Vermicomposting of stovers from baby corn, an intercrop in coconut garden

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Baby corn cultivation as a component crop in coconut interspaces yield agro-residues in the form of baby corn stover after the harvest of cobs. The baby corn stover could be successfully converted to good quality vermicompost using the coconut leaf degrading epigeic earthworm, *Eudrilus sp.*, available at ICAR-CPCRI, Kasaragod. The baby corn stover vermicompost has 21% organic carbon, 2.3% nitrogen, 0.4 % phosphorus and 0.4% potassium. This study proves that the agro-wastes generated from coconut-based cropping system can be recycled within the farm for soil and plant health improvement.

Introduction

Vast amounts of residues are generated by growing agricultural and horticultural crops which provide a viable option to small and marginal farmers to produce good quality organic manure within their farm via agro-waste recycling technologies. Vermicomposting is one such option which farmers can exercise to produce quality manure to improve soil health and fertility of their farm for sustainable crop production. At ICAR-Central Plantation Crops Research Institute (CPCRI), technology was developed

Fig.1 Baby corn plants growing in the interspaces of coconut palms

to convert mature and senescent dry coconut leaves to vermicompost by addition of cowdung and an indigenous strain of *Eudrilus sp.* earthworms. Using this technology, approximately 4-5 tonnes of healthy organic manure can be produced annually from 1 ha

coconut garden, if coconut is grown as a monocrop. However, the large interspaces between coconut palms allow scope for growing a variety of crops which can be substantially exploited to improve the economic returns of the farmers throughout the year. Research in ICAR-CPCRI has developed a number of highly productive and remunerative farming/ cropping system models including intercropping systems, multi-storied cropping systems and high density multispecies cropping systems, wherein many crops and animal/fishery components were established as profitable units in coconut garden.

Baby corn as an intercrop in coconut garden

To expand the scope of intercrops that can be cultivated within coconut garden, a field experiment was conducted at ICAR-CPCRI farm wherein suitability of baby corn as an intercrop was evaluated. Baby corn (variety Syngenta G-5406) was successfully grown in the interspaces of the coconut palms (WCT var.) (Fig.1, Fig.2). Baby corn (also known as young corn) is a cereal grain from corn (maize) harvested immediately after silk emergence (usually after 50-60 days of planting) while the stalks are still small and immature. It is typically eaten whole-cob included, as a vegetable in the preparation of various dishes.

Residues from baby corn crop

The cultivation of baby corn generated baby corn stover (also referred to as maize stover) as a recyclable biomass or fodder for animals. Cob (Fig. 2) constitutes around 15% of the total dry mass of the baby corn crop, remaining approx. 85% of the total dry mass of the crop are the residues such as stalk, leaves and husk which are left in the field after harvesting of corn. These residues, called baby corn stover, consist of stalk (around 48% of total dry mass), leaves (28%) and husks (8%) of the plant. It is an agricultural residue similar to paddy straw that are either dried and burnt in the field or used as a source of roughage for dairy animals. As appreciable quantities of baby corn stover was generated in the field trials, it was decided to evaluate whether the coconut leaf degrading earthworm, Eudrilus sp., which has broad spectrum agro-waste recycling ability, could be extended to baby corn stover waste too. Our earlier studies had indicated that Eudrilus sp. can degrade not only coconut leaves, but also other agro-wastes which become available when inter- mixed crops are grown along with main crop i.e. coconut.

Fig.2 Satisfactory yield of baby corn cobs was obtained indicating its successful cultivation in a coconut garden

Vermicomposting of baby corn stover

An experiment was initiated to convert baby corn stover into vermicompost using the technology developed at ICAR-CPCRI for production of vermicompost from coconut leaves through the use of Eudrilus sp. (Fig.3) with minor variation. Baby corn stover was mixed with cow dung in 3:1 ratio. For each 60 kg of baby corn waste, 20 kg of cowdung slurry was mixed. Heaps of this mixture were readied in cement tanks and allowed to pre-decompose for two weeks before releasing 200 nos. of Eudrilus sp. earthworms per heap. The heaps were protected from direct sunlight and moisture was maintained by intermittent sprinkling of water on the heaps. There is no turning over required. After three months, the vermicompost produced was separated and earthworms were sorted manually.

On an average, 38 kg of vermicompost was produced per heap and the earthworm population doubled. The vermicompost was shade-dried and sieved to remove partially undegraded residues. Twenty five kg of such fine textured, high quality vermicompost was thus obtained which consisted of mainly earthworm casts (Fig.4) and microbially degraded residues (Table 1). Three samples of this vermicompost from each heap were analysed for nutrient, enzyme activities and microbial structure using appropriate standard analytical procedures.

Table 1 : Input and output details of baby corn stover vermicomposting

Baby corn stover + cowdung input (kg)	Vermi-compost harvested (kg)	Fine, sieved, shade-dried ver-micompost recovered (kg)	Earth-worms added (nos.)	Earth-worms harvested (nos.)
60 + 20	38	25	~200	~400

Properties of stover vermicompost

The vermicompost produced from baby corn stover was dark-coloured, granular, alkaline in nature with pH of 7.45 and had high water holding capacity. The product had organic carbon content of 21%, total N, P and K content of 2.3%, 0.4% and 0.4 %, respectively (Table 2). It also had good amounts of micronutrients such as Fe, Cu, Zn and Mn apart from Ca and Mg. The baby corn stover vermicompost was found to have higher pH and nitrogen content than coconut leaf vermicompost (Table 2).

Table 2 : Comparison of physico-chemical properties of vermicom-post produced from baby corn stover and coconut leaves

Vermi-com-post pro-duced from	Total N (%)	Total P (%)	Total K (%)	OC (%)	pH (%)	Mois-ture (%)
Baby corn stover *	2.33	0.4	0.4	21.13	7.45	80.66
Co-conut leaves	1.80	0.3	0.4	20.00	6.20	45-55

*All values are mean of three replications

Average values obtained during trials carried out at different times during an extensive period

The vermicompost produced was also microbiologically rich with plant-beneficial microbes such as phosphate solubilizing bacteria and fluorescent pseudomonads. Phosphate solubilizing bacteria make the unavailable form of phosphorus available to the plants for their uptake and fluorescent pseudomonads are well known for both their plant growth promoting properties and also biocontrol effects. Bacteria formed the largest group in the vermicompost followed by actinomycetes. Presence of higher numbers of actinomycetes is desirable as they are known to produce several metabolites including antibiotics and help in suppression of soil pathogens among other things.

Fig.3 Indigenous strain of Eudrilus sp. earthworm used for vermicomposting of baby corn stover

Fig.4 Granular vermicompost produced from baby corn stover showing earthworm casts

Analysis result of the baby corn stover vermicompost for some important enzyme activities shows that the vermicompost had high dehydrogenase, phosphatase and urease activities indicative of high microbial activity. Production of these extracellular enzymes, particularly phosphatase and urease, are significantly relevant in terms of phosphate- nitrogen mineralization in soil, therefore, impacting the soil fertility positively.

Summary

Present studies indicated that residues from baby corn, which can be grown as a viable intercrop in coconut garden, can be successfully recycled to good quality vermicompost using the coconut leaf degrading earthworm, *Eudrilus sp.* This further widens the spectrum of agro-waste degrading capability of this indigenous *Eudrilus sp.* Farmers who intend to cultivate baby corn within their coconut gardens can now have additional source of input for manure production to improve their farm soil and plant health. They can also sell the vermicompost to generate additional income for their family. ■