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# Effective utilization of corn cob for vermicompost making using *Eudrilus eugeniae*

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**Abstract**
India produced 14.7 million tonnes of maize from 7.4 million hectares of land with an average yield of 1963 kg/hectare of which 2.94 million tonnes of corn cobs are annually produced as waste. Vermicomposting is the bioconversion of organic wastes using earthworms. In this study, the role of earthworm in converting corncob into a valuable product is assessed. The powdered corn cob was mixed with cow dung and earthworm *Eudrilus eugeniae* and left for vermicomposting for 30 days. After 30 days, the vermicompost was collected and the physico-chemical parameters were analyzed. Organic carbon and the pH were reduced significantly at 30 days of vermicomposting. *Eudrilus eugeniae* is found to be the best choice for converting corn cob into nutrient rich vermicasting in a short period of time (30-day). Thus, the recycling of agrowastes through vermitechnology reduces the problem of accumulation of agrowastes. Vermicastings are found to contain nutrients like N, K, Ca, Mg and P.

**Keywords:** cow dung, corn cob, *Eudrilus eugeniae*, vermicompost

## 1. Introduction
Maize (*Zea mays* L.) is one of the most versatile emerging crops having wider adaptability under varied agro-climatic conditions. Globally, maize is known as queen of cereals because it has the highest genetic yield potential among the cereals. It is cultivated on nearly 150 m ha in about 160 countries having wider diversity of soil, climate, biodiversity and management practices that contributes 36% (782 m t) in the global grain production. The United States of America (USA) is the largest producer of maize contributes nearly 35% of the total production in the world and maize is the driver of the US economy. Maize in India, contributes nearly 9% in the national food basket and more than Rs. 100 billion to the agricultural GDP at current prices apart from the generating employment to over 100 million man-days at the farm and downstream agricultural and industrial sectors. In addition to staple food for human being and quality feed for animals, maize serves as a basic raw material as an ingredient to thousands of industrial products that includes starch, oil, protein, alcoholic beverages, food sweeteners, pharmaceutical, cosmetic, film, textile, gum, package and paper industries etc. [1].

In US, annually approximately 204 million dry metric tons of corn residue are returned to the ground as waste byproduct in corn grain production of which 33.5–44.6 million metric tons of corn cobs are annually available [2]. Corncob has higher bulk density and can be easy to collect and transport, which is considered as one of the most potential lignocellulosic feedstocks [3].

The recycling of waste through vermitechnology reduces the problem of non-utilization of agro wastes. Vermicomposting is a bio-oxidation process in which, earthworm interacts with microorganisms and other soil fauna, accelerating the decomposition process and thereby stabilizes the organic matter. Earthworms consume raw materials and excrete it in digested form called "worm cast" (black gold), which is rich in nutrients, growth promoting substances, beneficial soil micro flora and become a major component of organic farming system. Vermicomposting is a simple biotechnological process of composting, in which, certain species of earthworms are used to enhance the process of waste conversion and produce a better end product. Earthworms consume various organic wastes and reduce the volume by 40-60%. Earthworm weighs about 0.5 to 0.6g, eats waste equivalent to its body weight, and produce cast about 50% of the wastes, it consumes in a day. The worm castings contain higher percentage of both macro and micronutrients than the garden compost [4]. The present study has been taken up to recycle powdered corn cob by using both cow dung and earthworm. *Eudrilus eugeniae*, commonly referred as the African Night Crawler, occurs all over the World is employed in this present study. This worm species can breakdown cellulose material without as much help from the soil bacteria and when they eat, they leave behind worm castings, which can be used as organic fertilizer [5].

## 2. Materials and methods
The healthy adult African red earthworms (*Eudrilus eugeniae*) were purchased from Thanthai Han's Roever Agricultural College, Perambalur were used in this present study. Cow dung was procured from the dairy farm situated in the Kurumbalur village, Kurumbalur. Cow dung was spread for 10 days for shadow air drying, so that unwanted gases and heat were removed, which may harm the earthworms. Corn cobs were collected from kurumbalur village, perambalur Dt. was dried in shadow for 15 days and powdered mechanically.

### 3. Experimental design

The experiment was carried out in a plastic bin of size 48 X 45 X 21cm were filled with mixture of cow dung and powdered corn cob. The plastic bin was spread with non-oven cloth to avoid spillage of compost as well as to avoid escape of earthworms. The bottom of the bin was uniformly spread with pure sand for about 1 inch height. Above this, the thoroughly mixed corn cob powder and cow dung was filled in the ratio of 1:1. Then 250g of earthworms were introduced into the substrate for vermicomposting. Then the vermicomposting bin was placed in the plastic tray to collect the vermiwash. The entire setup was maintained in a cool area for about 30 days. The substrate moisture content was maintained to 60-80% by sprinkling water every day. Once in 3 days, the surface of the substrate was ploughed well for better aeration with the help of wooden stick to speed up the vermicomposting and to eliminate volatile toxic gases. At the end of the experiment, worms, hatchlings and cocoons were removed. The vermicompost was sieved, air dried and stored in plastic bags for physico-chemical analysis.

### 4. Physico-chemical analysis

10g of air dried sample was dissolved in 100 ml of distilled water (1:10 ratio) and shaken well for 40 min. Then the supernatant was collected, filtered and the pH and EC of the filtrate was tested by using pH and EC meter. The porosity, water holding capacity, bulk density, organic carbon content (%), C:N ratio were determined as per standard protocols. The K, Ca, Mg, Cu, Fe, Zn were determined by using Atomic Absorption Spectrophotometer (Perkin Elmer analyst -100, New Jersey, USA). Total nitrogen and phosphorous contents were quantified by the standard methods.

### 5. Results and discussion

Table 1 shows the physico-chemical properties of vermicompost of corn cob. The pH of the vermicompost is decreased from 7.3 to 6.9; whereas the EC significantly increased (85% over control) probably due to the degradation of organic matter and thereby releasing minerals such as calcium, magnesium, potassium and phosphorous. Vermicomposting converts corn cob into compost in 30 days, reduces the C: N ratio and increases N, P and K. Vermicomposting has improved the porosity (86% over control) and water holding capacity (26% over control), whereas decreased the bulk density due to the high humus content [6-8]. The major and micronutrients were also increased significantly indicating the degradation of organic materials into exchangeable calcium, magnesium, phosphorous, potassium, nitrogen, copper and zinc [7-9]. Vermicomposting of corn cob is a natural, ecofriendly, cost-benefited, less laboured and speedy process where, earthworms are ingested the organic material and produced humus like vermicastings (Black Gold). Vermicastings are rich in nutrient and thereby enriched the physico-chemical parameters of the soil. In addition, the reduced pH solubilizes the macro and micronutrients, which make them readily available to the plant kingdom. This is in consonance with the findings of Suthar and Singh [9], Sakthivel, *et al*. [10, 11] and Liyue Guo, *et al*. [12]. The activities of earthworms convert the corn cob into a finely divided, peat-like vermicompost, with higher porosity and water holding capacity indicated that vermicomposting might fully use nutrients of the corn cob and convert corn cob into valuable organic fertilizer that is friendly to the environment.

**Table 1:** Physico-chemical parameters of vermicompost of corn cob at different time intervals. The Data are mean values of three different experiments. (Data in parenthesis indicates% over control)

| S. NO | Parameters | 0 - day | 30 – day |
|---|---|---|---|
| 1 | pH | 7.3 | 6.9 (95) |
| 2 | EC (mS/cm) | 6.51 | 12.05 (185) |
| 3 | Water holding capacity (%) | 37.02 | 46.52 (126) |
| 4 | Bulk density (Kg $m^{-3}$) | 566 | 432 (76) |
| 5 | Porosity (%) | 46.55 | 87.04 (186) |
| 6 | Organic carbon (%) | 36.52 | 19.53 (53) |
| 7 | C:N ratio | 33.5 | 21.14 (63) |
| 8 | Nitrogen (%) | 0.75 | 1.83 (244) |
| 9 | Phosphorous (%) | 0.55 | 0.85 (155) |
| 10 | Potassium (%) | 0.72 | 0.96 (133) |
| 11 | Calcium (%) | 1.30 | 2.35 (181) |
| 12 | Magnesium (%) | 0.41 | 0.59 (144) |
| 13 | Copper (ppm) | 123 | 136 (111) |
| 14 | Iron (ppm) | 130 | 156 (120) |
| 15 | Zinc (ppm) | 161 | 219 (136) |

### 6. References


1. https://farmer.gov.in/imagedefault/pestanddiseasescrops/normalmaizeproductiontechnologies.pdf
2. Perlack RD, Wright LL, Turhollow AF, Graham RL, Stokes BJ, Erbach DC. Biomass as Feedstock for a Bioenergy and Bioproducts Industry: The Technical Feasibility of a Billion-Ton Annual Supply. U.S. DOE, USDA and Oak Ridge National Laboratory, 2005.
3. Nan Jiang, Mingjia Zhang, Wei Qi, Rongxin Su, Zhimin He, Nan Xie. Effect of different pretreatment methods of corncob on bioethanol production and enzyme recovery, Cellulose Chem. Technol. 2014; 48(3, 4):313-319.
4. Vinothini V, Anuradha R, Senthilkumar R. Vermicompost production and nutrient analysis using *Eudrilus eugeniae*, World Journal of Pharmaceutical research. 2016; 5(6):1250-1257.
5. Senapathi BK. Vermitechnology - an option for recycling of cellulosic wastes of India. New trends in Biotechnology. New Trends in Biotechnology. Oxford and IBH Publications Pvt. Co. Ltd. Calcutta, 1992, 357-358.
6. Guoxue L, Zhang F, Sun Y, Wong WC, Fang M. Chemical evaluation of sewage composting as mature indicator for composting process, Water Air Soil Sludge Pollution. 2001; 132:333-345.
7. Suhane RK. Vermicompost, Publication of Rejendra Agricultural University, PUSA, Bihar, India, 2007, 88.
8. Tognetti C, Laos F, Mazzarino MJ, Hernndez MT. Composting Vs vermicomposting: a companion of end product quality. Compost Science Utility. 2005; 1:6-13.
9. Suthar S, Singh S. Vermicomposting of domestic waste by using two epigeic earthworms (*Perionyx excavatus* and *Perionyx sansibaricus*). International Journal of Environment Science and Technology. 2008; 5(1):99-106.
10. Sakthivel V, Malathi C, Jayashri S, Saralabai VC. Physico-chemical analysis of vermicompost produced from tea leaves waste mixed with cow dung using *Eudrilus eugeniae*, European Journal of Biotechnology and

Bioscience. 2017; 5(6):35-36.
11. Sakthivel V, Jeyashri S, Vinoth M, Saralabai VC. Vermicomposting of sugarcane bagasse using *Eudrilus eugeniae*, European Journal of Biotechnology and Bioscience. 2018; 6(4):41-42.
12. Liyue Guo, Guanglei Wu, Caihong Li, Wenjing Liu, Xiaofan Yu, Da Cheng, Gaoming Jiang. Vermicomposting with maize increases agricultural benefits by 304%, Agronomy for Sustainable Development. 2015; 35(3):1149-1155.