumbricus terrestris*; whereas, population density of decomposer among wetland territory was recorded nil; and from the total of recorded population, 12% (N=33) was recorded as omnivore from wetland pertaining to following taxa: *Humboldtiana pilsbry, Humboldtiana nuevoleonis, Allopeas gracile, Forficula auricullaria* and *Gryllus bimaculatus.* Whereas, population density of omnivore among dry land was recorded high 1.37% (N=04) and that population was pertaining to *Forficula auricullaria.* While, from the total of recorded population, 13.45% (N=37) was recorded as herbivore among wetland pertaining to following taxa: *Melontha melontha, Xerosecta cespitum* and *Dyscinetus morator* and *Leucomochala* spp. Whereas, population density of herbivore among dry land was recorded as 1.37% (N=04) and that population was consisting of; *Melontha melontha* and *Dyscinetus morator*. However, from the total of recorded population, 2.54% (N=07) was recorded as carnivores among wetland pertaining to *Rumina decollate.* Whereas, population density of carnivore among

dry land was recorded nil. Wherein from the total of recorded population, 0.72% (N=02) was recorded as predator/omnivore among wetland pertaining to *Gryllus assimilus.* Whereas, population density of predator/omnivore among dry land was recorded as 1.37% (N=04) and that population was consisting of; *Gryllus pensylvanicus*; and from the total of recorded population, 3.79% (N=11) was recorded as predator/carnivore among dry land pertaining to following taxa: *Geophillus flavus, Geophillus vattatus* and *Scolopendra cingulata.* Whereas, population density of predator/carnivore among wet land was recorded nil. However, from the total of recorded population, 4.00% (N=11) was recorded as herbivore/saprophagous among wetland pertaining to *Phyllophagas* spp. Whereas, population density of herbivore/saprophagous among dry land was recorded high 6.20% (N=18)**.** Whilst, from the total of recorded population, 0.34% (N=01) was recorded as herbivore/predator among dry land pertaining to *Ancyronyx schillhameri.* Whereas, population density of herbivore/predator among wetland was recorded nil; and from the total of recorded population, 9.09% (N=25) was recorded as honeydew/sucker from wetland pertaining to following taxa; *Lasius flavus* and *Formica subsericea* and also from dry land 8.96% (N=28) was recorded pertaining to *Formica subsericea* and *Lasius nearcticus.* While, from the total of recorded population, 1.45% (N=04) was recorded as pest/predator from wetland pertaining to *Selenopsis invicta*. Whereas, population density of pest/predator among dry land was recorded nil. Wherein from the total of recorded population, 1.45% (N=4) was recorded as scvanger/detrivore from wetland pertaining to *Componotus ligniperds.* Whereas, population density of scvanger/detrivore among dry land was recorded as 1.09% (N=03). However, from the total of recorded population, 5.45% (N=15) was recorded as pest/scvanger from wetland pertaining to *Odontatermis obesus.* Whereas, population density of pest/scvanger among dry land was recorded high 7.58% (N=22) pertaining to *Odontatermis obesus* and *Prototermes adamsoni*. While, from the total of recorded population, 0.34% (N=1) was recorded as pollinator from dry land pertaining to *Megascolia maculata.*Whereas, population density of pollinator among wetland was recorded nil. Whilst, from the total of recorded population, 3.27% (N=09) was recorded as phytophagus/detrivore from wetland pertaining to *Mastus olivaceus.* Whereas, population density of pollinator among dry land was recorded nil; and from the total of recorded population, 1.03% (N=03) was recorded as scvanger/predator from dry land pertaining to *Labia minor.* Whereas, population density of pollinator among wetland was recorded nil; whereas from the total of recorded population, 0.36% (N=01) was recorded as pest/herbivore from wetland pertaining to *Acheta domesticus.* Whereas, population density of pollinator among dry land was recorded nil. While, from the total of recorded population, 1.03% (N=03) was recorded as omnivore/pest from dry land pertaining to *Gryllotalpa gryllotalpa.* Whereas, population density of pollinator among wet land was recorded nil. Previously ([20]) it was reported that termites, ants and earthworms manipulate soil physico-chemical as well as biological procedures. In semi-arid and arid areas, earthworms are most active and dynamic while, in sub-humid and humid areas ecosystem engineers performed same activity. They control soil structure, profile and humification by mineralizing organic matter and soil texture. All these characteristics are controlled by soil fauna. But this faunal population was distributed by land clearing, monoculture, plowing and arbitrary use of agrochemicals. Soil as well as crop management methodologies support and enhance their activities e.g. zero-tillage, crop cover, agro-forest status as well as ecological compatibilities.

Hence, from the overall results, recital set of data and entire discussion, it is to inveterate that findings of present study were parallel and analogous with the findings and acknowledgements of previous studies made over the world. While, depart situation was occurred due to variations in ecological status [1, 32, 36, 37, 14, 21, 33, 25, 39].

Conclusions

Keeping in view the findings of present research, it is quite obvious that a large number of soil macro-fauna representatives inhabited both territories as an analogous feature but their prevalence was different. It was a naked portrayal that their relative abundance varies with regard to taxa comparison of abundance instead of overall community strength. Hence, as they are of key importance to sustain ecological niches and equilibrium constant in agro-ecosystem, therefore, in future for their conservation: a) Farming community must be aware about their ecological role, b) Formal education literature must be added in the curricula of the learning age groups, c) There should be the awareness regarding the soil quality improvement and sustainable uses of the natural resources.

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