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HABITAT PREFERENCE OF EARTHWORMS RELATIVE TO DIFFERENT FRUIT TREES

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Abstract: A study was conducted to evaluate the effect of different habitats (canopy and away from the canopy) of different plants on earthworms abundance. The specimens were collected from guava, mango, citrus, and date palm and mulberry fields. Total 480 sampling sites, 30 sampling sites a week (6 for each fruit tree) were selected randomly by replacement sampling method. The specimens were preserved as mentioned in Stephenson (1923). Under the canopy of plants maximum number of earthworms per site were present in guava field while minimum in mulberry field. Away from the canopy earthworms were the most abundant in citrus field and the least in guava field. A significant correlation was found between mean number of earthworms and canopy of plants. In all fields the shadow area harboured the highest number of earthworms than open edge soil of different plants.
Key words: Earthworm abundance, earthworm population, and habitat plant canopy.

INTRODUCTION

Soil dwelling earthworms are very important soil creatures as they make up a large portion of total biomass of invertebrates. They improve soil quality and productivity of plants (Edwards and Lofty, 1980; Lee, 1985) The importance of the earthworms for plant growth has been recognized for over 100 years, since the publication of Charles Darwin's book (Darwin, 1881), who has estimated that there are approximately 50,000 earthworms per acre of moist soil (Darwin, 1881). Multifold significance of earthworm is reported by a number of scientists: in increase of production of different plants (Edwards and Lofty, 1980; Lee, 1985); in enhancing decomposition, humus formation, nutrient

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recycling, fragmentation and in improvement of soil fertility (Kladivko *et al*., 1986; Parmelee *et al*., 1988); in enhancing nitrogen metabolism (Aldag and Graff, 1974; Aatlavynite and Vanagas, 1982; Tomati *et al*., 1990; Tomati *et al.*, 1996). The castings produced by the earthworm have high concentration of Calcium, Magnesium, Sodium, Molybdenum, available Phosphorus and ammonia (Shinde *et al*., 1992), higher pH (Tuneera *et al*., 1991), higher moisture contents and nutrients (Hendriksen, 1997). Earthworms are used as food in tribes of Australia and New Zealand (Jairajpuri, 2001). Earthworms have linoleic, arachidonic acids that are required for the growth and reproduction of animals (Kale, 2005) so, are used in animal feed industries in dried and powdered form.

Earthworms are influenced by soil type and texture (Guild, 1984). To use the earthworms for beneficial purposes in soil fertility, humus formation, pollution control and other purposes, first step will be to determine what earthworm ecotypes is present, and how abundant they are (Matthew, 1990). The present study is actually an attempt to study some aspects of ecology of earthworms *i.e.,* to determine the effect of specified flora on the abundance of earthworm fauna, and to determine the effect of specified flora on the relative abundance of the earthworm *spp.*

MATERIALS AND METHODS

Study Area

The specimens were collected from the fields of mango, citrus, date palm, guava and mulberry by the digging method (Lewis *et al*., 1979) and identified in the research lab of Department of Zoology, G.C. University, Faisalabad.

Collection

Out of total 480 sampling sites, 240 under the canopy and 240 away from the canopy were selected for study by the replacement sampling method every week**.** A hole of one square feet was dug with the help of spade and scraper in each selected site and earthworms were collected. The collection was made weekly for four months from July-October 2006.

Preservation

The collected specimens were preserved by the following method suggested by Stephenson (1923). The earthworms were washed with tap water, kept in 10% ethyl alcohol for ten minutes for dehydration, hardened by keeping in 10% formalin for about 24 hours and finally preserved in 5% formalin.

After counting and identification, the specimens were kept in separate jars with the inscribed species name and kept in museum of Department of Zoology, G.C. University, Faisalabad.

Table I: Number of earthworms per site in fields of different fruit tree during the study period.

Collection site/Field	Position	Sampling month			
		July	August	September	October
Mango	a	0.996	1.25	1	0.75
	b	0.915	0.667	1.5	0.416
Guava	a	1.75	1.41	2.16	1.16
	b	1.91	1.5	1.16	0.832
Date Palm	a	1.08	1.92	2.167	1.66
	b	0.334	0.69	1.16	0.41
Mulberry	a	0.83	0.75	0.58	0.33
	b	0.58	0.74	0.416	0.415
Citrus	a	1.5	1.66	2.25	0
	b	2.1	2.75	0.83	0

Table II: Habitat preference of earthworms relative to different fruit trees.

Fruit trees	Earthworms/site under the canopy	Earthworms/site away the canopy	Earthworms/site irrespective of canopy
Mango	0.99	0.875	0.937
Guava	1.62	1.350	1.485
Date palm	1.70	0.648	1.174
Mulberry	6.22	0.537	0.579
Citrus	1.35	1.42	1.385
Total	1.25	0.966	1.11

Month	Week	Average Temperature ºC	Mean R.H
July	1st	35.85	51
	2nd	26.50	77.5
	3rd	33.20	71
	4th	29.45	82
August	1st	27.75	80.5
	2nd	33.25	84.5
	3rd	31.10	78.5
	4th	23.80	96
September	1st	30	78.5
	2nd	30.10	71
	3rd	29	61
	4th	28.9	64
October	1st	28.8	66.5
	2nd	23.6	73.5
	3rd	20	79
	4th	23.4	73

Table III: Temperature and mean relative humidity during study period

RESULTS AND DISCUSSION

Earthworms play a key role in soil biology by serving as versatile natural bioreactor, converting organic waste into valuable organic manure. The benefits are now being globally realized that earthworms can do wonderful job in the management of different pedo-ecosystems. They are useful in land reclamation, soil improvement and organic waste management. (Harender and Bhardwaj, 2001) The need of knowledge of earthworm's ecology to exploit this natural resource for the benefit of mankind does not require any debate. In this study an attempt has been made to know the relative abundance of earthworms in fields of mango, citrus, date palm, guava and mulberry under and away from the canopy of plants from July to October. Abundance of earthworms depends upon the habitat types. Total number of earthworms per site in present study area

were (x=1.11) the number of earthworms per site was maximum in guava field (x=1.48) and minimum in mulberry (x=0.579) so the most preferred habitat out of five was guava field and the least preferred was mulberry field. Earthworms being cold-blooded animals are highly sensitive to seasonal changes. The highest number of earthworms per site during the study period was found in month of August (x=1.337) and the least was in October (x=0.597) (Table I). In the present study area mean relative humidity remained in the range of 51 to 96 while it dropped to 66.5-79 in October (Table 3). This data corroborates the findings of Credie *et al*. (1992) who showed that at the time of opening rains the abundance of earthworms was 58/m². It took more than ten weeks that the number reached to 170/m². Near the end of the wet season (October) density was 37per m². Population abundance of earthworms is affected by shadow area. The relation was found between the canopy of plants and the number of earthworms in the study area. Over all number of earthworms per site under the canopy of plants were (x=1.2564) and away from the canopy were (x=0.966).

Preferred habitat regarding canopy of plants and away from canopy of plants canopy was found to be prior one because number of earthworms per site were (x=1.2564) greater than (x=0.966) for the later one regarding five field The same trend was found when each fruit plant field was under consideration separately except citrus for which away from canopy habitat showed a bit greater value 1.42 against 1.35 (table 2). These results are in accordance with Sabahat (2005) who reported that the sub-shadow site harbored the maximum number of earthworms. The open edge soil of the crop field had low abundance of earthworms.

From all above results it was concluded that earthworms preferred the guava plants and canopy of the plants because of more shadow area and presence of more organic matter under the canopy. Secondly due to the presence of more moisture because of rain earthworms were more abundant in August and minimum in October due to less moisture.

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