Agric. Sci. Digest., 37(3) 2017: 244-246
Print ISSN:0253-150X / Online ISSN:0976-0547

AGRICULTURAL RESEARCH COMMUNICATION CENTRE
www.arccjournals.com

Impact of agricultural practices on earthworm biodiversity in different agroecosystems

M. Akilan* and S. Nanthakumar

Adhiparasakthi Agricultural College, Kalavai-632506,
Vellore District, India.

Received: 21-11-2016 Accepted: 03-08-2017 DOI:10.18805/asd.v37i03.8999

ABSTRACT

The diversity of Earthworms in agro-ecosystems is less studied and the modern agriculture which involve different agricultural practices like crop rotation, tillage and application of synthetic fertilizer leads to pollute the soil ecosystem as a result the highly sensitive soil micro and macro faunal diversity is in threaten condition. This investigation was an attempt to assess the diversity of different native species of earthworms from five different agro-ecosystems. The diversity of earthworms reveals that the diversity of earthworms from rice field recorded higher number followed by turmeric field. *Eiesnia foetida* and *Periyonx excavates* were the local earthworm species recorded during the entire investigation. The investigation reveals the impact of different agricultural practices on the soil faunal diversity and its importance in the context of soil organic matter.

Key words: Agricultural practices, Agro-ecosystems, Biodiversity, Earthworm, Soil fauna.

The soil biota can be regarded as the biological engine of the earth and is implicated in most of the key functions of the soil provided in terms of ecosystem services by driving many fundamental nutrient cycling processes, soil structural dynamics, degradation of pollutants and regulation of plant communities. Earthworms form one of the major macro fauna among soil biota to maintain dynamic equilibrium and regulate soil fertility. Their existence and food source in the given ecosystem and the major secondary decomposers in the soil faunal community (Lee, 1985). Earthworm diversity is an indicator of soil quality because they depends on several conditions associated with soil quality and agricultural practices of the region (Reddy *et al*., 1995). Different agricultural practices cause shift in habitat quality resulting in changes in abundance of soil faunal diversity. Physical disturbance caused by tillage is a crucial factor in determining soil faunal species diversity in the agro ecosystem (Breure, 2004).The number and intensity of tillage operations caused destruction of burrows, cocoon and the bodies of earthworms. Pollutants in general, influence the organisms living in the soil. The application of fertilizers and pesticides influence the structure of the soil biota. Soil macro faunal diversity is one of the most profound ecological consequences in modern agriculture leading to decreased earthworm diversity in modern agricultural practices in our country. Thus this investigation is aimed to assess the diversity of local earthworm species in relation to different agro-ecosystems.

Agro- ecosystems like rice, sugarcane, banana and turmeric fields were selected for the study of population dynamics of two native earthworm species. The earthworm species selected for this investigation were, *Eisnia foetida* commonly known as red worm and *Perionyx excavates* commonly known as Asian worm. The study was carried out every fortnight for four months started from December, 2012 to March, 2013. Earthworm populations were estimated by hand sorting in a sampling hole of 50 x 50 cm (0.25 cm^2) from 10-20 cm depth. The soil is removed with a spade and spread out on a plastic sheet, the number of earthworms both adult and juveniles were identified and recorded (Rombke *et al.,* 2004). The soil samples from the concerned agro-ecosystems were also collected and estimated the parameters like pH, EC and Organic carbon during the study period (Edwards and Bohlen, 1996). The recorded data on population of two different species of earthworms in relation to the different agro-ecosystems were analyzed to test its significance by Duncan's Multiple Range Test (DMRT) at $P<0.05$.

The population dynamics of two different species of earthworms of different agro-ecosystems showed marginal difference among its ecosystem. Among the different agro-ecosystems, rice field recorded higher number of adult worms followed by turmeric, sugarcane and banana fields. The soil nutrient (N, P, K) levels of selected agro-ecosystems showed that higher nutrient level in the rice field followed by banana and sugarcane fields(Table.1). During the study period the

*Corresponding author's e-mail & address: drakilanm@gmail.com; P.G. and Research Department of Zoology, Voorhees College, Vellore-632 001, India.

Table1: Soil physicochemical characters of the selected agro-ecosystems

Soil Charerstrics	Rice field	Sugar Cane	Turmeric	Banana	LFA
Soil pH	7.0 ± 0.1	7.4 ± 0.3	7.1 ± 0.3	7.6 ± 0.9	7.5 ± 0.6
EC	0.2 ± 0.01	0.1 ± 0.01	0.2 ± 0.04	0.1 ± 0.01	0.2 ± 0.01
Texture	CL	SCL	SCL	CL	CL
N	193 ± 8.8	139 ± 6.4	107 ± 4.3	149 ± 2.6	172 ± 6.1
P	8.0 ± 0.8	7.0 ± 0.1	1.30 ± 2.2	9.0 ± 0.8	1.20 ± 0.14
K	197 ± 8.1	108 ± 7.8	165 ± 8.2	115 ± 5.3	75 ± 8.2

Values are mean of three replicates± SD. CL- clay Soil ; SCL-Sandy Clay Loamy soil.
LAF- Land free from agricultural practice considered as control

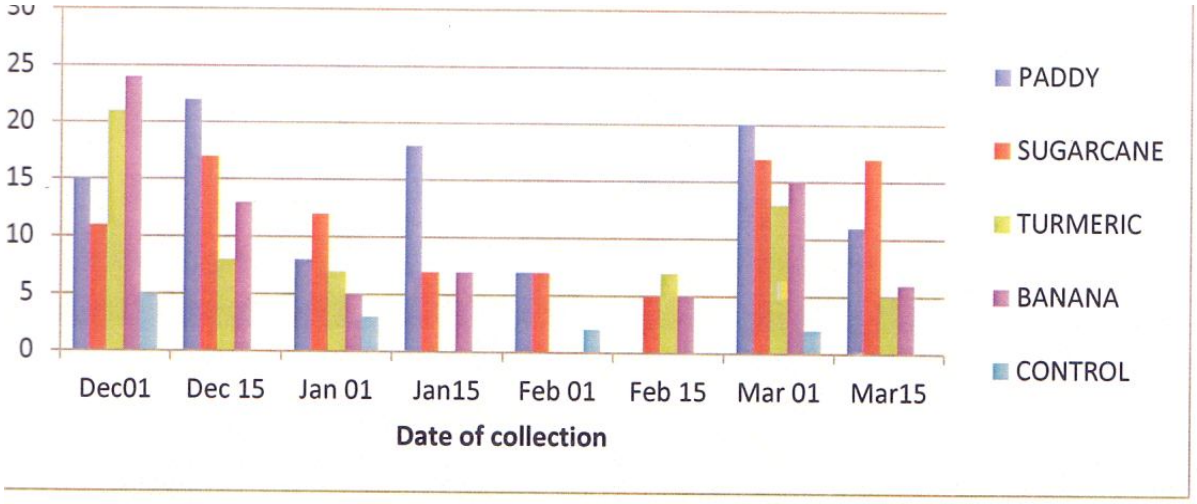

Figure 1: Population dyanamics of Eisnia foetida from the selected Agro-ecosystem.

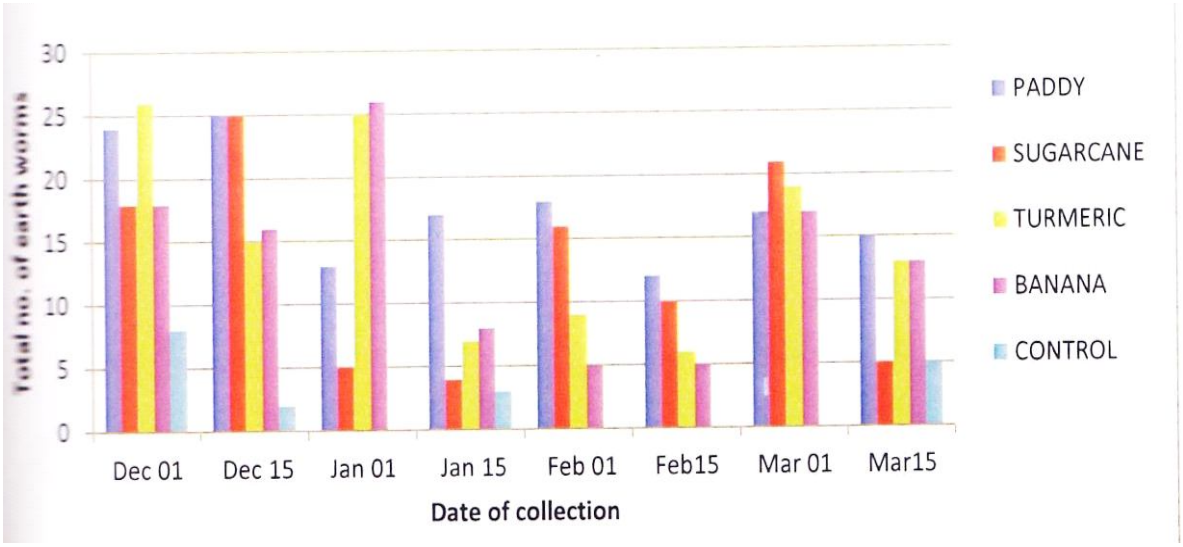

Figure 2: population dyanamics of Perionyx excavates from the selected Agro-ecosystem.

number of two different earthworm species was observed a decline during the months of February and March in all agro-ecosystems except rice fields(Fig. 1&2). This may be due to the soil moisture level of the field due to higher temperature and lesser rainfall. Earthworm diversity and distribution pattern are generally governed by biotic and abiotic factors and regional climate (Decanes *et al.,* 1998 & 2008).The pH and Organic Carbon present in the soil influence the worm population in the selected agro-ecosystems (Julka *et al.,* 2006). Tillage affects decomposition and availability of surface residues, cropping pattern and addition of manure or other organic inputs (Julka and Paliwal, 2005). The population density among the two earthworm species, *Eisneia foetida* recorded higher population in the rice field

where as *Perionyx excavates* population was higher in turmeric and banana fields. Statistical analysis showed a positive correlation between the nutrient level of the soil with earthworm population. Among the different agro-ecosystems, Rice field showed more significant when compared to other fields. The habitat and type of the agricultural practices play a major role in the earthworm species diversity.

REFERENCES

Breure, A.M. (2004).Soil Biodiversity: Measurements, Indicators, Threats and Soil functions. International Conference on Soil and Compost Eco-Biology,Leon,15-17, September, 2004, 83-96.

Decaens ,T., Dutoit,T, Alard, D.,and Lavelle P. (1998). Factors influencing Soil macro faunal communities in post-pastord succession of western France. *Appl Soil Ecol.* **9**:361-367.

Decaens,T., Lavelle, P.,and Jimenez J.J.(2008). Priorities for Conservation of soil animals.CAB Reviews: Perspectives in Agriculture, *Veterinary Science, Nutrition and Natural Resources,* **3**(14): 1-18.

Edwards,C.A. and Bohlen P.J. (1996). Biology and Ecology of Earthworms (3rd Ed.), Chapman and Hall, London, 426 pp.

Julka, J.M. and Paliwal R. (2005). Distribution of earthworms in different agro-climatic region of India. In: Soil biodiversity, Ecological processes and landscape Ramakrishnan, P.S., Saxena, K.G.,Swift, M.J., and R.K. Racks maikhuri(eds.). Oxford and ABH Publications Co. Pvt Ltd.,New Delhi, pp.3-13.

Julka, J.M., Paliwal, R.and Kathireswari P. (2007). Biodiversity of Indian earthworms-an overview pp.36-56.In: Edwards C.A., Jayaraaj R. and.Jayaraaj I.A. (eds.) Proceedings of Indo-Us workshop on Vermitechnology in Human welfare. Rohini Achagam, Coimbatore.

Reddy,V.M..Kumar,V.P.K.,Reddy,V.R., Balashouri,P., Yule,D.F., Cogle,A.L., and L.S. Jangawad. (1995). Earthworm biomass reponse to soil management in semi-arid tropical Alfisol Agroecosystems. Biol fertil Soils 19:317-321

Rombke,J.S., Jansch, S. and Didden W. (2005). The use of earthworms in ecological soil classification and assessment concept. *Ecotoxicology and Environmental Safely*, **62**(2): 249-265.