



परिक्षण रिपोर्ट / TEST REPORT

CIPET/MDU/PTL/TR/2024-25/2202

Page No.1 of 3
Date: 26.09.2024

Issued to : M/s. Recarb Bioplastics Private Limited
Plot no: 37-C, First Floor, Phase-V,
IDA Cherlapally, Hyderabad – 500 051.
Ref. No. : Test Request Dated: 21.02.2024
TEST REPORT : As Per ISO 17088:2021
REPORT NO : 10995 (Final)

PART A: PARTICULARS OF SAMPLES SUBMITTED

a) Nature of Sample	: Bio- Compostable Film (As stated by Party)
b) Grade/Variety/Type/Size/Class etc	: Bio- Compostable Film (As stated by Party)
c) Brand name if any	: Nil
d) Declared values if any	: Nil
e) Code No.	: Nil
f) Batch No. and date of Manufacture	: Nil
g) Quantity	: 3 kg
h) Mode of Packing	: Packed
i) Date of receipt	: 28.02.2024
j) Seal	: Nil
k) I.O's signature on the sample	: Nil
l) Test Duration	: 04.03.2024 – 13.09.2024
m) Any other Information	: Interim Report No. CIPET/MDU/PTL/TR/2023-24/01190/TR. No. 10995 Dated: 09.07.2024

PART – B: SUPPLEMENTARY INFORMATIONS

a) Reference to sampling procedure	: Supplied by the Party
b) Supporting documents for the measurements taken and results derived	: Nil
c) Deviation from the test methods as Prescribed in relevant IS/Work Instructions, if any	: Nil



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Page 2 of 3

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PART-C TEST RESULTS

Sl. No.	Name of test	Test Method	Unit	Specified Requirements	Results Obtained
01	Material Identification	FTIR / DSC	--	--	Poly(butylene adipate-co-terephthalate) (PBAT) & Poly Lactic Acid (PLA)
02	Disintegration (Dry mass remains in 2mm sieve after 84 days)	ISO 20200:2015	%	Not more than 10	7.64
03	Ultimate aerobic Biodegradation (with reference to 100% degradation of positive reference)	ISO 14855-1:2012	%	>90% (At the end of the test period not more than 180 days)	90.41 (at the end of 121 days)
04	Plant Growth study Monocotyledon % Seed emergence	OECD:208 Guidelines	%	>90.0	96.64
	Dicotyledon % Seed emergence		%	>90.0	95.67
05	Acute Ecotoxic Effects of Earthworm				
a)	Survival of adult earthworm at the end of 7 days	ISO 11268-1:2012	%	Shall be more than 90	96.67
b)	Survival of adult earthworm at the end of 14 days		%	Shall be more than 90	96.57
c)	Biomass end of the 14 days		%	Shall be more than 90	97.90
06	Chronic Eco toxic effects to earthworm				
a)	Survival of adult earthworm at the end of 28 days	ISO 11268-2:2023	%	Shall be more than 90	96.55
b)	Offspring at the end of 56 days		%	Shall be more than 90	96.12
c)	Biomass end of the 56 days		%	Shall be more than 90	96.61



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Sl. No.	Name of test	Test Method	Unit	Specified requirements	Results Obtained
07	Heavy Metal Analysis (On Dry Mass Basis)				
	Arsenic (As)	IS 3025:2022 (Part 37)	mg/kg	Max: 10.00	0.0007
	Copper (Cu)	IS 3025:1992 (Part 42)		Max: 300.00	0.0320
	Nickel (Ni)	IS 3025:2003 (Part 54)		Max: 50.00	0.0690
	Zinc (Zn)	IS 3025:1994 (Part 49)		Max: 1000.00	1.1441
	Chromium (Cr)	IS 3025:2003 (Part 52)		Max: 50.00	0.0118
	Mercury (Hg)	IS 3025:1994 (Part 48)		Max: 0.15	0.0967
	Cadmium (Cd)	IS 3025:2023 (Part 41)		Max: 5.00	0.0670
	Lead (Pb)	IS 3025:1994 (Part 47)		Max: 100.00	0.0111

PART-D: REMARKS:

Note: The detailed observation on biodegradation test is enclosed in Annexure -I

- NB:1. This Test Report / Certificates issued only for the samples submitted to CIPET.
2. The results stated above related only to the items tested.
3. The quality of the subsequent production lot has to be ensured by the purchaser.
4. This Test Certificate shall not be reproduced except in full without the written approval of the laboratory.
5. Details of tests sub-contracted: Nil

End of Report

AUTHORISED SIGNATORY
Dr.Nalini R
Manager (T)

AUTHORISED SIGNATORY
Dr.K.Prakalathan
Director & Head

सेन्ट्रल इंस्टिट्यूट ऑफ पेट्रोकेमिकल्स
इंजीनियरिंग & टेक्नॉलाजी (सिपेट)

{पूर्व सेन्ट्रल इंस्टिट्यूट ऑफ प्लास्टिक्स इंजीनियरिंग & टेक्नॉलाजी (सिपेट)}
सेन्टर फॉर स्किलिंग & टेक्निकल सपोर्ट (सी एस टी एस)

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सिपेट CIPET



CENTRAL INSTITUTE OF PETROCHEMICALS
ENGINEERING & TECHNOLOGY (CIPET)

{Formerly Central Institute of Plastics Engineering & Technology (CIPET)}

CENTRE FOR SKILLING & TECHNICAL SUPPORT (CSTS)

Department of Chemicals & Petrochemicals

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Head office : CIPET, Guindy, Chennai - 600 032



CERTIFICATE OF ANALYSIS

AS PER ISO 17088:2021

CIPET/MDU/PTL/TR/2024-25/2202

Date- 26.09.2024

To,

M/s. Recarb Bioplastics Private Limited,

Plot no: 37-C, First Floor, Phase-V,

IDA Cherlapally, Hyderabad – 500 051.

Sub: Test Report- Reg.

Ref. No:

1) Test Request Dated 21.02.2024

2) Interim Test Report No. 10995 Dated 09.07.2024

Dear Sir,

With reference to the above, the submitted sample was analyzed as per ISO 17088:2021. The summary detail of testing & analysis is given below:

Company Name & Address	:	M/s. Recarb Bioplastics Private Limited, Plot no: 37-C, First Floor, Phase-V, IDA Cherlapally, Hyderabad – 500 051
Test Standard	:	ISO 17088:2021
Sample Details	:	Bio-Compostable Film
Test Report No	:	10995 (Final) & Dated : 09.07.2024
Date of Receipt of sample	:	28.02.2024
Date of Initiation	:	04.03.2024
Date of Completion	:	13.09.2024
Percentage of Compostability in 121 Days	:	90.41%
Requirement of Compostability in 180 days as ISO 17088:2021	:	90%

The sample submitted by M/s. Recarb Bioplastics Private Limited, is compostable and the percentage of compostability in 121 days reported vide test report No.10995 is 90.41 %.

The submitted sample also complies with the terms of Compostability, Seed germination and Disintegration as per ISO 17088:2021

Thanks & Regards,

Authorized Signatory

Encl : Analysis Report

केन्द्र : अहमदाबाद, अमृतसर, औरंगाबाद, अगरतला, बदी, बालासोर, बेंगलूरु, भावनगर, भगलपूर, भुवनेश्वर, भोपाल, चन्द्रपुर, चेन्नई, देहरादून, दिल्ली, गुवाहाटी, ग्वालियर, हैदराबाद, हाजीपुर, हल्दिया, इम्फाल, जयपुर, कोच्चि, कोरबा, लखनऊ, मधुरै, मुरथल, मैसूरु, नवसारी, परदीप, पालकाड, रायपुर, रांची, तमोत, वलसाड, विजयवाडा एवं वारणासी

Centres : Ahmedabad, Amritsar, Aurangabad, Agartala, Baddi, Balasore, Bengaluru, Bhavnagar, Bhagalpur, Bhuvaneswar, Bhopal, Chandrapur, Chennai, Dehradun, Delhi, Guwahati, Gwalior, Hyderabad, Hajipur, Haldia, Imphal, Jaipur, Kochi, Korba, Lucknow, Madurai, Murthal, Mysuru, Navsari, Paradip, Palakkad, Raipur, Ranchi, Tamot, Valsad, Vijayawada & Varanasi



परिक्षण रिपोर्ट / TEST REPORT

Annexure-I

TR.NO. -10995 (Final)

ANALYSIS RESULT

Page: 1 of 9

Date: 26.09.2024

OBSERVATION FOR BIODEGRADABILITY TEST AS PER ISO 17088:2021

Date of Initiation : 04.03.2024
Date of Completion : 13.09.2024

1. Sample detail : "CIPET/MDU/PTL/INT/2024-25/ 01" - As stated by the party
2. Material Identification by DSC & FTIR: DSC & FTIR graph indicates that the supplied material is PBAT and PLA based film.

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 : 51.05 (%)
Volatile Solid : 30.13 (%)
CO₂ evolved during 1st
10 days in blank vessels : 59.21 mg/g of volatile solids of compost
Test duration : 90.41% (121 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	7.2	7.3
Blank 3	7.2	7.3
Cellulose1	7.1	7.2
Cellulose2	7.2	7.5
Cellulose3	7.6	7.4
Negative 1	7.7	7.8
Negative 2	7.6	7.7
Negative3	7.5	7.6
Sample 1	7.3	7.4
Sample 2	7.5	7.5
Sample 3	7.4	7.5

Authorized Signatory
Dr.Nalini R
Manager (T)

Authorized Signatory
Dr. K.Prakalathan
Director&Head

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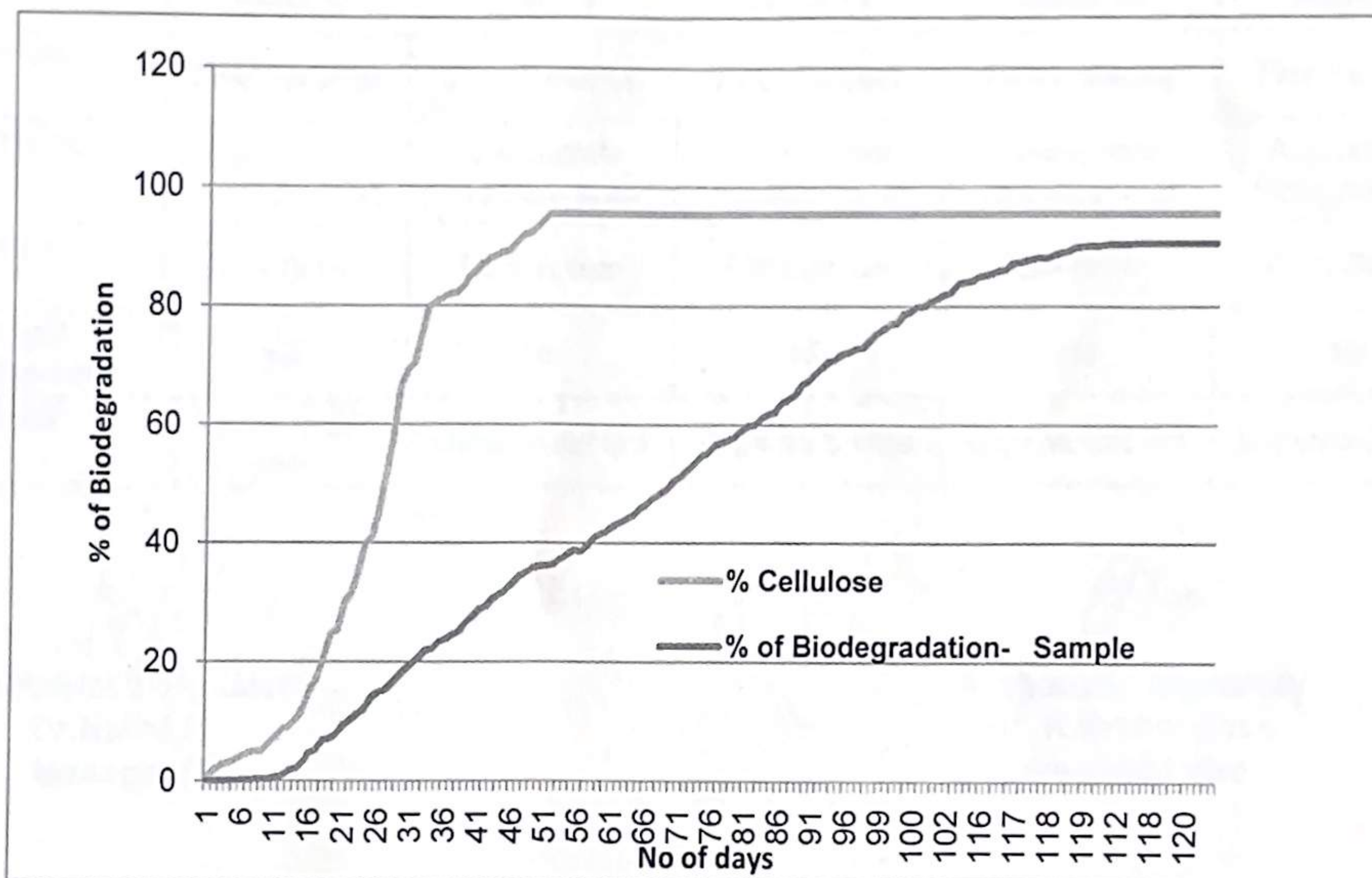
TR.NO. -10995 (Final)

ANALYSIS RESULT

Page: 2 of 9

Date: 26.09.2024

4. Result: Percentage biodegradation relative to positive reference
MEAN (%) : 90.41
The reference material-cellulose (%) : ~100



5. Visual Observation of Sample :-

	Week 1	Week 7	Week 11	Week 14	Week 17
Structure	Film Sample	Film Sample	Fragmented Film sample	Disintegration Observed	--
Moisture	Appropriate moisture level	Appropriate moisture level	Appropriate moisture level	Appropriate moisture level	Appropriate moisture level
Color	Milky White	Dirty White	--	--	--
Fungal Development	Nil	Nil	Nil	Nil	Nil
Smell	Organic/dirt like	Organic/dirt like	Organic/dirt like	Organic/dirt like	Organic/dirt like

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TR.NO. -10995 (Final)

ANALYSIS RESULT

Page: 3 of 9

Date: 26.09.2024

5.1 Visual Observation of Compost :-

	Week 1	Week 7	Week 11	Week 14	Week 17
Structure	Fine Particles	Fine Particles	Fine Particles	Fine Particles	Fine Particles
Moisture	Appropriate moisture level	Appropriate moisture level	Appropriate moisture level	Appropriate moisture level	Appropriate moisture level
Color	Dark Brown	Dark Brown	Dark Brown	Dark Brown	Dark Brown
Fungal Development	Nil	Nil	Nil	Nil	Nil
Smell	Organic/dirt like	Organic/dirt like	Organic/dirt like	Organic/dirt like	Organic/dirt like


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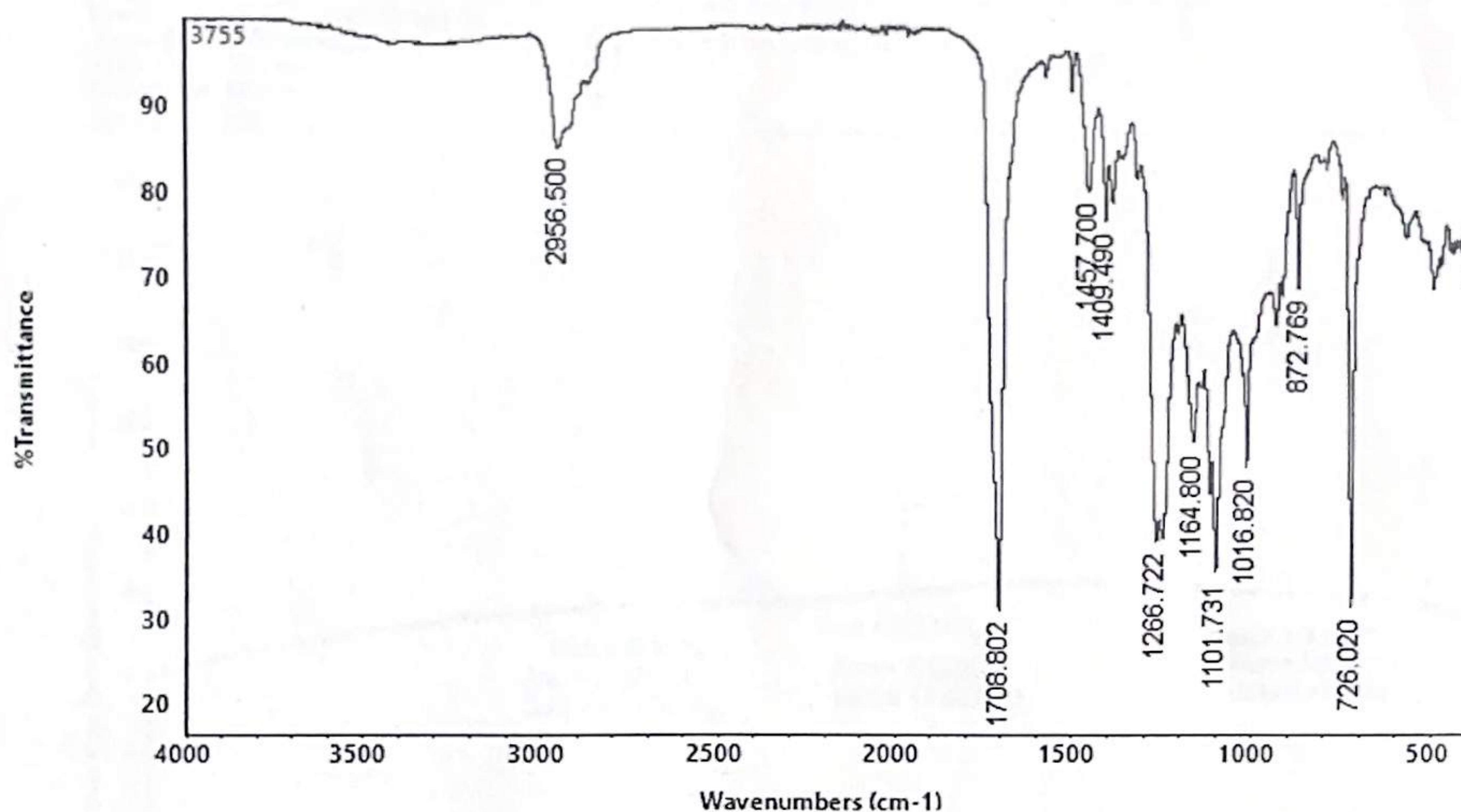
Page: 4 of 9

Date: 26.09.2024

TR.NO. -10995 (Final)

ANALYSIS RESULT

6. FTIR Analysis:



Wave number (cm ⁻¹)	Possible Nature of Bond
2956.50	C-H Stretching vibration
1708.80	C=O Stretching vibration
1457.70	C-H ₂ Bending vibration
1409.49	C-H Bending vibration
1266.72, 1164.80, 1101.73, 1016.82	C-O Stretching vibration
872.76	C-H Bending vibration
726.02	C-H Out plane Bending vibration in Benzene ring

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सिपेट CIPET

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SIDCO Industrial Estate

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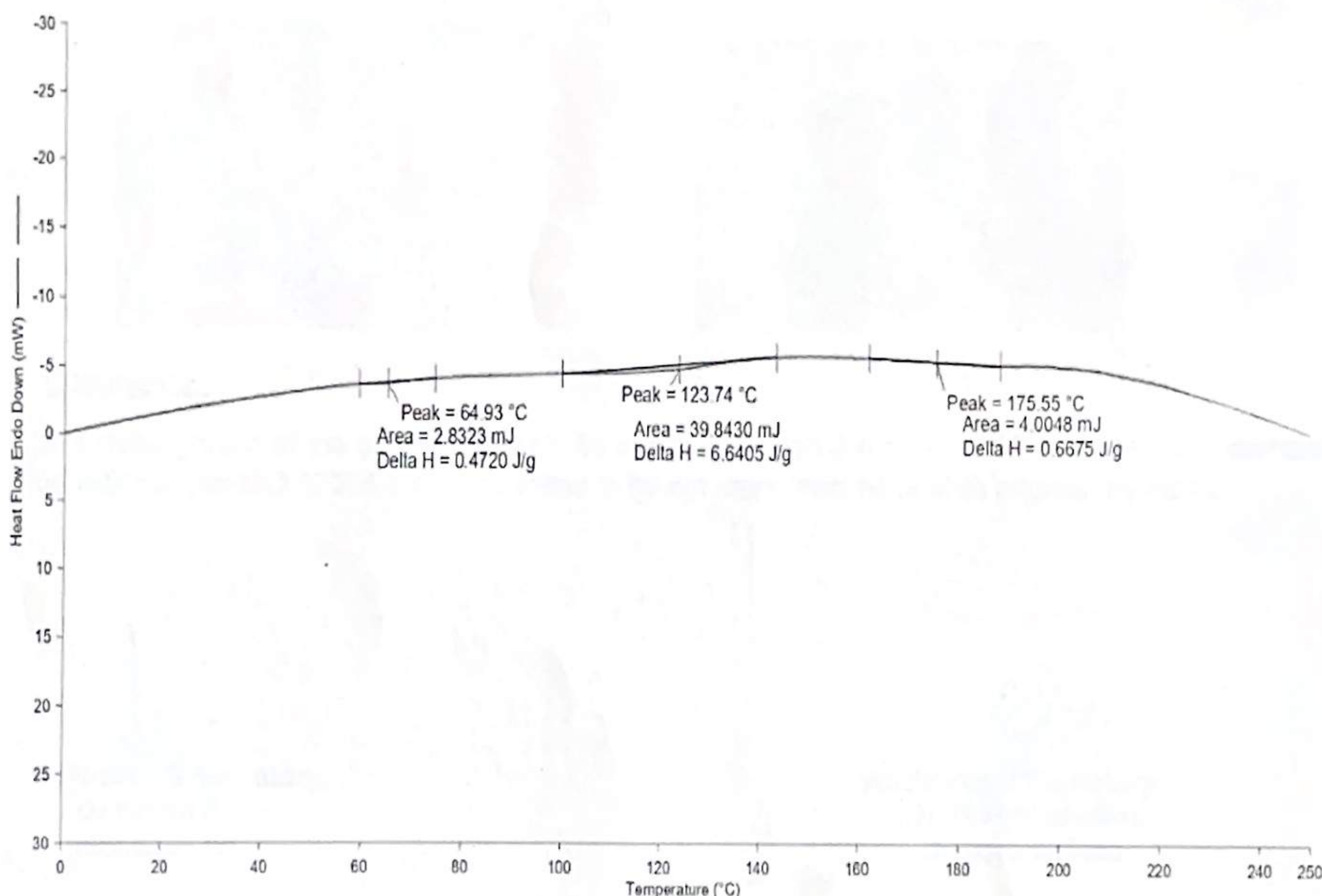
ANALYSIS RESULT

Page: 5 of 9

Date: 26.09.2024

7. DSC Analysis:-

Filename: D:\2023-24 DSC\3755 rep3.ds8d
Operator ID: CIPET Madurai
Sample ID: 3755 rep3
Sample Weight: 6.000 mg
Comment: DSC



04-07-2024 15:34:00

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

Authorized Signatory
Dr.Nalini R
Manager (T)

Authorized Signatory
Dr. K.Prakalathan
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TR.NO. -10995 (Final)

ANALYSIS RESULT

Page: 6 of 9
Date: 26.09.2024

8. Disintegration- After 17 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.


Authorized Signatory
Dr. Nalini R
Manager (T)


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Director & Head

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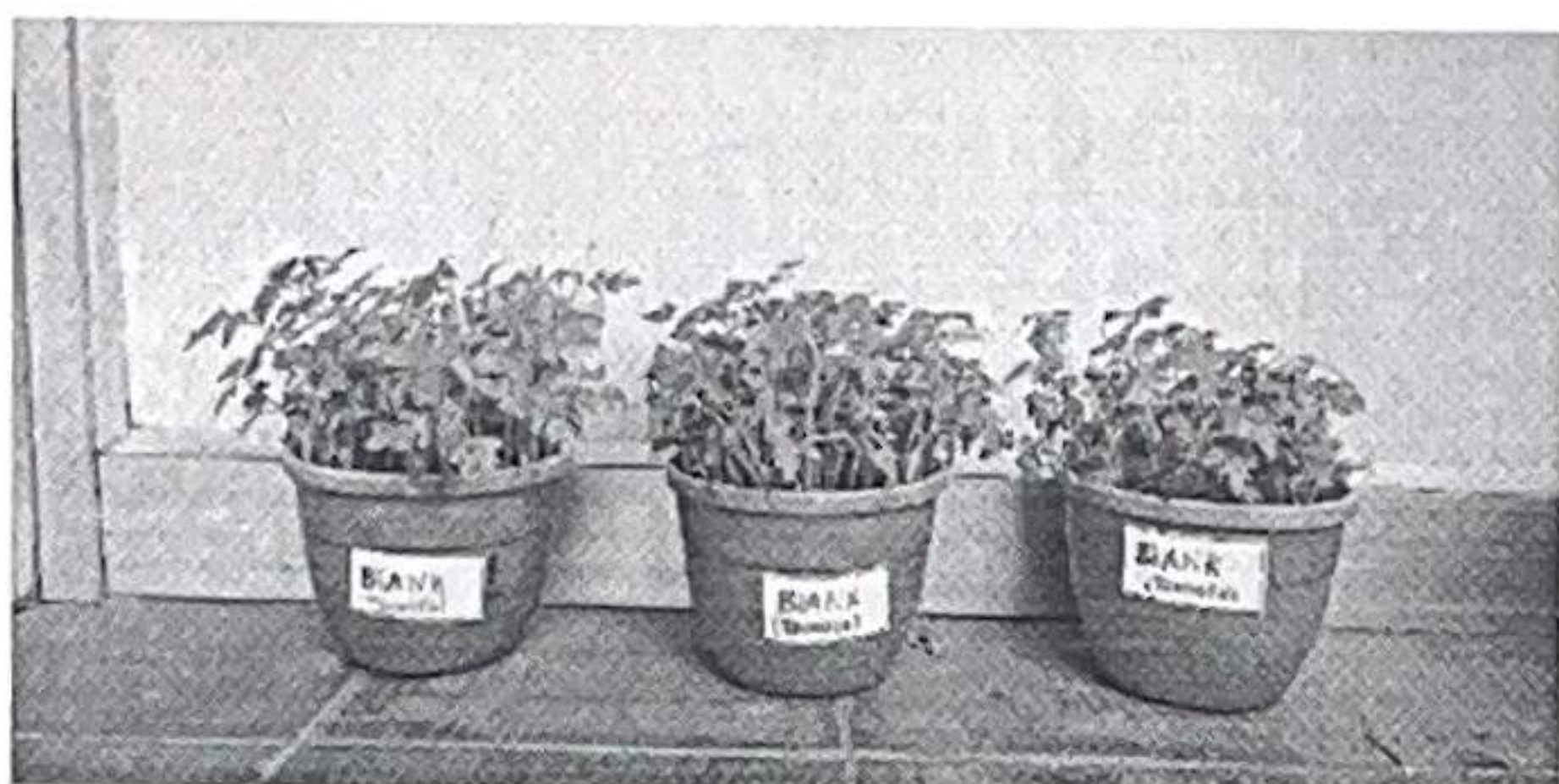
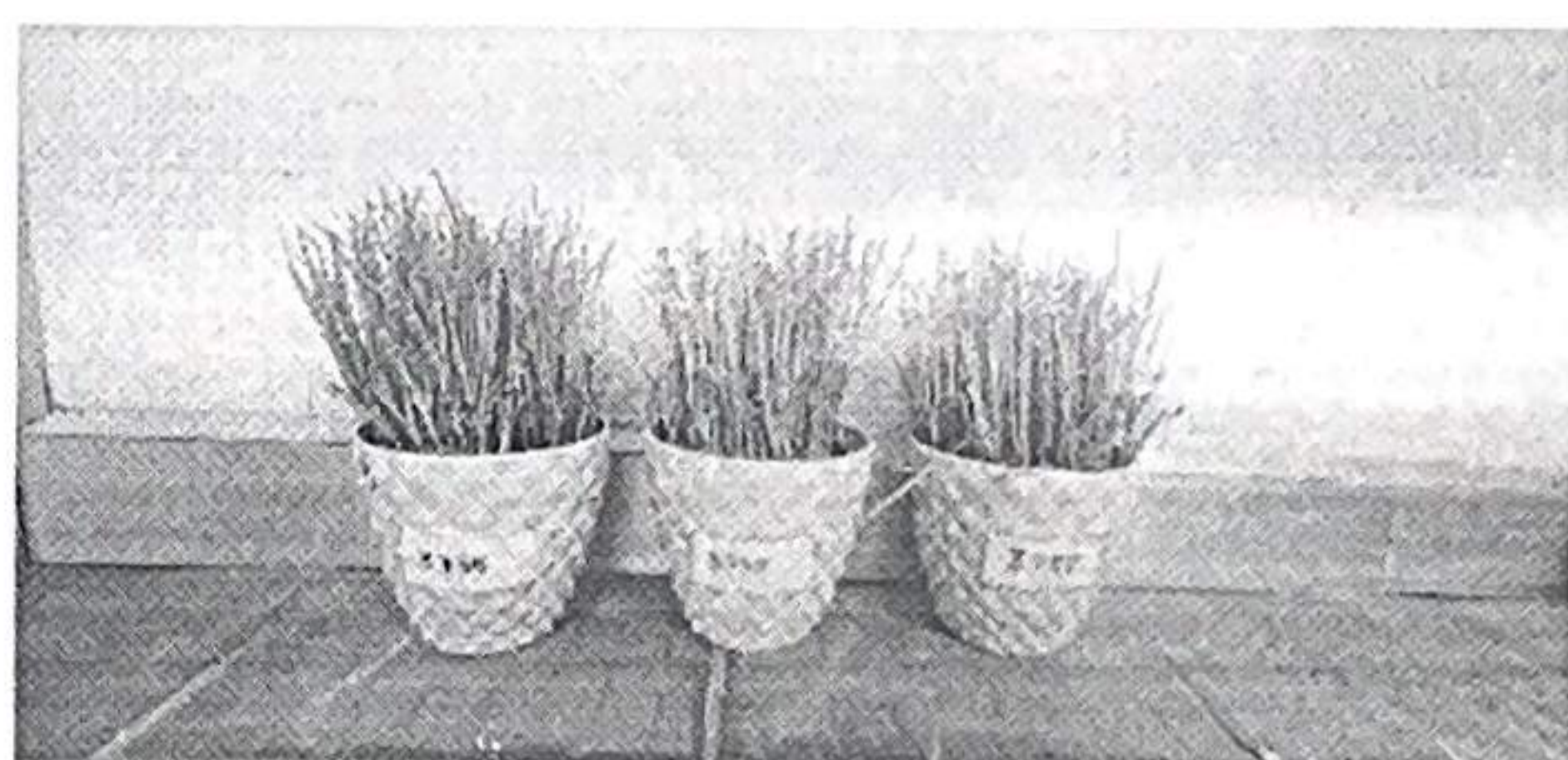
TR.NO. -10995 (Final)

ANALYSIS RESULT

Page: 7 of 9

Date: 26.09.2021

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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इंजीनियरिंग टेक्नॉलाजी (सिपेट)

{ पूर्व सेन्ट्रल इंस्टिट्यूट ऑफ प्लास्टिक्स इंजीनियरिंग & टेक्नॉलाजी (सिपेट) }

उत्पाद परीक्षण प्रयोगशाला

यूनिट एकांग - सिपेट सी एस टी एस, मधुरै

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सिपेट CIPET



CENTRAL INSTITUTE OF PETROCHEMICALS
ENGINEERING & TECHNOLOGY (CIPET)

(Formerly Central Institute of Plastics Engineering & Technology (CIPET))

Product Testing Laboratory

Unit of CIPET : CSTS Madurai.

SIDCO Industrial Estate

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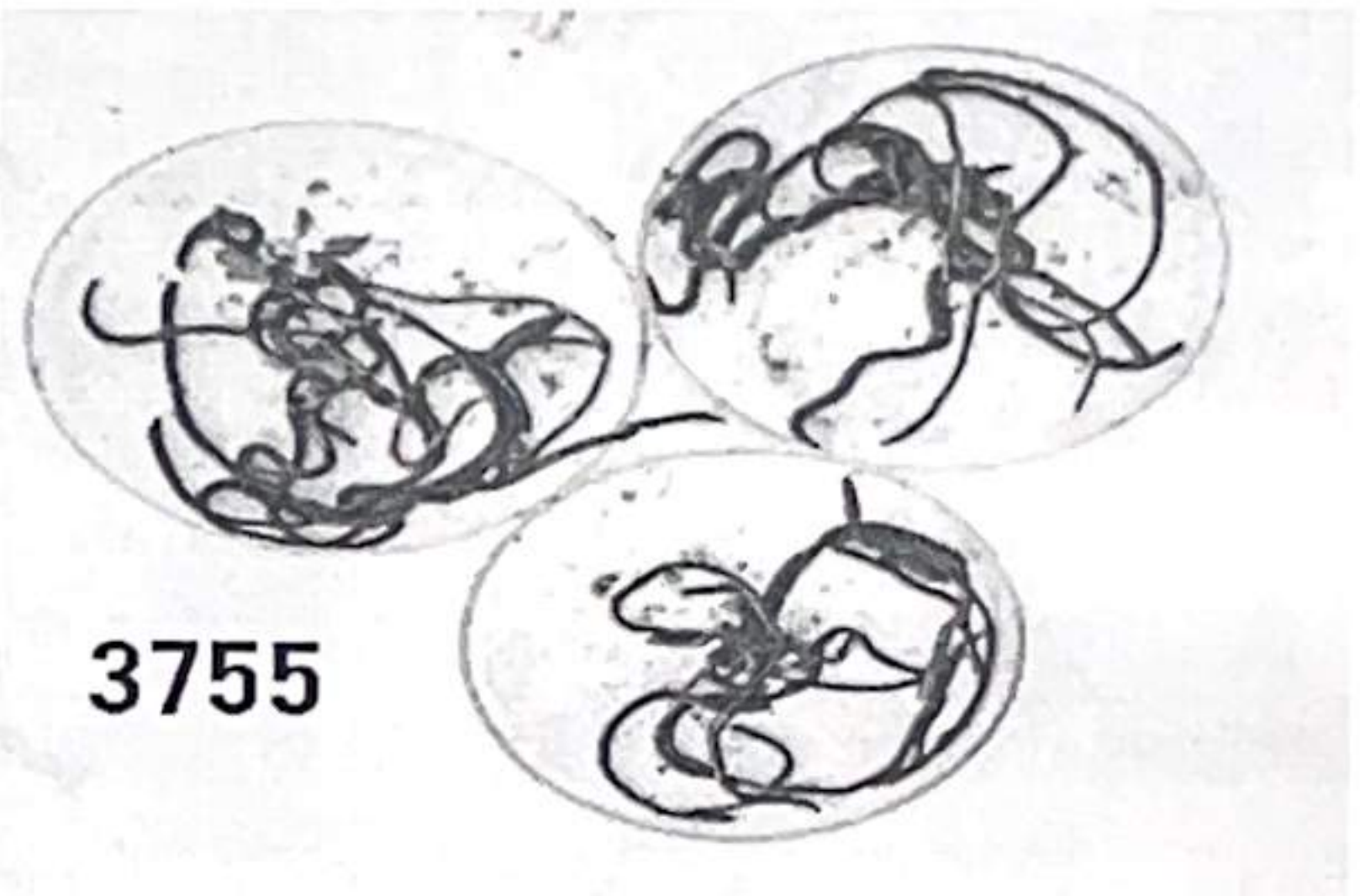
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ANALYSIS RESULT

Page: 8 of 9

Date: 26.09.2024

10. Acute & Chronic Eco toxicity effects to Earthworm

 3755 Photograph of Live earthworm in the sample compost at the end of 7 days	 3755 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	


Authorized Signatory
Dr.Nalini R
Manager (T)


Authorized Signatory
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Director&Head

रसायन एवं पेट्रोसायन विभाग, रसायन एवं उर्वरक मंत्रालय, भारत सरकार, तिरुवथवूर, मधुरै - 625 110.

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ANALYSIS RESULT

Page: 9 of 9

Date: 26.09.2024

3755

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

3755

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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