

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

रसायन एवं पेट्रोसायन विभाग
रसायन एवं उर्वरक मंत्रालय, भारत सरकार
प्लॉट नंबर 630, फेज 4, जी.आई.डी.सी., वटवा,
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Department of Chemicals & Petrochemicals
Ministry of Chemicals & Fertilizers, Govt. of India

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PLASTICS TESTING CENTRE

Series: H

ANALYSIS REPORT TEST CERTIFICATE

S.L. No.

7733

Issued to: M/s Shashwat Bio polyplast LLP
14/1 Kalpataru paper mill compound,
Khatraj-Thol road,
Karoli village, Khatraj,
Gandhinagar (Gujarat)382721

Test Report No. : 2409

Dated : 11.09.2020

Your Ref. No. : NIL

Dated : 14.11.2019

Test Report as per Standard: : As per part C

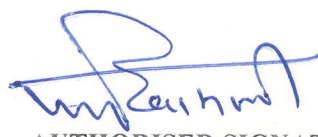
**PART A ULR No. TC816419000000001385P
PARTICULARS OF SAMPLE SUBMITTED**

- | | |
|---|---|
| a) Name of the sample | : Compostable Film (as stated by the party) |
| b) Grade/Variety/Type/Size/Class etc. | : --- |
| c) Code No. | : ---- |
| d) Quantity (pcs/mtr/gm/nos) | : 2.20 kg. |
| e) Mode of packing
(Sealed carton/poly pouch/container or not) | : Packed in poly pouch |
| f) Date of receipt of sample | : 12.07.2019 |
| g) Date of Performance of test | : 06.09.2019 |
| h) Any other information | : --- |

**PART B
SUPPLEMENTARY INFORMATION**

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


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ANALYSIS REPORT

Report No.: 2409

Date : 11.09.2020

**PART C
TEST RESULTS**

Sr. No.	Name of the Test	Test Method/Standard	Unit	Results obtained	Specified Requirements
Sample Details :Compostable Film (As stated by the party)					
1.	Material Identification	FTIR/DSC	--	Blends of PLA/PBAT	-----
2.	Disintegration(Dry mass passing through 2 mm sieve after 84 days)	IS 17088:2008	%	8.0	Not more than 10%
3.	Ultimate aerobic Biodegradation (with reference to 100% degradation of positive reference)	IS 17088:2008	%	90.6	>90 (At the end of the test period not more than 180 days)
4.	Plant growth study Monocotyledon(Rice) % Seed emergence	IS 17088:2008	%	92.5	>90
	Dicotyledon(tomato) % Seed emergence		%	95.0	>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 # Arsenic (As) Copper (Cu) Nickel (Ni) Zinc (Zn) Cobalt (Co) Chromium (Cr) Molybdenum (Mo) Mercury (Hg) Cadmium (Cd) Lead (Pb) Selenium (Se)	IS 17088:2008	Mg/l	<0.1 1.421 2.091 6.147 < 0.1 1.595 < 0.1 < 0.1 < 0.1 0.437 < 0.1	20 500 100 2500 ---- 300 ---- 10 20 500 -----

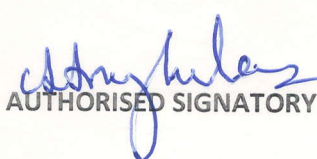
*Based on Municipal waste (Management and Handling) Rules, 1999 notified on 27th September, 1999 by Ministry of Environment and Forests, Government of India. Note that Concentration of Metals like Cobalt, Molybdenum, and Selenium is not mentioned in the notification.

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): # Chennai Mettlex Lab PVT Ltd


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ANALYSIS REPORT

Report No.: 2409

Date : 11.09.2020

Annexure-I

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

Customers Details:

Name of the Party :- Shashwat Bio Polyplast LLP

Sample Details : Bio degradable film (As declared by the party)

- 1 Material Identification by FTIR & DSC: Blends of Polylactic Acid(PLA) / Polybutyleneadipate co-terephthalate (PBAT)

2 Observation:-

- a) Conditions of reaction mixtures

Origin of Compost

: Livestock excreta, municipal and vegetable waste

Reaction Temperature

: 58° (±2°C)

Dry Solid

: 52.6 %

Volatile Solid

: 30.51 %

CO₂ evolved during 1st 10 days

in blank vessels

: 50.76 mg/g of volatile solids of compost

Test Duration

: 174 Days.

Reference Material

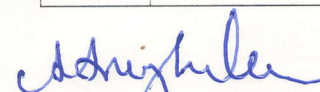
: Cellulose.

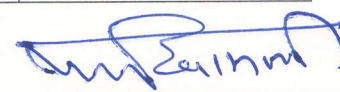
Volume of reaction vessel

: 3000ml.

- b) pH of Test medium

Sl. No.	Composting Vessel	pH (before test)	pH (after test)
1	Blank 1	7.8	7.8
2	Blank 2	7.6	7.7
3	Blank 3	7.5	7.5
4	Cellulose 1	7.6	7.5
5	Cellulose 2	7.6	7.4
6	Cellulose 3	7.5	7.5
7	Negative 1	7.4	7.5
8	Negative 2	7.5	7.6
9	Negative 3	7.4	7.6
10	Sample 1	7.5	7.5
11	Sample 2	7.5	7.3
12	Sample 3	7.3	7.4


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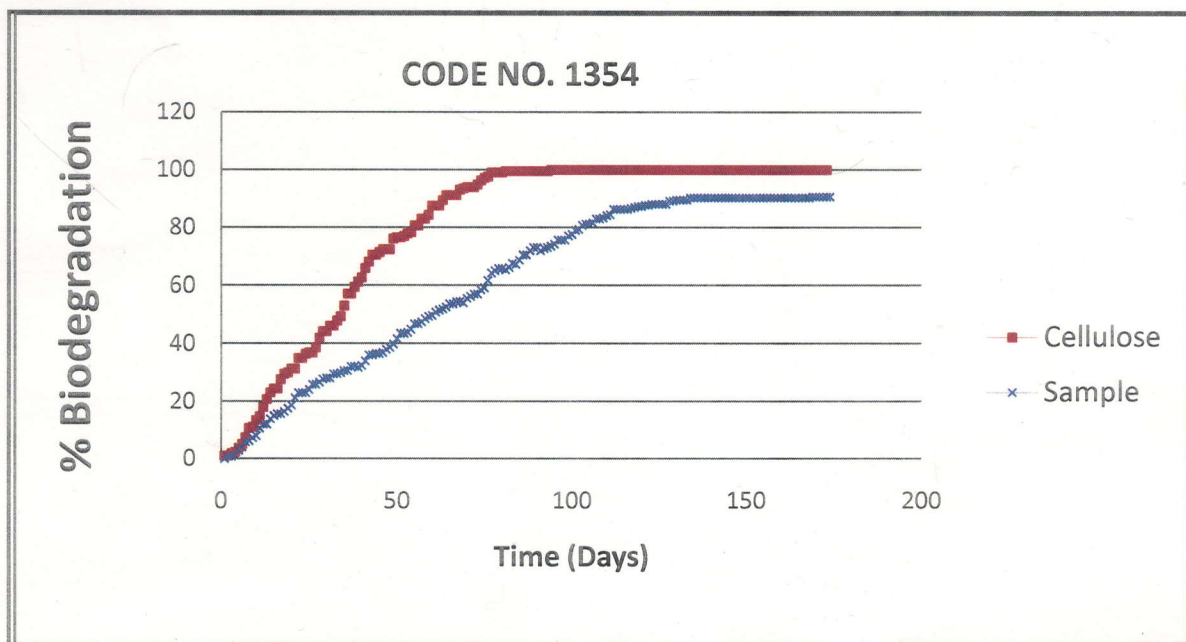
4. Result :

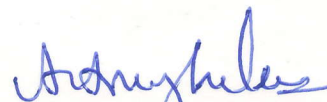
Percentage biodegradation relative to positive reference

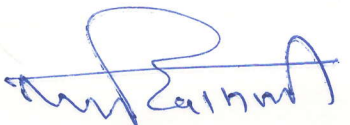
MEAN (%)

: 90.6 %

The reference material- Cellulose (%) : 100%




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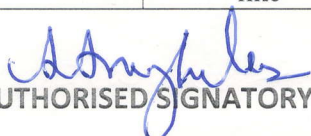
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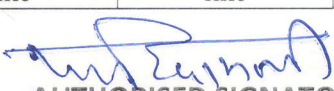
5. Visual Observation of Sample

Description	Week 2	Week 5	Week 10	Week 16	Week 26
Structure	Film sample	Film sample	Film sample	Film sample	Film sample
Moisture	Appropriate Moisture level	Appropriate Moisture level	Appropriate Moisture level	Appropriate Moisture level	Appropriate Moisture level
Colour	Milky white	Milky white	Milky white	Milky white	Milky white
Fungal Development	None	None	None	None	None
Smell	Organic/dirt like	Organic/dirt like	Organic/dirt like	Organic/dirt like	Organic/dirt like

6. Visual Observation of Compost

Description	Week 2	Week 5	Week 10	Week 16	Week 26
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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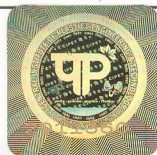
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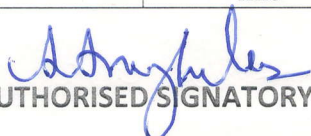
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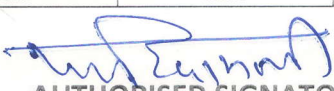
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Structure	Film sample	Film sample	Film sample	Film sample	Film sample
Moisture	Appropriate Moisture level	Appropriate Moisture level	Appropriate Moisture level	Appropriate Moisture level	Appropriate Moisture level
Colour	Milky white	Milky white	Milky white	Milky white	Milky white
Fungal Development	None	None	None	None	None
Smell	Organic/dirt like	Organic/dirt like	Organic/dirt like	Organic/dirt like	Organic/dirt like

6. Visual Observation of Compost

Description	Week 2	Week 5	Week 10	Week 16	Week 26
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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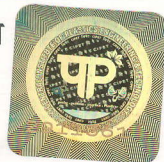
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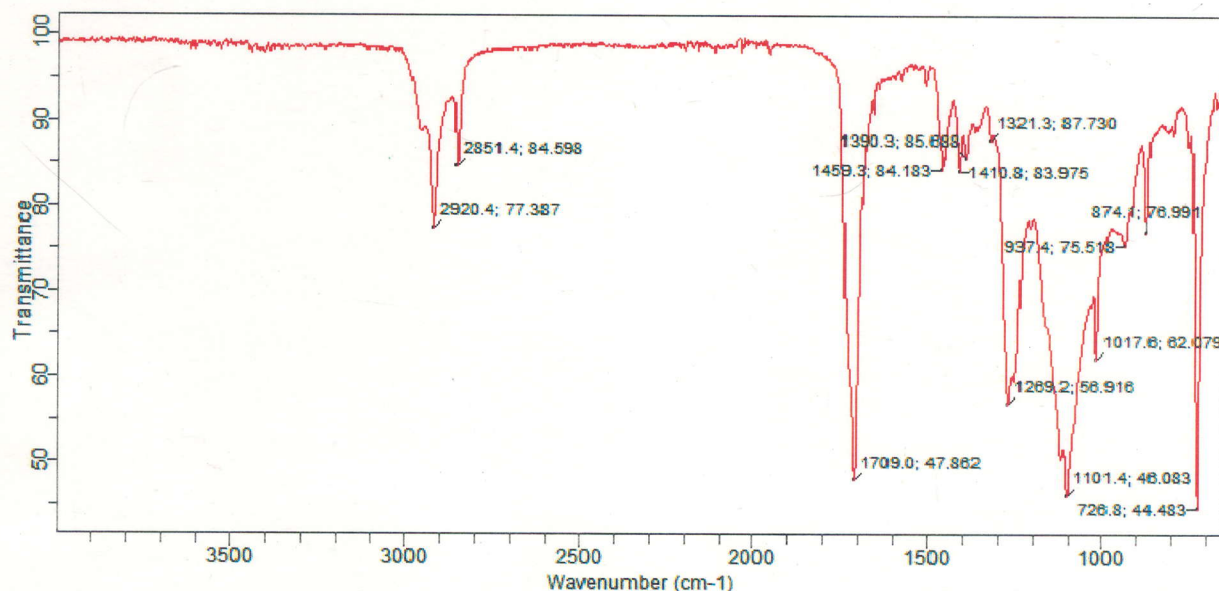
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Report No.: 2409

Date : 11.09.2020

6. FTIR Analysis

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



Wave number (cm ⁻¹)	Nature of Bond
1) 2920.4	C-H Stretching vibrations
2) 1709.0	C=O Stretching vibrations
3) 726.8	C-H Bending vibrations
4) 1269.2	C-O Stretching vibrations
5) 1017.6	C-O Stretching vibrations

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

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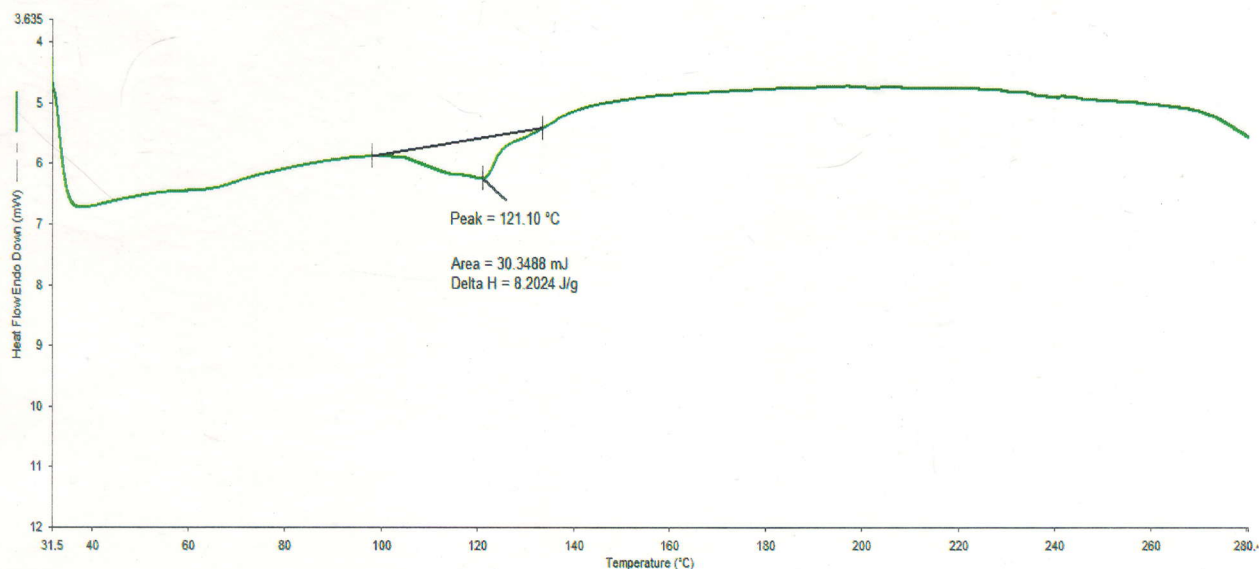
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7. DSC Analysis



Comment: The above DSC & FTIR analysis indicates the above sample is PLA(Polylactic acid) /PBAT Polybutylene Adipate co-terephthalate (PBAT)

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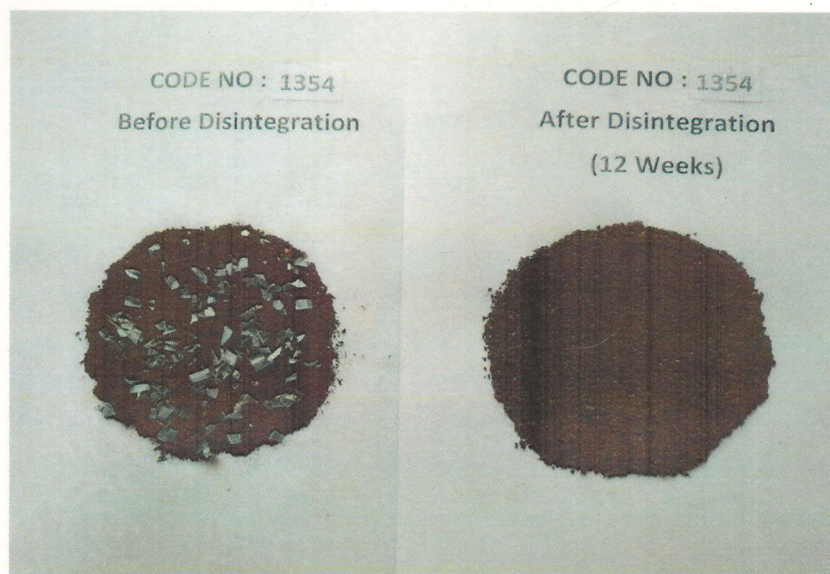
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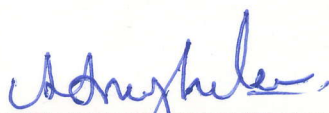
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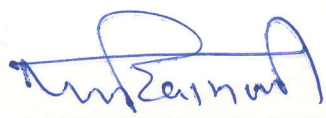
Date : 11.09.2020

1. DISINTEGRATION - AFTER 12 WEEKS



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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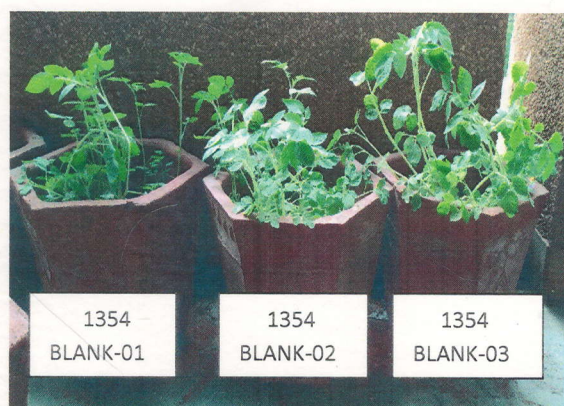
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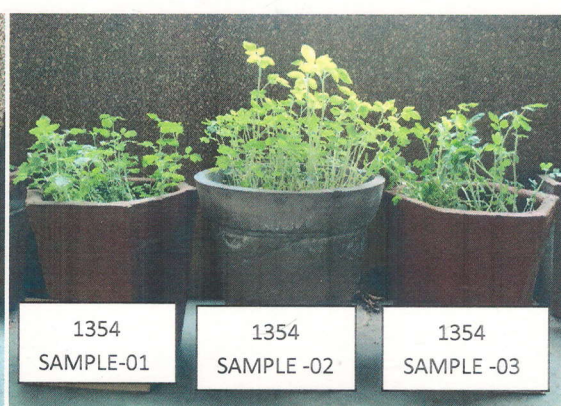
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9. GERMINATION AND PLANT GROWTH STUDY



1354 Compost (Control)



1354 Compost (Sample)



1354 Compost (Control)



1354 Compost (Sample)

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

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