

## Earthworms and IPR: A review

Dr. Latha V\*

Department of Zoology, Maharani Cluster University, Bangalore, Karnataka, India

\*Corresponding Author: latha.enscience@gmail.com

### Abstract

IPR refers to legal ownership by a person or business of an invention/discovery of an invention/discovery attached to particulate product or processes which protects the owner against unauthorised copying or imitation. IPR procedures includes patenting, trademarks, trade secrets, design, varieties, pharma products, database rights etc . Patent is an exclusive right granted by law to applicants/assignees to make use of and exploit their inventions for a limited period of time. The patent holder has the legal right to exclude others from commercially exploiting his invention. An invention should satisfy the three conditions of novelty, inventiveness and usefulness. Earthworms are soil organisms that are known from Darwinian era which perform functions such as improving soil fertility, used as food or bait and also for medicinal and cosmetic uses. They are very sensitive organisms and the rearing procedures need to be standardised. Various attempts were made to patent the useful aspects of earthworm starting from their culturing units to their medicinal properties. This paper highlights the important patents that were filed in beneficial aspects of earthworm and its culturing.

**Keywords:** intellectual property rights, patents, earthworms

### Introduction

Intellectual property (IP) is the combination of the human intellect including creativity concepts, inventions, industrial models, trademarks, symbols, names, brands etc. Intellectual Property Rights allow their owner to completely benefit from his/her product which was initially an idea that developed and crystallized, prevent others from using, dealing or tampering with his/her product without prior permission from the inventor. A patent is a form of right granted by the government to an inventor or their successor-in-title, giving the owner the right to exclude others from making, using, selling, offering to sell, and importing an invention for a limited period of time, in exchange for the

public disclosure of the invention which is innovative and useful to the society. Earthworm are soil organisms that burrows and improve the soil's water intake and help aerate and loosen the soil. They also improve the nutrient supply to the crops by ingesting organic material from the surface and excreting the digested material into the topsoil (Jager 2003)<sup>[5]</sup>. Unfortunately, the advanced farm machinery and farming techniques have destroyed the earthworm population in many fields. This paper emphasises on the important patents that were filed regarding rearing of earthworm, apparatus design and beneficial aspects of earthworm.

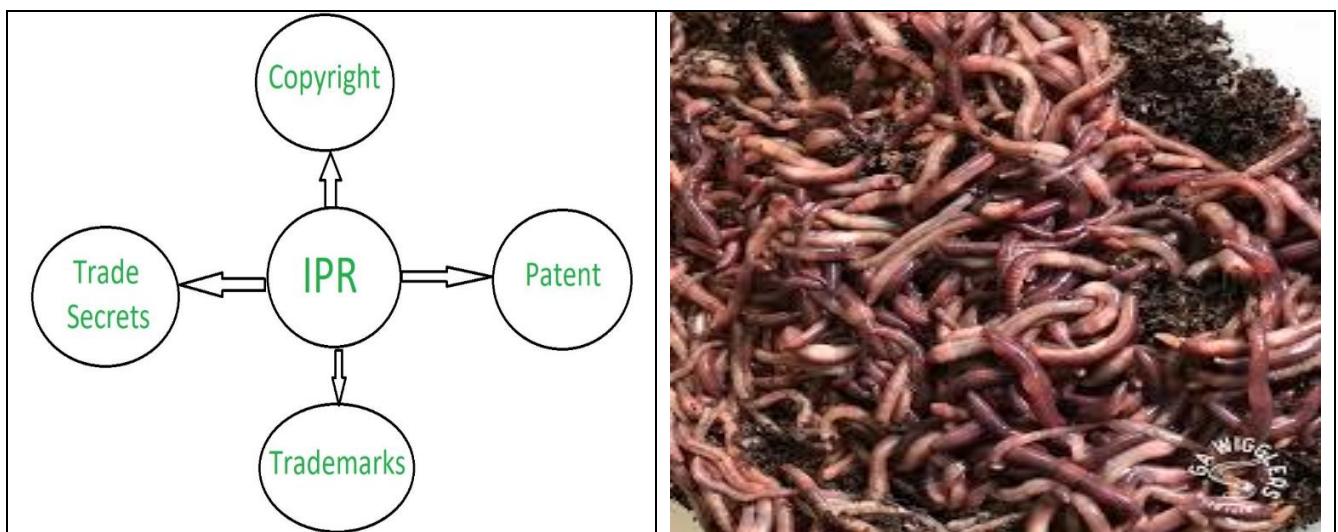


Fig 1

### Methods

Google search was done with the key words” earthworms” and “patenting” and all the results were read for their

suitability and the summary of each work was compiled and presented.

**Results**

**Patents on earthworm for improving soil fertility**

Many patents were filed with respect to use of earthworms for improving soil fertility. Within the past several years, there has been a strong movement to reduce soil erosion and hence concept of no-tillage is practiced that creates favourable conditions for the growth of earthworms as well. In spite of this, need was felt to introduce earthworms into the soil in areas where the earthworm population has completely disappeared. Frijters with paptent no U.S. Pat.

No. 4,513,685, explains the methods of raising and harvesting earthworms in a capsule that can be plantable. The gel capsule comprises (a) an earthworm cocoon having one or more viable eggs; and (b) a material to provide a density to the capsule approximately equal to that of the seed being planted; such that the capsules may be mixed with and planted with capsule is to permit the flow of oxygen and carbon dioxide necessary for respiration of the eggs and dissolves in water to enable the cocoon to be liberated in the soil.



Fig 2

**Patents on earthworm culturing /rearing and apparatus**

Frank S. Lebedzinski, filed a patent bearing no.2,867,055 for earthworm trap and breeding box. This invention relates to a novel container adapted to be placed upon or partially embedded in the earth and containing materials for attracting earthworms thereby. The box has the perforations which are of sufficient size for the earthworms to pass through from the earth into the container. Soil will substantially fill the perforations of said part so that no air spaces will exist which would tend to discourage movement of earthworms from the earth through the perforations into

the container. Container is partially filled with organic materials which will decompose rapidly to provide food for earthworms and which will cause earthworms to be attracted into the container and remain there to breed. Hyung Ju Kim (2010) in a Korean Patent Laid-Open Publication No. 10-2002-0045871, discloses an apparatus for breeding earthworms using organic waste, comprising: an assembly consisting of an earthworm box, in which earthworms are bred by feeding organic waste, and an earthworm casting box; a storehouse in which the assembly can be received; and a transport means.



Fig 3: Different types of composting bins used in vermicomposting.

### Patents on remediation of solid wastes using earthworms and earthworm casting

Earthworm castings are excrements of earthworms obtained from the digestion of feed in the digestive tract of the earthworms and contain undegraded fiber residue mixed with viscous materials and have high contents of exchangeable calcium, magnesium, potassium, phosphoric acid and organic matter. Castings are dark brown in colour, do not evolve an unpleasant odour and gas, and contain organic matter, trace elements such as nitrogen, phosphoric acid and potassium, and a large amount of antibiotic *Bacillus* sp. microorganisms which destroy or dissolve mould harmful to soil to increase the resistance of the soil to blight and harmful insects. Thus, earthworm castings are known as the best natural organic fertilizer. Hyung Ju Kim (2015)<sup>[7]</sup> has a patent with no 9215864 that solves the problems associated with the disposal of ash generated from the combustion of solid fuels produced from food waste, combustible waste, ocean waste or the like, by feeding the solid fuel ash to earthworms. It also intends to produce good-quality earthworm castings using solid fuel ash by feeding earthworms with a mixture of solid fuel ash, yellow earth, and ocean waste, such as shells or crab shells, which are difficult to dispose of, but have useful components such as chitosan, and to use the earthworm castings in a wide range of applications, including fertilizers, and soil amendments. This is an environmental friendly and economical manner by feeding the solid fuel ash to earthworms to produce earthworm castings. In the same lines, Lukehart and Loren (2013) with Registration no. 20-0294434 discloses an earthworm breeding apparatus for producing earthworm castings, in which earthworms can be bred in a breeding bed in a layered state, whereby the breeding area of the earthworms is maximized and earthworm castings are easily collected using an automated method.



Fig 4

### Patents on earthworm as bait/food

The use of live bait in fishing has long been known to be one of the most effective means for catching fish. The problem with live bait is that any creature has a natural tendency to resist the baiting process. The ability of the earthworm to curl its body in almost any direction, connected with the fact that it is coated with slimy film, makes it extremely difficult for the fisherman to impale the earthworm with the fishing hook. Jordan M. claims a patent for an apparatus used for temporary immobilization of an earthworm. This invention relates to the immobilization of live bait for use in fishing. In particular, the invention

relates to a method and apparatus for the dewigging of earthworms.



Fig 5



Fig 6

### Patents on earthworm powder for medicinal use

Earthworms are known for its medicinal value from ancient time. Its widely used in Chinese (earthworms also called "dilong") medicine and from remote antiquity. The following pharmacological effects of earthworms have been reported in the literature. (1) Shinryu Ofuchi "Mimizu-to-Jinsei (Earthworms and Human Life)", Maki Shobo, Oct. 30, 1947, pp. 223-226. Recently, a patent has been filed for preparation of dry powder of earthworm with an active ingredient that can be used as antihyperlipemic, antidiabetic, antihypertensive (anti hypertensive and/or antihypotensive) and antihypotensive. This dried earthworm powder may be combined with pharmaceutically acceptable carriers to form pharmaceutical compositions which are useful for the treatment or prevention of hyperlipemia, diabetes, hypertension and hypotension in human beings. The medicines derived out of earthworm was found effective in reducing the size of vesical calculi and eliminating them from the body, in the treatment of jaundice, and as a parturifacient, restrative, hair grower, tonic and an antipyretic. In a recent patent process, filed by Ishii (2012)<sup>[3]</sup> patent no US 8,137,701 B2. small pieces of dried earthworms were freed of soil and then extracted with boiling water and the extract was concentrated using ethyl alcohol and the precipitated material (lumbrofebrin) was dissolved in Ringer's solution without destroying or inactivating the enzymes present therein, so as to obtain

sterile dried earthworm powder which has a high degree of safety without producing side effects such as haemolysis (i.e., destruction of red blood cells) and tachycardia, and can be preserved or stored in a well-closed state for at least 4 years.

### Patents on cosmetic property of earthworms

Chinese patent no CN104887541A reveals an earthworm peptide capable of resisting skin aging including its preparation and application methods. The preparation methods include hydrolyzing an earthworm sample liquid by using own enzyme or adding protease, then carrying out membrane filtration and membrane interception on the hydrolysate, and freezing and drying to acquire the lumbricus peptide which can be applied to cosmetics or health care products capable of resisting skin aging. The resultant earthworm peptide has the advantages of strong affinity, high safety, obvious antioxidant activity and capabilities of effectively promoting growth and multiplication of human skin fibroblast, significantly promoting secretion and synthesis of cell matrix collagen and obviously resisting skin aging and can be applied to the development of cosmetics and health care products capable of resisting skin aging.



Fig 7

### Patents on vermicomposting technology

Patent filed by Miguel Jardine (2014) with no: 8919282 includes methods for continuous vermiculture culture system. The continuous vermiculture culture system includes at least one culture member that is fluidly connected to an irrigation system. After preparing a feeding solution, a volume of the feeding solution is then infused into the at least one culture member via the irrigation system. The steps of providing a feeding solution and infusing a volume of the feeding solution into the at least one culture member via the irrigation system are optionally repeated to promote formation of culture-grade soil and plant growth within the at least one culture member.

Gary toet (2012) has filed a patent with no 20140130744 for devising a method which involves transferring heat from decomposing manure to a worm growth zone. A shelter contains manure in a first area and a worm growth bed in a second area. The worm growth bed supports a plurality of worms substantively covered by a layer of manure. Vermicast passes through a supporting grid of the worm growth bed and deposits on a floor or a bottom of the second area. Heat generated by the manure is transferred to the worm growth bed by radiant heat transfer and/or by air convection. The manure is transferred portion by portion

over time from the first area to the worm growth bed. The shelter may include a battery, a solar power converter, a microcontroller, dynamic memory, a real-time clock, a wireless transponder, temperature sensors, humidity sensors, water pumps, and/or springs or motors used to open or close apertures of walls of the shelter.

Kishorilal Ramnath Dhoot and Kamlesh Kishorilal Dhoot (2017) <sup>[1]</sup> has a patent (20130074556) for a tetra vermi bed and a process for composting agricultural waste. The conventional composting apparatus are mostly bulky, posing problems in transportation to sites, storing agricultural waste. This invention addresses the shortcomings by construction of composting bed of multiple layers of LDPE and HDPE substrate. The tetra vermin bed propagates production of worms and yields manure, which is easy to handle and to transport in bags. The tetra vermin bed is easy to install and to dismantle for operation at multiple sites, storing agricultural waste.

### Conclusion

The above review states the importance of earthworm and its applicability in various fields. In Indian context, there is a clear lacuna in filing patents, though earthworm research is carried out from decades. Rise in Indian economy is a clear impact of Intellectual Property (IP) influence in country. In present scenario, various important steps have been taken in reaching IPR to a new height in compliance with other countries. Further researchers are still not aware of advantages of taking intellectual property rights. Hence government and educational institutions should promote awareness about IPR among students and encourage them to take the IPR rights.

### References

1. Dhoot KR, Dhoot KK. inventors. Tetra vermi compost container and method for composting agricultural waste. United States patent application US 15/086,940. 2017, 23.
2. Frijters PJ, Van Es AF. inventors; Frijters Petrus Johannes G, Es Antonie Franciscus Van, assignee. Method and device for raising worms, method of raising worms in nutrition limited by inhibiting means, method of producing worm castings, and holder for raising worms. United States patent US 4,513,685. 1985, 30.
3. Ishii Y, Sumi H, Yoshida E. inventors; Well Stone Co, assignee. Method of producing a dry earthworm powder. United States patent US 8,137,701, 2012, 20.
4. Jardine M, inventor; The Local Soil Company, LLC, assignee. System and method for continuous vermiculture cycle. United States patent US 8,919,282, 2014, 30
5. Jager T, Fleuren RH, Hogendoorn EA, De Korte G. Elucidating the routes of exposure for organic chemicals in the earthworm, *Eisenia andrei* (Oligochaeta). *Environ sci tech*, 2003;37(15):3399-404.
6. Jordan D, Stecker JA, Cacio-Hubbard VN, Li F, Gantzer CJ, Brown JR. Earthworm activity in no-tillage and conventional tillage systems in Missouri soils: a preliminary study. *Soil Biology and Biochemistry*. 1997;1:29(3-4):489-91.
7. Kim HJ, inventor. Method of producing earthworm castings using solid fuel ash and earthworm bed for

- producing earthworm castings. United States patent US 9,215,864, 2015,22.
8. Lukehart L, inventor. Method and apparatus for temporarily immobilizing an earthworm. United States patent US 4,800,666. 1989 Jan 31.
  9. Toet G, inventor. Vermicomposting method and apparatus. United States patent application US 13/677,301, 2014 15.