



परिक्षण रिपोर्ट / TEST REPORT

Annexure-I

TR.NO. -16026 (Final)

ANALYSIS RESULT

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Date: 17.09.2025

OBSERVATION FOR BIODEGRADABILITY TEST AS PER ISO 17088:2021

Date of Initiation : 26.02.2025
Date of Completion : 17.09.2025

1. Sample detail : Bio Compostable Cutlery Sample - As stated by the party
2. Material Identification by DSC & FTIR: DSC & shows that the supplied material is PLA and PBAT based cutlery sample

3. Observation: -

a. Conditions of reaction mixtures

Origin of compost: Livestock excreta, municipality waste and vegetable waste
Reaction Temperature : 58 °C (± 2°C)
Dry Solid : 51.94 (%)
Volatile Solid : 30.58 (%)
CO₂ evolved during 1st 10 days in blank vessels : 100.96mg/g of volatile solids
Test duration : 129 days (under compost)
Reference material : Cellulose
Volume of reaction vessel : 3000 ml

b. pH of test medium :-

Composting Vessel	pH (Before Test)	pH (After Test)
Blank 1	7.3	7.4
Blank 2	7.3	7.4
Blank 3	7.4	7.5
Cellulose1	7.3	7.4
Cellulose2	7.5	7.5
Cellulose3	7.6	7.6
Negative 1	7.7	7.8
Negative 2	7.7	7.8
Negative3	7.7	7.8
Sample 1	7.2	7.3
Sample 2	7.3	7.3
Sample 3	7.4	7.4


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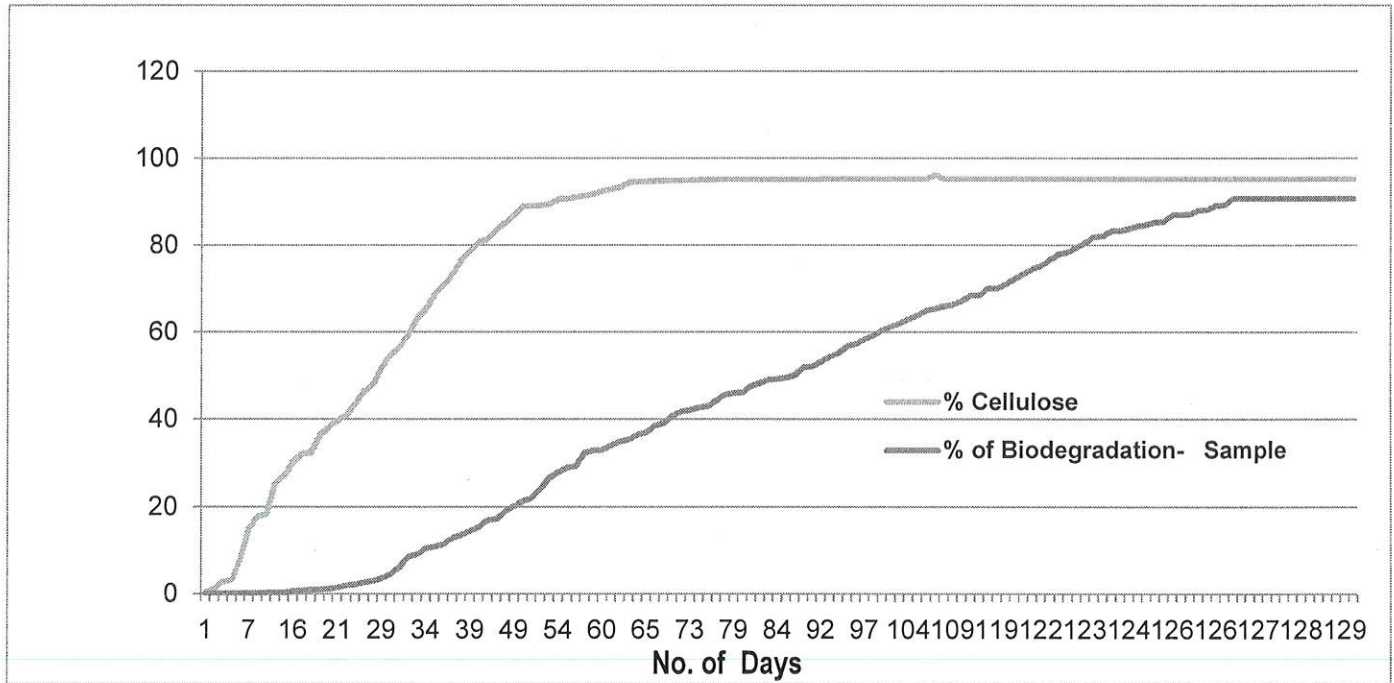
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4. Result: Percentage biodegradation relative to positive reference
MEAN (%) : 90.73
The reference material-cellulose (%) : ~100



5. Visual Observation:-

	Week 1	Week 2	Week 3	Week 4	Week 5
Structure	Cutlery sample	Cutlery sample	Cutlery sample	Cutlery sample	Cutlery sample
Moisture	Appropriate moisture level	Appropriate moisture level	Appropriate moisture level	Appropriate moisture level	Appropriate moisture level
Color	Cream White	Cream White	Cream White	Cream White	Cream White
Fungal Development	None	None	None	None	None
Smell	Organic/dirt like	Organic/dirt like	Organic/dirt like	Organic/dirt like	Organic/dirt like

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	Week 6	Week 7	Week 8	Week 9	Week 10
Structure	Cutlery sample	Cutlery sample	Cutlery sample	Cutlery sample	Cutlery sample
Moisture	Appropriate moisture level	Appropriate moisture level	Appropriate moisture level	Appropriate moisture level	Appropriate moisture level
Color	Cream White	Cream White	Cream White	Cream White	Cream White
Fungal Development	None	None	None	None	None
Smell	Organic/dirt like	Organic/dirt like	Organic/dirt like	Organic/dirt like	Organic/dirt like

	Week 11	Week 12	Week 13	Week 14	Week 15
Structure	Cutlery sample	Cutlery sample	Cutlery sample	Cutlery sample	Cutlery sample
Moisture	Appropriate moisture level	Appropriate moisture level	Appropriate moisture level	Appropriate moisture level	Appropriate moisture level
Color	Brown	Brown	Brown	Brown	Brown
Fungal Development	None	None	None	None	None
Smell	Organic/dirt like	Organic/dirt like	Organic/dirt like	Organic/dirt like	Organic/dirt like

	Week 16	Week 17	Week 18
Structure	Disintegrated cutlery sample	Disintegrated cutlery sample	Disintegrated cutlery sample
Moisture	Appropriate moisture level	Appropriate moisture level	Appropriate moisture level
Color	--	--	--
Fungal Development	None	None	None
Smell	Organic/dirt like	Organic/dirt like	Organic/dirt like


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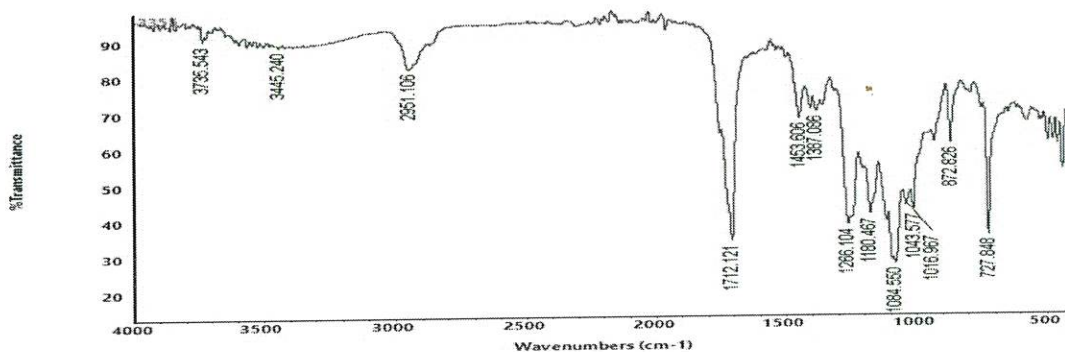
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6. FTIR Analysis:



Wave number (cm ⁻¹)	Possible Nature of Bond
3735.54, 3445.24	O-H stretching vibration
2951.10	C-H stretching vibration
1712.12	C=O stretching vibration
1453.60, 1387.08	C-H bending vibration
1266.10, 1180.46, 1084.55, 1043.57, 1016.96	C-O stretching vibration
872.82, 727.84	C-H out-of-plane bending vibration


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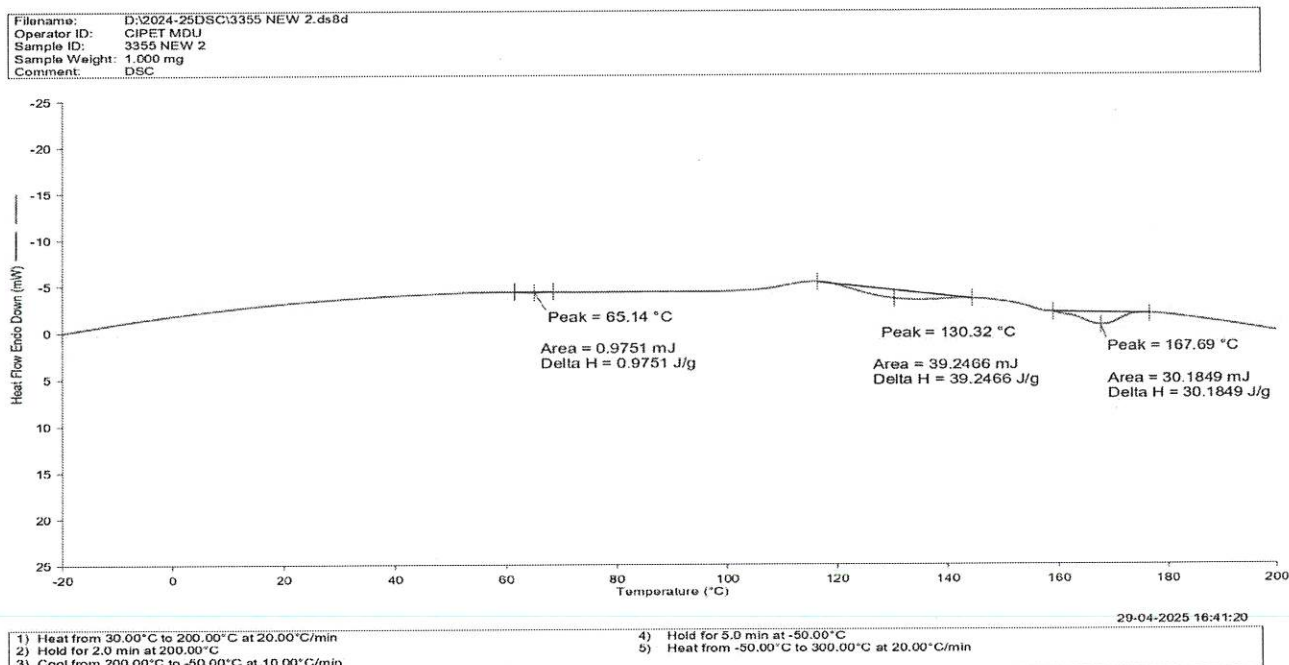
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7. DSC Analysis:-



Comment: DSC & FTIR graph indicates that the supplied material is PLA and PBAT based cutlery.

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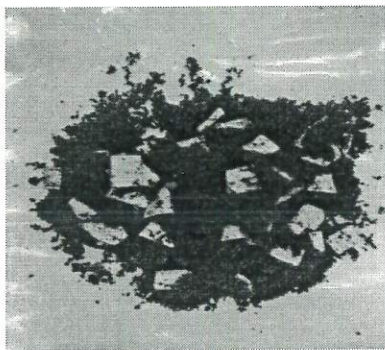
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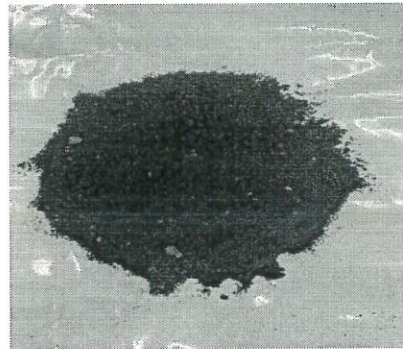
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8. Disintegration- After 18 Weeks

BEFORE DISINTEGRATION Internal



AFTER DISINTEGRATION Internal



Comments:-

The disintegration of the supplied sample by passing through 2 mm sieve after 12 weeks in composting condition as per ISO 17088:2021 was found to be not more than 10 % of its original dry mass.


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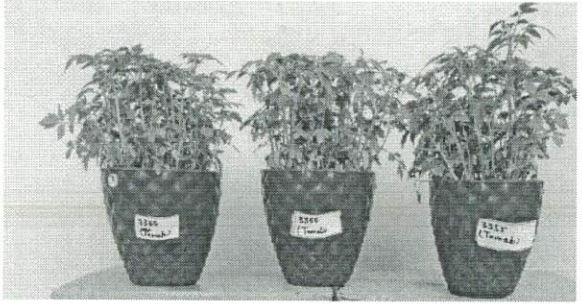
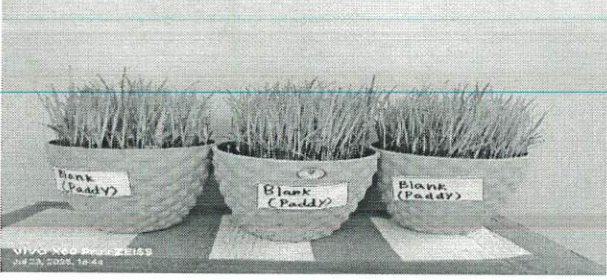
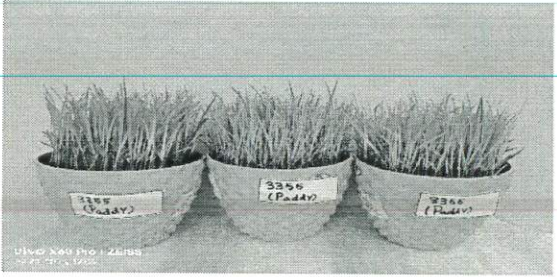
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9. Germination and Plant Growth Study

	
Tomato Compost (Control)	Tomato Compost (Sample)
	
Paddy Compost (Control)	Paddy Compost (Sample)

The percentage of seed germination was found to be greater than 90% for both control and sample


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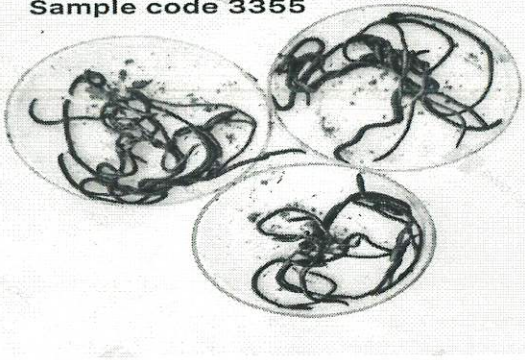
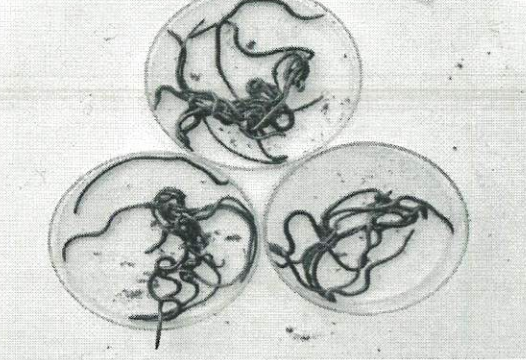
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10. Acute & Chronic Eco toxicity effects to Earthworm

Sample code 3355  Photograph of Live earthworm in the sample compost at the end of 7 days	Sample code 3355  Photograph of Live earthworm in the sample compost at the end of 14 days
The surviving adult earthworms grown in the sample compost exposed to the test material after an incubation period of 14 days is more than 90 % of those from the corresponding blank compost not exposed to any material	


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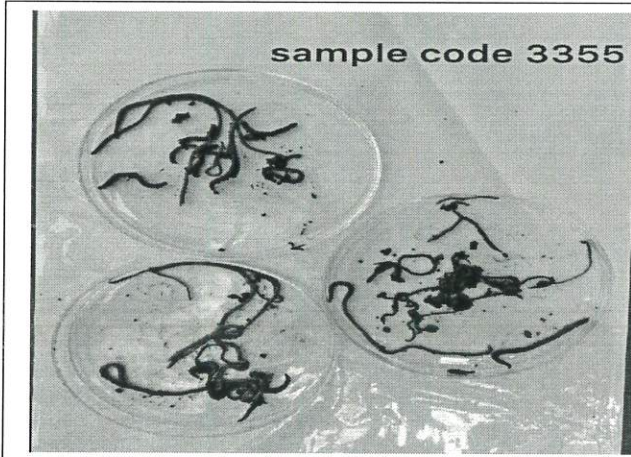
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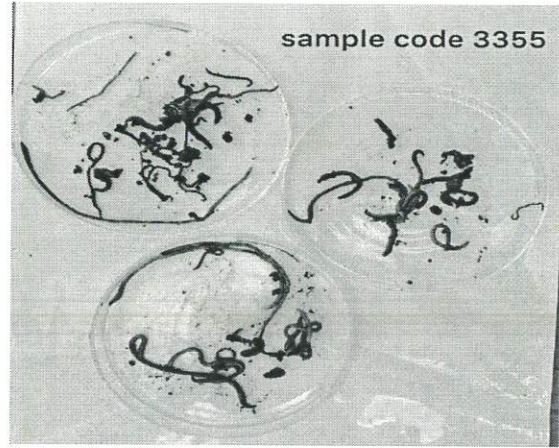
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Photograph of Live earthworms in the sample compost at the end of 28 days.



Photograph of Live earthworms in the sample compost at the end of 56 days

The surviving adult earthworms grown in the sample compost exposed to the test material after an incubation period of 28 days and the counted number of offspring after an incubation period of 56 days is more than 90 % of those from the corresponding blank compost.


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