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Earthworms - The Wonders of our 'Motherland'

"..... Earthworms are Unheralded Soldiers of mankind and friends of farmers. It may be doubted that there are many other animals which have played so important a part in the history of the world as these lowly organized creatures."

- Charles Darwin



Usefulness of earthworms has been known for a long time. These creatures are protecting our 'Motherland', very silently, for over 600 million years. They are global "ecosystem reworkers". We have gargantuan information's about their multifarious role as soil managers, fertility improvers, plant growth promoters and transformers of bio-degradable solid wastes into biomanure. A long term study has recently proved that weeds, that cause 45% annual agricultural loss in India, could be successfully utilized as feed for earthworms if mixed with appropriate ratio of predecomposed cattle dung and egested material be utilized as vermicompost to improve soil health.

These worms are now widely used by our progressive and educated farmers all over the country for vermicomposting, vermifiltration, vermi-remediation and vermi agro-production – a step towards organic farming and for sustainable agriculture. However, our marginal farmers are unaware of terrible consequences of chemical farming in the years to come. We must have essential innovative agenda for this group of farmers holding more than 76% of the total agricultural land in the country to implement under Lab. to Land program. It will lead a noble revolution in producing disease free, pesticides and chemical fertilizers free crops.

Earthworms are not only the amazing gift for the soil ecosystem but could be helpful in alleviating global warming-a serious sweeping issue today. Moreover, their contributions in medical therapy are also not unknown since ancient times. They can reduce cholesterol as the basic essential oil of worms is Omega 3. VERMECO discusses about the current developments in therapeutic usage of earthworms with one of former professor of Annamalai University, Dr. LS Ranganathan.

VERMECO wishes a speedy recovery of the Hon'ble president of the academic forum, SEER Prof. Mohd. Muzammil, the Vice-Chancellor of Mahatma Jyotiba Phule Rohilkhand University, Bareilly



Recently, the academic forum, SEER has organized its 3rd National Symposium on Earthworm Ecology & Environment at Tripura University, Tripura, to discuss various issues, problems and challenges on earthworms' role in soil health, waste management and medical therapy. Some of the issues which need to be worked out are: role of native and exotic species of earthworms in 'C' sequestration, identification of varied feed substrates of earthworms, physiological changes in plants after the application of vermicompost, economics of crop yield applying organic farming system, variations in nutritional status of organically and chemically produced plant products, quantification of optimal and saturation states of soil for various types of vermicompost/acre land area for the maximum crop yield and trial of vermi-medicines on humans.

We appeal to all the earthworm researchers of the country to work on these blazing issues for an incredible tomorrow using earthworms - the only creatures doing work quietly for the betterment of whole of the humanity, the motherland and the nature.

May every living being on the planet be happy and healthy!

VERMECO wishes to all its readers a very Happy New Year' 2013.

Satyendra M. Singh
Editor

"..... No body and nothing can be compared with earthworms and their positive influence on the whole living nature. They create soil and improve soil's fertility and provide critical biosphere's functions: disinfecting, neutralizing, protective and productive." - Anatoly Igonin

Recently held activity of the Academic Forum (SEEER) - NSEEE-3

The Academic Forum SEEER has organized its 3rd National Symposium on Earthworm Ecology & Environmental Research (NSEEE-3) in association with the Department of Zoology, Tripura University, Tripura, from November 9 to 11, 2012 under the convenership of Dr. Priyasankar Chaudhuri. The symposium was inaugurated by Mr. Joy Gobinda Deb Roy, the Minister of Science, Technology & Environment, Government of Tripura and Prof. Arunoday Saha - Hon'ble Vice Chancellor of the University. Prof. Madhab Chandra Dash- former Vice Chancellor, Sambalpur University, Sambalpur (Odisha) was the Key-note speaker.

More than 45 delegates of earthworm ecology and environmental sciences and 35 young scientists had participated from different corners of the country. Dr. Rajiv K. Sinha was one of the earthworm scientists from Griffith University, Brisbane, Australia. Eminent earthworm biologists, Prof. Radha Kale (Bangalore), Prof. M. Vikram Reddy (Pondicherry), Prof. LS Ranganathan (Annamalainagar) Dr. AK Sannigrahi (Chandipur, Balasore) and Dr. PS Chaudhuri (Agartala) were felicitated by the Academic Forum, SEEER in recognition of their valuable contributions in VERMECO- a bulletin on Agricultural Sustainability and Rural Development.

Participants of NSEEE-3 at Tripura University Campus ➔



Inaugural Ceremony of NSEEE-3



Some Views of Earthworm Biologists in the Symposium



Dr. MC Dash: Soil biodiversity is one of the important areas of ecological research, land use management and conservation concerns. Role of native and exotic species of earthworms in carbon sequestration should be studied in detail as soil carbon pools vary in different ecosystems.



Dr. Radha Kale: Feed substrates of earthworms should be identified in getting suitable vermicompost to achieve the maximum benefit on its application to the agricultural fields. It should be taken up as an extensive study in India. Such study can suppress the virulent plant pathogens that have negative effect on crop yield and in turn on economy.



Dr. LS Ranganathan: Earthworms extract/paste has therapeutic properties against inflammation, ulcer, microbial, anti-thrombotic and thrombolytic activities and we have a lot of scope in research to know importance of earthworms in the field of alternative medicine therapy.



Dr. Rajiv K. Sinha: Earthworms play significant role in Reduction of Greenhouse Gases to mitigate Global Warming. This is a serious global issue today. Future of mankind on earth beholds with the earthworms and our relationship must be maintained.



Dr. Sultan A. Ismail: Soil health- the basis for human health; although it is multifarious and earthworms are the pulse of the soil, healthier the pulse, healthier the soil. We should know much more about the earthworms, the vermicompost and the vermishash for sustainable and pests free agriculture.



Dr. SM Singh: Earthworms are incredible creatures, easily feed upon weeds and transformed them into vermicompost - the biomanure. This Biotechnique would save ecological balance of both aquatic and agro ecosystems and application of biomanure will improve the soil health.



Dr. BK Senapati: Detailed studies on the ecology of earthworms in Indian agro-ecosystems are very few. Earthworm ecologists now have the opportunity to go beyond vermicomposting by exotic species and enter into local specificity. Let us hope and contribute the best for a developed India through Vermitechnology.



Dr. MV Reddy: Earthworms are potential bioremediators of toxic contaminants from polluted soils, sediments, sludge and wastes from houses and industries. Now it is the time to use epigeic earthworms and remediate persistent pollutants from the soil and save the motherland from the toxicants.



Dr. GN Chattopadhyay: Vermicomposting is an effective tool for facilitating fly ash - an inorganic waste in agriculture. However, more information is needed on different aspects of this biotechnology as it is a new field of study.

Earthworms have Therapeutic properties

Earthworms have been known as a source of therapeutic drugs for various diseases since 1340 AD in China, India, Korea, Vietnam and Japan. Our ancestors have used earthworms to treat fever, gastrointestinal disorders, inflammation, skin diseases, asthma, hairball and reproductive disorders. The ointments and extracts prepared from earthworm tissues have been used for the treatment of numerous ailments. Practical pharmacological studies on earthworms are limited and most of them are less than twenty years old. Recent studies have shown extracts from earthworms to exhibit anti-inflammatory, anti-pyretic, anti-spasmodic, detoxifying, diuretic, anti-hypertensive, anti-allergic, anti-asthmatic, anti-oxidative, anti-microbial, anti-ulcer, anti-cancer and effects.



Any type of inflammation can be cured by the use of earthworm paste. Administration of worm-paste of *Lampito mauritii* to experimental rats where inflammation was induced by carrageenan/turpentine has been reduced. Petroleum-ether fraction of earthworm, *Eudrilus eugeniae* extract was shown to exhibit anti-inflammatory activity with no side effects.

Studies have also demonstrated earthworm extract to reduce fever in rats when the animals were fed with the extract @ of 200 mg/kg. Since fever is due to infection, inflammation, graft rejection, malignancy or other diseases, the anti-inflammatory effect of earthworm extract could be the cause of suppression of fever. As inflammation is biphasic and the later phase of edema is sensitive to the clinically effective anti-inflammatory agents. The later phase is attributed to the release of bradykinin, protease, prostaglandins, lysosomal enzymes and cox1 and cox2. Our studies have shown that earthworm extract @ 80 mg/kg have markedly reduced the lysosomal enzymes-acid phosphatase and alkaline phosphatase in chronic phase of inflammation in experimental rats. Neutrophils that play a crucial role in growth and manifestation of inflammation are the major source of free radicals and cytokinins at the site of inflammation. Earthworm extract was demonstrated to reduce and bring to normal level of the population of neutrophils, which was enhanced during the inflammation. They scavenge the free radicals due to the presence of hydroxyl groups. Our studies have also shown high polyphenol in the earthworm paste which contributes directly behind anti-inflammatory activity by scavenging the free radicals.

Oxidative stress may elevate the levels of oxidative damage markers leading to vasorelaxation, aging and diseases. It could be minimized by using worm-paste or extract. Earthworm derived extracts/paste have significant amount of antioxidants such as reduced glutathione (GSH), glutathione peroxidase (GPx), superoxide dismutase (SOD),

catalase (CAT) and thiobarbituric acid reactive substances (TBARS). It has been shown in the experimental rats where liver was damaged by paracetamol, level of antioxidants-GSH, GPx, SOD and CAT was reduced and TBARS level had increased, administration of earthworm extract/paste had enhanced the levels of the antioxidants GSH,GPx, SOD and CAT and decreased the levels of TBARS. In other words, earthworm paste/extract had overwhelmed oxidative stress by enhancing antioxidant defense mechanism. SOD, CAT and GPx are important scavengers of superoxide ion and hydrogen peroxide. These enzymes prevent the generation of hydroxyl radicals and protect the cellular constituents from oxidative damage. GSH is concerned with the removal of free radicals and maintenance of membrane protein and thiols and is a substrate for GPx. Any oxidative insult to a cell induces lipid peroxidation of cell membrane lipids. Increased levels of TBARS indicate enhanced lipid peroxidation leading to tissue damage and failure of antioxidant defense mechanism s in preventing the formation of excessive free radicals.

Studies have shown that the increased activities of AST, ALT, ALP and bilirubin in the rats treated with paracetamol are due to extensive liver damage and cell necrosis. AST and ALT are indicators of liver damage. Bilirubin had increased in the blood of rats whose liver was damaged by paracetamol, because of regurgitation of bile due to obstruction within the liver. Regurgitation of bile results in the increase of ALP activity. Administration of earthworm extract has brought down the levels of serum AST,ALT,ALP and bilirubin.

Further the increased levels of TBARS due to administration of paracetamol was brought down by earthworm extract indicating its role in protecting hepatocytes (liver cells) by reducing lipid peroxidation in the liver. It has already been mentioned that GSH- a non-enzymatic antioxidant present in the liver is concerned with the removal of free radicals and maintenance of membrane proteins and thiols and is a substrate for GPx. Earthworm extract enhances the level of GSH that was reduced by paracetamol. The liver cells innate ability to arouse and maintain defense against oxidants by secreting more antioxidants is overpowered by the onslaught of the oxidative stress or damage caused by paracetamol. Earthworm extract overpowers this onslaught by suppressing the formation of reactive oxygen species and protecting the antioxidant machinery by enhancing the levels of SOD, CAT, GSH and GPx. Our studies have also shown earthworm paste to have definitive anti-ulceral property and suggested to have thrombolytic property. These findings showed that earthworms are good sources in extracting medicines.

L.S. Ranganathan, Former Professor of Zoology, Annamalai University, Annamalai Nagar (TN)

Indian Earthworm Ecologist-3

Prof. Madhab Chandra Dash (b. 1939)

Dr. Dash - a former Professor of Ecology and Vice-Chancellor of Sambalpur University, Odisha- is a well known, globally recognized earthworm biologist and Pioneer in developing Vermitechnology in India. He did UG and PG from Utkal University, India, and PhD in Biology from the University of Calgary, Canada. He supervised 35 Ph.D., 3 D.Sc. and 15 M. Phil students, published more than 200 research papers in peer reviewed International and National Journals and > 38 books/ book chapters on Ecology and Environmental Sciences.



He served as Chairman, Odisha State Pollution Control Board, Bhubaneswar; as Chairman of visiting team of NAAC (UGC) for five years; as Chairman-Expert committee for Environmental clearance to the Thermal Power Plants, Govt. of Orissa, India; Expert member for common wealth/full bright and Nehru Centenary and UGC fellowships; Former member-National Expert Committee of the Ministry of Environment & Forests, Government of India, New Delhi; Member-Central Pollution Control Board, New Delhi.

He was honored by the Government of Orissa and Orissa Science Academy for his excellence in Life Science Research from Samanta Chandra Sekhar Award in 1991; Paribesh Bandhu Award in 1998; Geoscientist & Allied Technologists Award in 2002; Lifetime Contribution Award in 2008 by the Science Academy, Govt. of Orissa; Lifetime Achievement Award by Indian Science Congress Association, Bhubaneswar Chapter in 2009; Lifetime Achievement Award in 2011 by the Society of Geoscientists & Technologists; Lifetime Achievement Award in 2012 by Orissa Environmental Society, Bhubaneswar and recently by National Institute of Ecology, New Delhi on Prof. R. Mishra Birth Centenary Award in 2012. He was bestowed by Nandi Ghosh Upayan Sanman in 2000; Green Earth Sanman in 2000; Siddhartha Foundation Sanman in 2007 and Dr. Pranakrushna Parija Sanman in 2006 & 2010.

He has gained fabulous recognition as a pioneer worker on Earthworm Biology in India and the popularity at the level that Dr. JM Julka – a renowned earthworm taxonomist, has coined the name of one of the earthworms as *Dashiella khandalensis* and Dr. BK Senapati for another earthworm, as *Lennogaster dashi* after his name. Besides, ZSI has instituted a Gold Medal for excellence in Ecology & Environmental Sciences in his name since 2002-03.

Presently, Fellow of National Academy of Sciences, Allahabad; National Institute of Ecology, New Delhi; Zoological Society of India, Bodh Gaya; International Society for Tropical Ecology; National Environmentalists Association, Ranchi; Society of Geoscientists and Allied Technologists; Aquaculturist Association of India, Bhubaneswar and Member, Environment Appellate Authority, Government of Odisha, Bhubaneswar; EIA Coordinator (NABET), New Delhi and President, NEA, Ranchi; Chairman-Advisory Board of Odisha Environmental Society. He is reviewer of several Foreign and Indian scientific Journals; referee of 8 scientific journals and Chief Editor of the International journal- The Ecoscan.

Amazing !



Is it Earthworm?

No, a legless Amphibian (reported from remote northeast India by Sathyabhama Das Biju of Delhi University).

READER'S OPINION IS SOLICITED

With Best Compliments from.

Gyan Agarwal

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