ECOLOGY AND ECONOMIC SIGNIFICANCE OF EARTHWORMS.

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Abstract

A comparative study was conducted on the earthworm resources of Gulbarga District. These region blessed with contrasting ecosystem which will ideal for the combination of different species of earthworms. Earthworm were sampled continuously for two years by employing standard techniques. The habitat and diversity of the earthworm is noted. The ecology of earthworm and the importance contribution and roles placed by the earthworm in their respective ecosystem in Gulbarga district on soil structure, fertility, and vermin compositing so its role ever discussed in details.

Keywords: Gulbarga District, earthworm, ecology, important of compositing and harmful worms.

Introduction

Earthworms are found almost all over the world, being absent only from regions where soil is sandy and deficient in humus. They are also not found in mountain regions, having scanty and poor soil. They also do not prefer very clayey or acidic soils. They live usually in the upper layers of slightly damp soil, lawns and gardens, upto the depth of 12 to 18 feet in burrows for protection against the enemies and unfavourable conditions of climate. Respiration in earthworms requires their skin to remain moist, a condition obtained by secretion of mucous on the skin and also by their tendency to seek moisture.

They make their burrows partly by boring with their pointed anterior ends and partly by swallowing the earth. They can force their way through soft earth, but literally eat their way through soft earth, but literally eat their way through harder soil, passing and dirt through the alimentary canal. The swallowed earth is reduced to powder in the gut. Some of its organic matter is digested, and the residue is discharged from the anus on the surface as pallets of mud, commonly known as worm casting which are also used to line the burrows. The openings of the burrows are protected either by worm castings or closed by dry leaves or small stones.

Earthworms are nocturnal creatures, lying in their burrows during the day, but coming out at night promoted by hunger and love. They feed on dead leaves and other organic material, some of which they may pull back into their burros. They do not have special sensory organs, yet they respond to several stimuli. They avoid strong light and will also withdraw in the burrow in response to irritating chemical vapours and mechanicals vibrations caused by heavy foot falls on the ground. Mechanical vibrations such as pounding, appear to irritate them, some times causing them to come quickly to the surface, as if in pain.

This can be observed particularly after a heavy rain when hundreds of them emerge out and may be seen crawling on the ground probably for oxygen. This was the basis of the old notion that the worms had "rained down", but the opposites earthworms come to the surface after a hard rain and many of these die.

Earthworms form burrows by literally eating their way through the soil and pushing through crevices. Not all species have burrows, it is usually only those species that penetrate deep into soil such as Lumbricus terrestris, allolobophora longa and allolobophora nocturnes, pheretima posthuma, perionyx excavatus, octochaetold sudershensis, metaphire houlleti, lampito mauritii etc.

There is not a great deal of information about the relationships between earthworms and their more important predators and parasites. They are prayed upon by very many species of birds, by badgers and shrews, and especially by moles.

Materials and Methods :

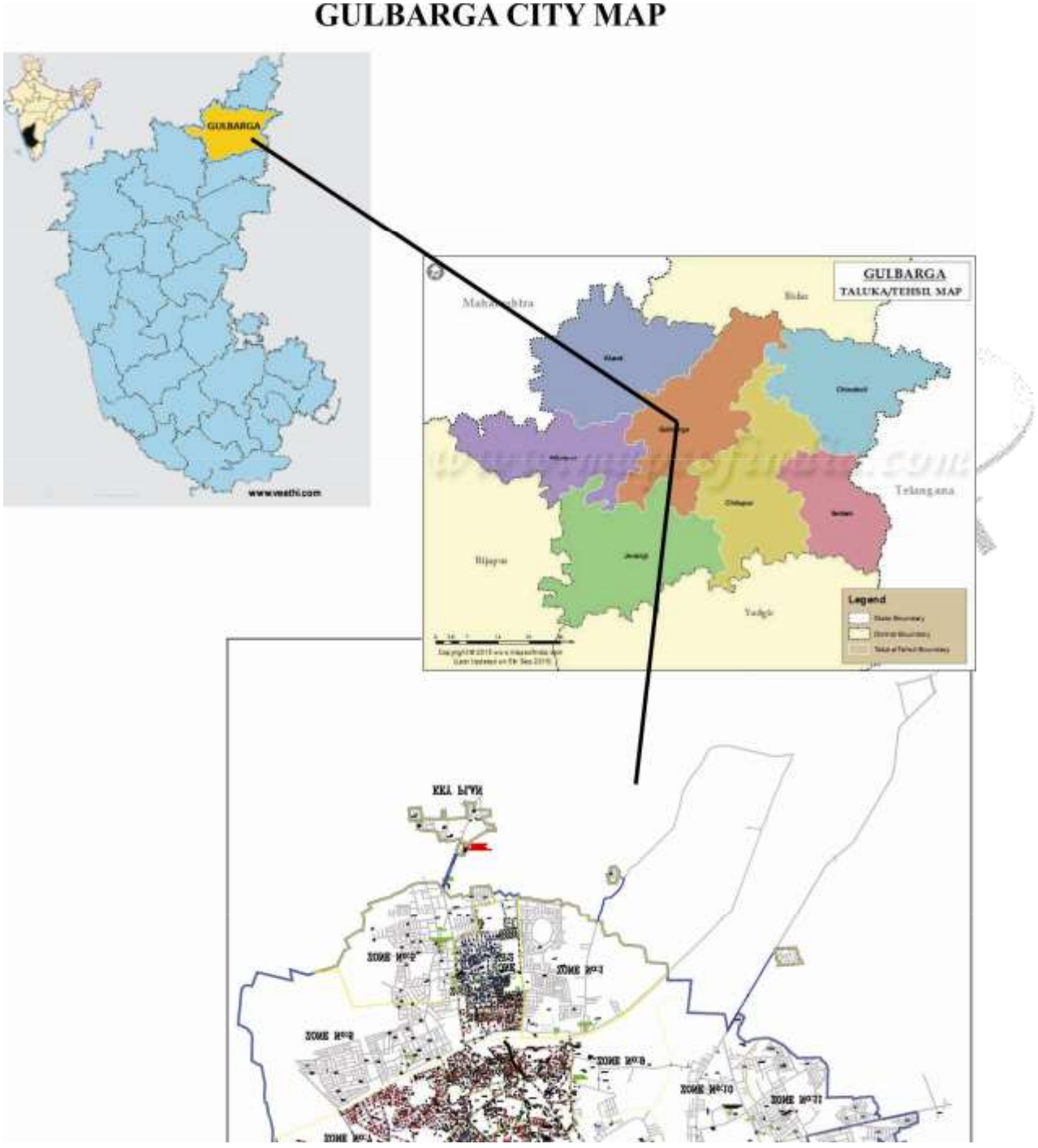
The earthworms were collected from the outskirt of Gulbarga district. They were acclimatized for 3 days to the prevailing laboratory conditions under normal day / night illumination at 25^0C ± 0.5^0C. The worms having approximately equal size (12 ± 0.5cm) and weight 0.5 ± 0.7 g) were selected for all eventual experiments.

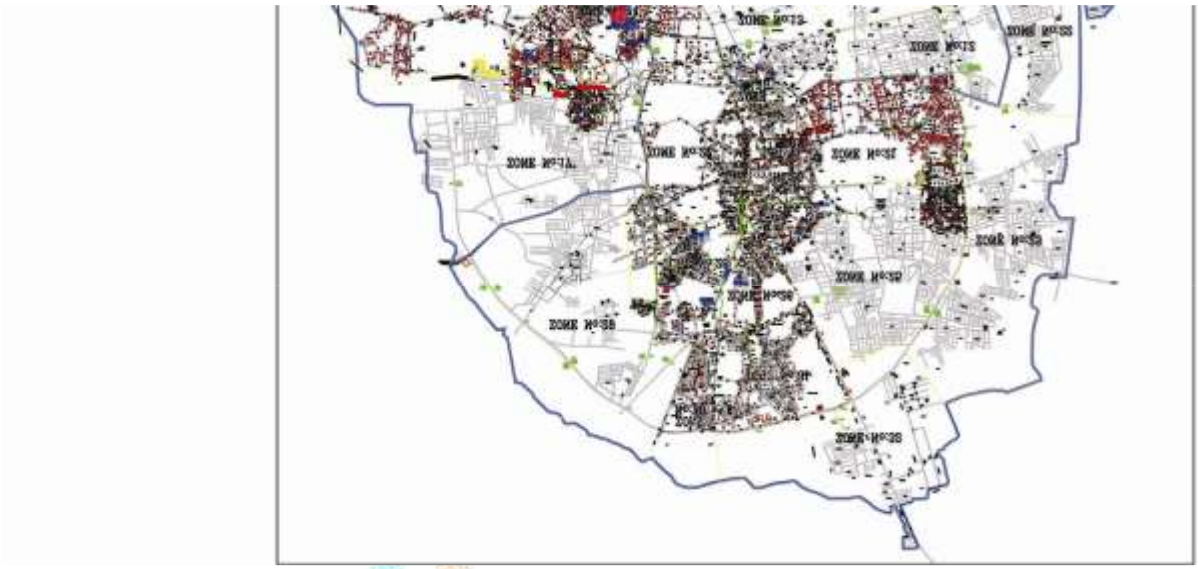
Garner (1953) described a method of making latex casts of the burrows of earthworms by pouring liquid latex (thinned with ammonia and diluted 1 to 8 with distilled water) into the burrows. Burrows range from about 3 mm to 12 mm in diameter, but it is not certain whether worms increase the size of their burrows as they grow, or make new ones. Some earthworms can burrow very deep

into the soil, Drawida Grandis has burrows to a depth of 2.7 – 3.0m (Bahl, 1950). Most shallow working species, which are usually smaller, do not have well defined burrows.

Study Area :

Gulbarga district lies in the northern part of Karnataka between 16011^0 – 17045^0N latitudes and 76003^0 – 77030^0E longitudes, with a geographical area of 16,174 sq km. The district is bounded by Bidar district in the north. Bijapur district in west, Raichur district in south and Andhra Pradesh in the east. As of the 2014 India census Gulbarga had a population of 11,01 ,989. The weather in Gulbarga consists of three main seasons. The summer spans from late February to mid June. It is followed by the southwest monsoon, which spans from late June to late September. It is then followed by dry winter weather until mid January, temperatures during the different seasons are Summer 26^0C to 39^0C, monsoon 23^0 to 32^0C, winter 12^0 to 31^0C.





Ecological studies on Indian earthworms :

Ecological studies on tropical earthworms from India are not very extensive as compared to their counterpart temperate earthworms from Europe and other western countries. *Thambi and Dash (1973)* reported on seasonal variation in numbers and biomass of enchytraeidae worms, enchytraeus, marionia and achaeta populations in tropical grassland and soils from Orissa. Later on *Dash et.al., (1974)* compared primary production of plant material and secondary production of oligochaetes belonging to three families such as enchytraeidae, magascolecidae and ocnerodrilidae in the same tropical grassland of Orissa.

Varma and Chauhan (1979) reported on pH preferences of a few earthworms. *Dash et.al., (1979)* reported on microfungi associated with decomposition of the tissue of lampito mauritii and octochaetona surensis in a pasture soil. Where as worm cast production and nitrogen contribution to soil by lampito mauritii has been reported by *Dash and Patra (1979). Senapati et.al., (1979)* recorded the seasonal dynamics and emergence pattern of Drawida Calebi by studying cocoon morphology, hatching etc. in pasture site. Further Senapati et.al., (1980) have made observations on changes in chemical characteristics of sterilized field soil through the activity of the worm octochaetona surensis in the process of decomposition. Dash et.al., (1980) have studied the effect of a population of the worm lampito mauritii on four functionally different groups of nematodes, i.e. parasitic forms, miscellaneous feeders, microbial feeders and predators. Potential for utilizing organic waste was studied by Kale et.al., (1982).

In the worm, pontoscolex corethrurus, Bhaskaran et.al., (1986 a) determined the relation between soil moisture and the body weight and reported that the mortality of the worms resulted when it has lost 77.5% of its total water content in any soil with 0.07% moisture, whereas the tolerance of the same species of worms was studied by Bhaskaran et.al., (1986 b) when exposed to different soil media containing cowdung in various proportions (0 to 100%). It was also observed that within the tolerance limit, the rate of cocoon formation of the earthworms increased with the increase of cowdung level in the medium.

Economic importance of earthworms :

Earthworms are simple common place creatures of great economic importance to man. They are certainly small but, directly or indirectly they are very useful to us. Our earth would be a far different place without them.

1) As Bait :

All over the world they are used as bait for fishing. Various methods are employed to drive them out of their burrows for making large collections. Some of these include jarring soil by beating a stick driven into it, pouring poisonous chemical solutions such as mercuric chloride on the ground and even using an electric current. They form the best food of fish in aquaria. A small white earthworm (enchytraeus albidus) is often growing in soil and used to feed aquarium fish and small laboratory animals. They are actually used as food by uncivilized people in many parts of the birds, notably robins and chickens. Large numbers of them are eaten by frogs, moles, lizards, small snakes, centipedes and other predatory invertebrates.

As food earthworms have also been used for human food. They are regarded as a delicacy by the Moaris in New Zeland. In Japan, earthworm pies have been made, and there have been reports from South Africa and of fried earthworms being eaten (Ljungstrom and Reinecke, 1969). Primitive natives from New Guinea and parts of Africa have been reported to eat raw earthworms.

2) In agriculture :

Earthworms are in general beneficial to agriculture. Although they may some times do damage to young and tender plants yet they are good friends to the gardner, and farmer as they are continually polughing and manuring the soil. Their habit of burrowing and swallowing earth below the surface increase the fertility of the soil in many ways. Their burrows permit the penetraitions of air and moisture in the porous soil, improve drainage, and make easier the downward growth of the roots. The thorough grinding of soil in the gizzard constitutes an effective kind of soil "cultivation". The ecretory wastes and other secretions of the worms also enrich the soil by adding nitrogenous matters that form important plant food. Their effect on turning over of soil is considerable. On acre of ground may contain 50,000 earthworms and the quantity of earth brought up from below and deposited on the surface as worm casting has been estimated to be as 18 tons per acre per years, by Darwin. In 20 years, a layer of 3 inches thick would be transferred from the subsoil to the surface. Darwin wrote, "The plough is one of the most ancient and valuable of man's inventions but long before he existed the land was in fact regularly ploughed and still continues to be thus ploughed by the earthworms.

3) As indicators of soil type :

Several workers have proposed that the species of earthworms that occur in a soil can be indicators of the soil type and its properties (Saussey, 1959; vol. 1962). Ghillarov (1956, 1965), is the chief modern proponment of this theory and his work has been comparatively successfully. Many other attempts to diagnose soils by the earthworms they contain have been unsuccessful, probably because those ecological factors that favour multiplication of earthworms, such as moisture capacity, pH, organic matter content etc. are not always those properties directly linked to soil type.

4) In medicines :

Earthworms were used variously as medicine in the past, Hamadullah Mustafi of Qazwin in A.d. 1340, in "Naizat-ul-Qutub" and Damari written in Hayat-ul-Haiwan (the life of animal), written in A.D. 1371, tell use of medicine prepared from earthworms to cure stone in bladder, yellowness of jaundice, pyorrhaea, piles, rheumatism or gout, diarrhaea, weakness after pregnancy and sexual impotency. Even to this day the Chinese, the Japanese and the Indians are said earthworms in various fancy medicines. There have been many reports of earthworms being eaten by humans as medicine, to cure such ills as stones in the bladder, jaundice, piles, fever and to alleviate impotency. Earthworm ashes have been used as a tooth powder in primitive societies (Stephenson, 1930) and it has been suggested that earthworms might contain a substances effective in curing rheumatism (we is back, 1962).

Earthworms have been used in testing for pregnancy. Urine from human females (concentrated according to Zonak 5:1) is injected into earthworms subcutaneously, and smears taken from their seminal vesicles, both before and after injections, to assess spermatogenesis. An accuracy of 90% was claimed for this method of pregnancy testing (Hasenbeing, 1951). A method of testing substances for carcinogenic properties was described by Gersch (1959) who found that benzopyrine (0.5%), dimethybenzenthrene (0.5%) and other compounds when applied to lumbricus terrestris for several weeks induced tumors.

5) In laboratories :

The earthworms are easily obtained and are of convenient size for dissections. They are therefore universally employed for cross purposes in the zoological laboratories. They are also frequently used for investigations in general and comparative physiology.

6) As pollution indicators :

Oligochaetes and some other soft bodied form (flatworms, mollusk, leeches, etc) are more tolerant of pesticides than arthropods, but less tolerant of heavy metal ions, and anything that reduces bacterial activity (acids) will reduce worm populations according. Hence, the abundance of worms relative to other organisms as well as the relative abundance of various species of worms may be of interest. The absolute number of worms may be significant in cases of self evident organic pollution, i.e. where the sediments literally stink. In such instances a few very resistant species i.e., limodrilus hoffmeisteri may be so abundant as to be thought of as indicators perse but one should be aware that all such indicators have been around a long time, certainly for longer than man with his special knack of modifying environment to his own detriment. Hence "indicator" species must be present in clean environments, though their microhabitats may be naturally polluted by leaves or other rotting organic material dropping out of the system.

7) Harmful worms :

In some cases the earthworms become harmful, exceptionally, their burrows may cause loss of water by sewage from ditches in irrigated lands. Their castings on sloping lands tend to be washed away by rain and thus contribute to soil erosion, through to a lesser extent. Certain species live as external parasites of frogs and man. Sometimes they burry in the caracases of buried animals and bring the disease germs to the surface where they may infact other animals.

Some species become pests for plants. Pheretima alongata is suspected to be damaging the roots of the Betel vine (piper Betel) in Coimbatore Malabaria padudicola and aphanascus oryzivours are said to injure the roots of paddy in Malbar. A species of perionyx damages cardamom stems grown on the Annamalai Hills in South India.

Conclusions :

Keeping in view the foregoing literature on the ecology and economic importance of earthworms, the present study has been designed to study some physiological aspects of regeneration, using commonly available earthworm. The data obtained during the study of past clearly explaining the importance of earthworm to increase economic and ecological background.

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