

सिपेट : इंस्टीट्यूट ऑफ प्लास्टिक्स  
टेक्नोलॉजी (आई.पी.टी.)



CIPET : INSTITUTE OF PLASTICS  
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Department of Chemicals & Petrochemicals  
Ministry of Chemicals & Fertilizers, Govt. of India  
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PLASTICS TESTING CENTRE

Series : I **ANALYSIS REPORT**

**TEST CERTIFICATE**

S.L. No. **2665**

Issued to : M/S .Green-On India, Surat  
231,RJD Industrial Society, Ichhapore  
Adajan-Hazira Road, Surat, Gujarat  
Pin : 394 510  
Phone No. 8460348456/ 9428149654  
E-mail: info@greenonindia.com

Test Report No : 2976  
Dated : 22.07.2021  
Your Ref. No. : NIL  
Dated : 08.12.2020

Test Report as per Standard : As per part C

PART A

ULR No. TC816421000001745P

PARTICULARS OF SAMPLE SUBMITTED

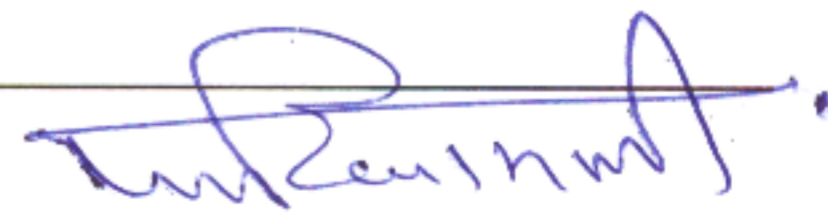
- a) Name of the sample(as stated by the party) : Biodegradable & Compostable Film  
b) Grade/Variety/Type/Size/Class etc. : ---  
c) Code No. : ---  
d) Quantity (pcs/mtr/gm/nos) : 1.5 kg.  
e) Mode of packing : Open  
(Sealed carton/poly pouch/container or not)  
f) Date of receipt of sample : 08.12.2020  
g) Date of Performance of test : 14.12.2020  
h) Any other information : ---

PART B

SUPPLEMENTARY INFORMATION

- a) Reference to sampling procedure : Drawn & supplied by the party  
b) Supporting documents for Measurements : As per Part C  
Taken and results derived like graphs,  
Tables, sketches and/or Photographs as  
appropriate to test report if any (to be attached)  
c) Deviation from the test methods as : Not Applicable  
Prescribed in relevant ASTM/ISO/BIS/  
Work instructions, if any

  
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ANALYSIS REPORT


Report No.: 2976  
Date : 22.07.2021

PART C  
TEST RESULTS

Sr. No.	Name of the Test	Test Method/Standard	Unit	Results obtained	Specified Requirements
<b>Sample Details : Biodegradable &amp; Compostable Film (As stated by the party)</b>					
1.	Material Identification	FTIR/DSC	--	Blends of PLA/PBAT	-----
2.	Disintegration(Dry mass passing through 2 mm sieve after 84 days)	IS 17088:2008	%	8.8	Not more than 10%
3.	Ultimate aerobic Biodegradation (with reference to 100% degradation of positive reference)	IS 17088:2008	%	90.99	>90 (At the end of the test period not more than 180 days)
4.	Plant growth study <b>Monocotyledon(Rice)</b> % Seed emergence	IS 17088:2008	%	95.0	>90
	<b>Dicotyledon(tomato)</b> % Seed emergence		%	92.5	>90

Note: The detailed observation on biodegradability test is enclosed as Annexure -I

  
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PART C  
TEST RESULTS

Sr no	Name of the Test	Test Method/Standard	Unit	Results obtained	Specified requirements
5.	Heavy metals concentrations #	ISO 17088:2012/ IS 17088:2008	Mg/l		
i.	Arsenic (As)			B.L.Q (Q.L=0.05)	20
ii.	Copper (Cu)			1.98	500
iii.	Nickel (Ni)			0.19	100
iv.	Zinc (Zn)			6.58	2500
v.	Cobalt (Co)			B.L.Q (Q.L=0.05)	----
vi.	Chromium (Cr)			0.41	300
vii.	Molybdenum (Mo)			B.L.Q (Q.L=0.05)	----
viii.	Mercury (Hg)			B.L.Q (Q.L=0.05)	10
ix.	Cadmium (Cd)			B.L.Q (Q.L=0.05)	20
x.	Lead (Pb)			0.70	500
xi.	Selenium (Se)			B.L.Q (Q.L=0.05)	----

\*Based on Municipal waste (Management and Handling) Rules, 1999 notified on 27<sup>th</sup> September, 1999 by Ministry of Environment and Forests, Government of India. Note that Concentration of Metals like Cobalt, Molybdenum, and Selenium is not mentioned in the notification.

PART D

REMARKS : Nil

Note :

1. This Test Report / Certificate is issued only for the samples submitted to the laboratory.
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 Report shall not be reproduced except in full without the written approval of the laboratory.
5. Any anomaly/ discrepancy in this report should be brought to the notice of the laboratory within 30 days from the date of issue.
6. Subcontracted Tests (if any): # Gujarat Laboratory

  
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Annexure-I

OBSERVATION FOR BIODEGRADABILITY TEST AS PER IS /ISO 17088:2008

Customers Details:

Name of the Party :- Green-On India, Surat

1. Sample Details :- Biodegradable & Compostable Film (As declared by the party)

2. Material Identification by FTIR &DSC : Blends of Polylactic Acid (PLA) /  
Polybutylene adipate co-terephthalate (PBAT)

3. Observation:-

a) Conditions of reaction mixtures

Origin of Compost : Livestock excreta, municipal and vegetable waste

Reaction Temperature : 58° (±2°C)

Dry Solid : 53.6%

Volatile Solid : 36.6%

CO<sub>2</sub> evolved during 1<sup>st</sup> 10 days  
in blank vessels : 50.9 mg/g of volatile solids of compost

Test Duration : 143 Days.

Reference Material : Cellulose.

Volume of reaction vessel : 3000ml.

b) pH of Test medium

Sl. No.	Composting Vessel	pH (before test)	pH (after test)
1	Blank 1	8.0	8.5
2	Blank 2	7.4	7.6
3	Blank 3	7.2	7.0
4	Cellulose 1	8.2	8.0
5	Cellulose 2	7.6	7.4
6	Cellulose 3	7.8	8.0
7	Negative 1	7.9	8.3
8	Negative 2	7.3	7.6
9	Negative 3	8.3	8.1
10	Sample 1	8.3	8.1
11	Sample 2	7.3	7.2
12	Sample 3	7.7	7.1

  
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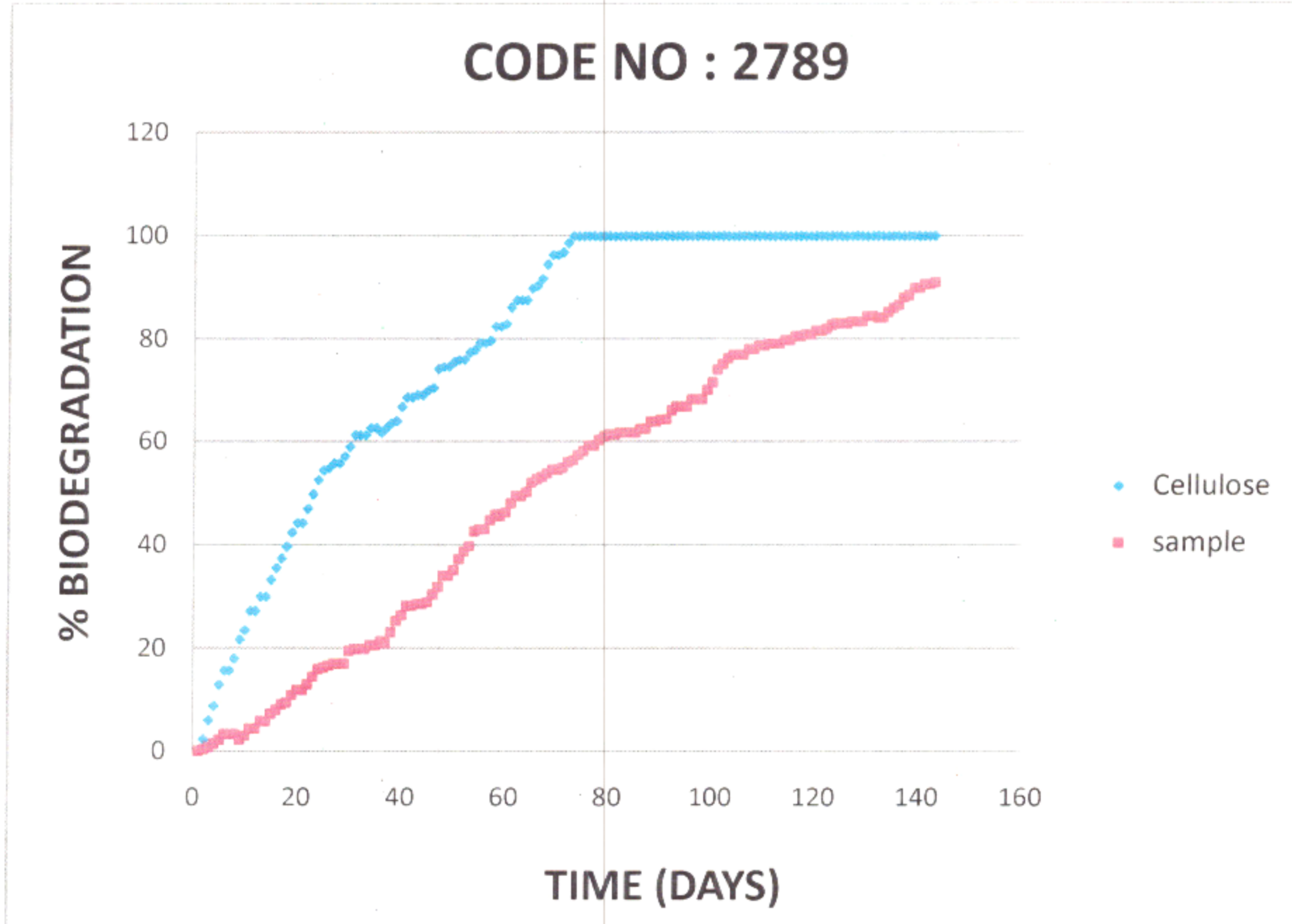
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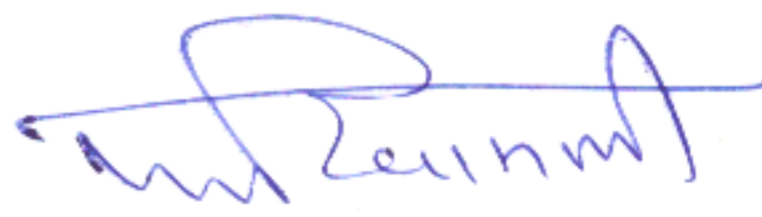
4. Result: Percentage biodegradation relative to positive reference

MEAN (%) : 90.99%

The reference material- Cellulose (%) : 100%



  
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5. Visual Observation of Sample

Description	Week 1	Week 5	Week 12	Week 16	Week 21
Structure	Film sample	Film Sample	Film Sample	Film sample	Film sample
Moisture	Adequate moisture level	Adequate moisture level	Adequate moisture level	Adequate moisture level	Adequate moisture level
Colour	Milky white	Milky white	Milky white	Faded white	----
Fungal Development	Nil	Nil	Nil	Nil	Nil
Smell	Organic /dirt like	Organic /dirt like	Organic /dirt like	Organic /dirt like	Organic /dirt like

6. Visual Observation of Compost

Description	Week 1	Week 5	Week 12	Week 16	Week 21
Structure	Fine Particles	Fine Particles	Fine Particles	Fine Particles	Fine Particles
Moisture	Adequate moisture level	Adequate moisture level	Adequate moisture level	Adequate moisture level	Adequate moisture level
Colour	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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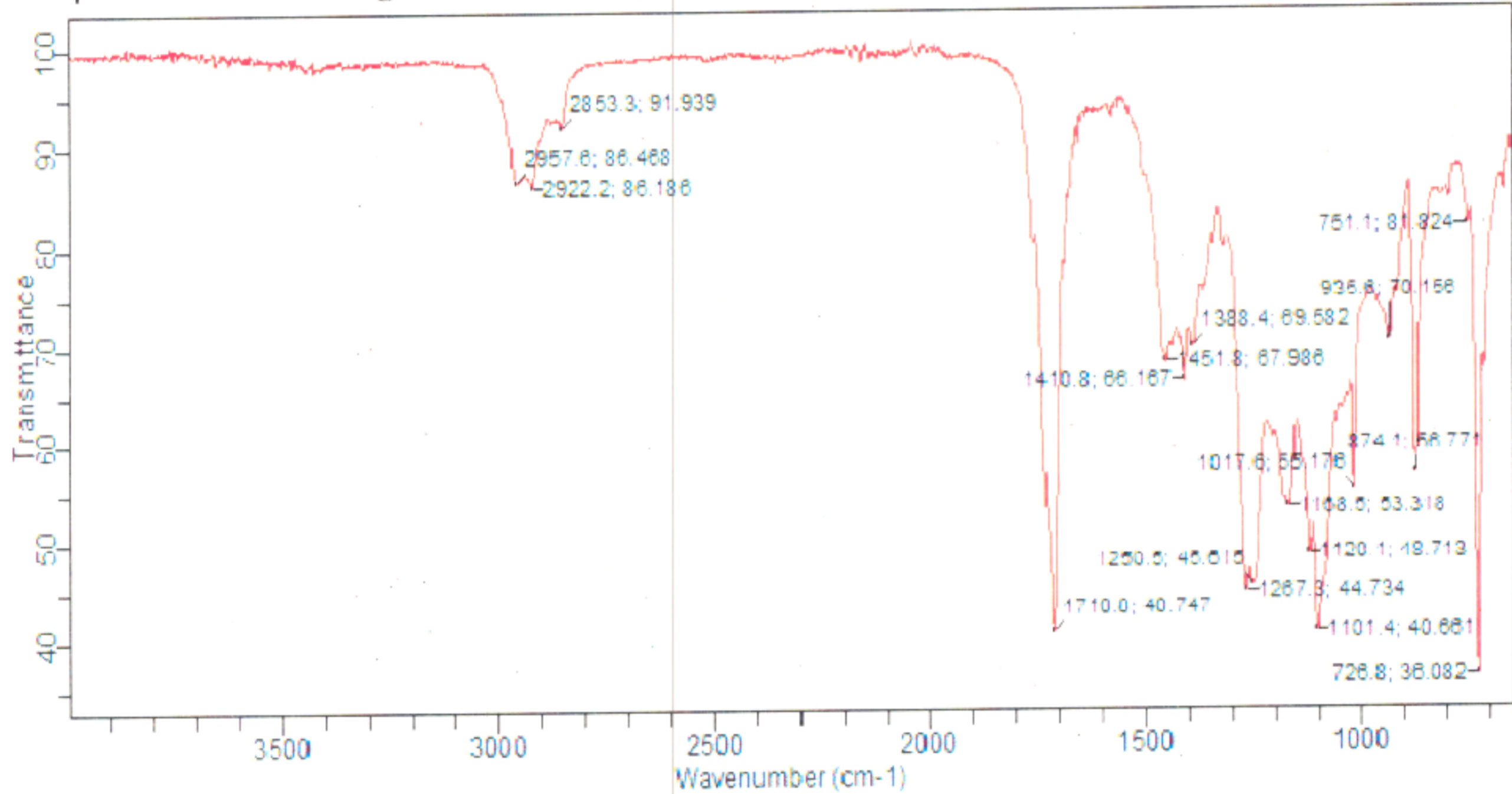
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7. FTIR Analysis

Sample Details: :- Biodegradable & Compostable Film (As declared by the party)



Wave number (cm <sup>-1</sup> )	Nature of Bond
1) 2922.2	C - H Stretching vibrations
2) 1710.8	C = O Stretching vibrations
3) 1267.8	C - O Stretching vibrations
4) 1101.4	C - O Stretching vibrations
5) 874.1	C - H Bending vibrations

  
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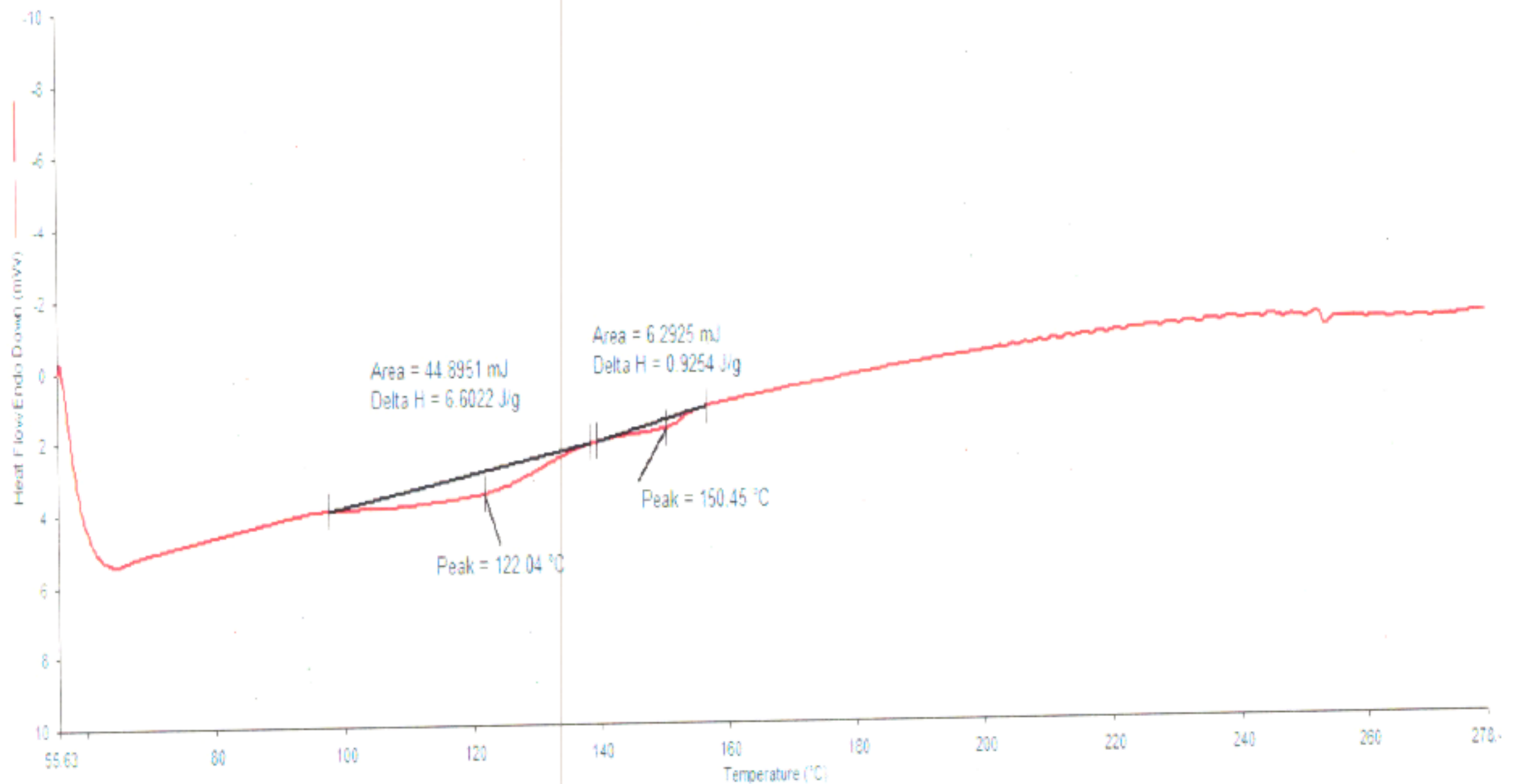
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8. DSC Analysis



Comment: The above DSC & FTIR analysis indicates the above sample is Blends of  
PLA (Polylactic acid) / PBAT (Poly butylene adipate co-terephthalate)

  
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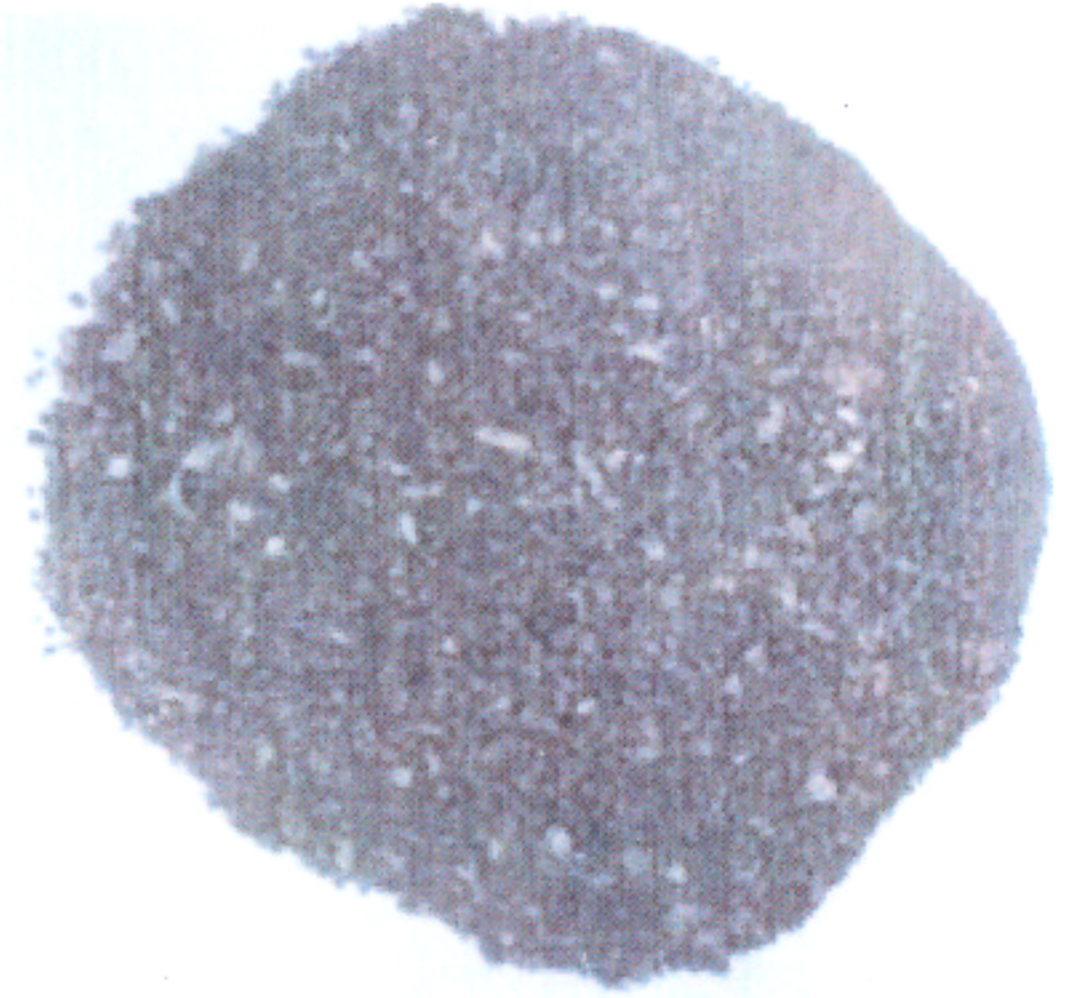
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**9. DISINTEGRATION - AFTER 12 WEEKS**



BEFORE DISINTEGRATION



AFTER DISINTEGRATION

The disintegration of the sample by passing through 2 mm sieve after 12 week in composting condition as per ISO 17088-2012/IS 17088: 2008 was found not more than 10% of original dry mass remain.

  
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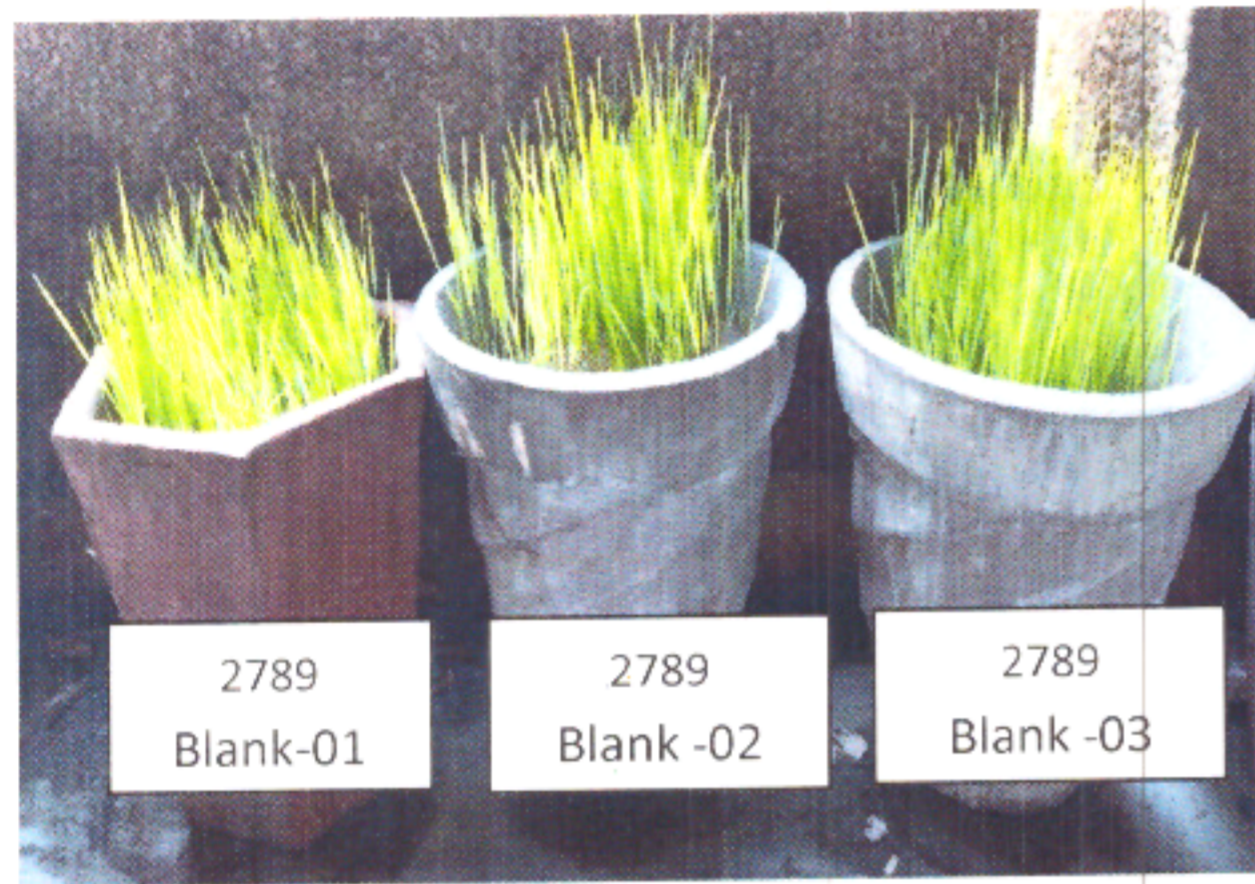
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PLASTICS TESTING CENTRE

ANALYSIS REPORT

Report No.: 2976  
Date : 22.07.2021

10. GERMINATION AND PLANT GROWTH STUDY



2789 Compost (Control)



2789 Compost (Sample)




2789 Compost (Control)



2789 Compost (Sample)

The percentage of seed germination rate is found to be greater than 90% for both Monocotyledon and Dicotyledon.

  
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