

DEVELOPMENT OF VERMICOMPOSTING MONITORING

SYSTEM IoT AND ARDUINO MODULE

Abstract—Vermicomposting is a low-cost technology that naturally converts organic wastes into organic fertilizers, commonly called vermicompost, through the combined action of earthworms and mesophilic microorganisms. Vital parameters, such as moisture, temperature and CO₂ level must be considered in the vermicompost production to achieve optimum yield. The system which monitors these vital parameters and determines the readiness of vermicompost is developed. The system uses Arduino Nano microcontroller, sensors, and an android phone for monitoring.

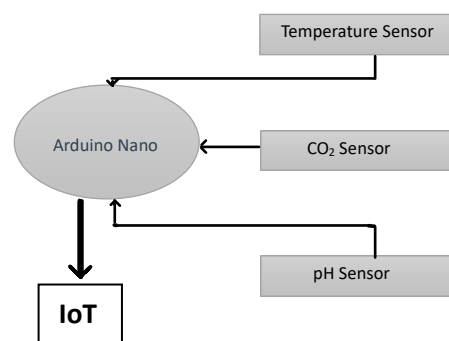
INTRODUCTION

Vermicomposting is a sustainable method of recycling nutrients and energy from organic materials like food waste and paper products. It uses earthworms and microorganisms to break down, accumulate, detoxify, and convert waste materials into a product that can be used for agricultural purposes.

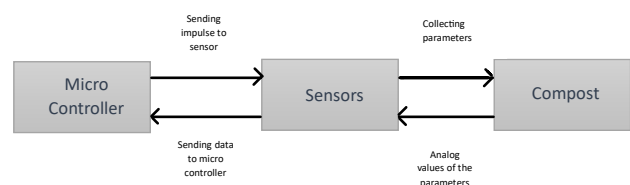
Eudrilus worms, particularly *Eudrilus eugeniae*, play a vital role in vermicomposting by efficiently decomposing organic matter, rapidly processing large quantities of waste, and exhibiting a high reproductive rate. These worms foster a symbiotic relationship with microorganisms in their digestive tracts, leading to enhanced microbial activity that breaks down complex compounds into nutrient-rich vermicompost. Their prolific breeding contributes to increased composting efficiency, while the resulting vermicompost improves soil structure, aeration, water retention, and nutrient availability. *Eudrilus* worms' adaptability to various conditions and low maintenance requirements make them well-suited for both indoor and outdoor vermicomposting systems, offering an eco-friendly and effective way to convert organic waste into valuable soil amendments.

Two of the vital parameters that needs consideration in a vermicomposting system are moisture and temperature. The worm bedding must be able to hold enough moisture because they breathe through their skin. A moisture level less than 50% is fatal to worms. Also, maintaining temperature within the worms' tolerance is important to both vermicomposting and vermiculture processes. According to Macabuhay, moisture level must be maintained at around 60-80% in Philippine setting so that microbial activity is high and food matter is easy to feed up. Studies show that *Eudrilus eugeniae* have preferences for high temperature, with maximum biomass production occurring from 25°C – 30° C, while growth rates were very low at 15° C .

The system consist of Arduino nano microcontroller which constantly sense pH value, temperature and CO₂ level in compost through temperature sensor (DS18B20), pH gel electrode sensor, CO₂ sensor (MHZ19E). Then these values are uploaded in an IoT system.



Flow Control



TASK COMPLETED SO FAR

All the sensors ie pH sensor, CO₂ concentration and temperature sensor have been integrated with Arduino nano and was able to obtain accurate output. Only uploading it to IoT interface is left for mobile monitoring and Casing the components to protect it from water is left.

OUTCOME

Accurate readings from the sensor is obtained.



