

सिपेट : पेट्रोकेमिकल्स तकनीकी
संस्थान (आई.पी.टी.)

(पूर्व में केंद्रीय प्लास्टिक्स इंजीनियरिंग एवं तकनीकी संस्था)

रसायन एवं पेट्रो-रसायन विभाग

रसायन एवं उर्वरक मंत्रालय, भारत सरकार

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ANALYSIS REPORT प्लास्टिक परीक्षण केंद्र / PLASTIC TESTING CENTRE

श्रृंखला:बी / Series : C

परीक्षण रिपोर्ट / TEST REPORT

क्र.सं / S.L. No.

20287

को जारी / Issued to **SUPER GREEN INDUSTRIES**
Shed No.13, Reliable Compound,
Dilip Nagar, Ratlam, M.P.- 457001

रिपोर्ट सं / Test Report No : 1685

दिनांक / Dated : 02.02.2024

संदर्भ / Your Ref. No. : NIL

दिनांक / Dated : 30.06.2023

As per part C

मानक के अनुसार टेस्ट रिपोर्ट

Test Report as per Standard :

PART A

PARTICULARS OF SAMPLE SUBMITTED

- a) Name of the sample(as stated by the party) : **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 : In Sealed Carton
(Sealed carton/poly pouch/container or not)
- f) Date of receipt of sample : 30.06.2023
- g) Date of Performance of test : 15.07.2023
- h) Date of Completion : 02.02.2024
- i) 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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**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)	ISO 17088:2021 Cl.6.2.1	%	9.2	Not more than 10%
3.	Ultimate aerobic Biodegradation (with reference to 100% degradation of positive reference	ISO 17088:2021 Cl.6.3.1	%	92.86	>90 (At the end of the test period not more than 180 days)
4.	Plant growth study- Monocotyledon(Sorghum) % Seed emergence	ISO 17088:2021 Cl.6.4.3	%	93.5	>90
	Dicotyledon(tomato) % Seed emergence		%	96	>90
5.	Acute Ecotoxic effects to earthworm	ISO 17088:2021		100	>90
a.	Survival adult earthworm at the end of 7 days	Cl.6.4.4			
b.	Survival adult earthworm at the end of 14 days		%	97.5	>90
c.	Biomass at the end of 14 days			95.25	>90
6.	Chronic Ecotoxic effects to earthworm	ISO 17088:2021		96	>90
a.	Survival adult earthworm at the end of 28 days	Cl.6.4.5			
b.	Survival adult earthworm at the end of 56 days		%	94	>90
c.	Biomass at the end of 56 days			92.31	>90
d.	Offspring at the end of 56 days			92	>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
7.	Heavy metals concentrations #	ISO 17088:2021	mg/l		
	Arsenic (As)			0.38	20
	Copper (Cu)			8.17	500
	Nickel (Ni)			3.12	100
	Zinc (Zn)			38.71	2500
	Cobalt (Co)			0.58	---
	Chromium (Cr)			5.05	300
	Molybdenum (Mo)			0.06	---
	Mercury (Hg)			B.L.Q(Q.L.=0.05)	10
	Cadmium (Cd)			0.33	20
	Lead (Pb)			1.36	500
	Selenium (Se)			0.35	---

*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): # Gujarat Laboratory

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Annexure-I

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

Customers Details:

Name of the Party :- SUPER GREEN INDUSTRIES

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

2. Material Identification by FTIR & DSC : Blends of poly lactic Acid (PLA)/ Poly Butylene 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

: 53.9 %

Volatile Solid

: 35.12 %

CO₂ evolved during 1st 10 days

in blank vessels

: 54.4 mg/g of volatile solids of compost

Test Duration

: 110 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	8.1	7.4
2	Blank 2	8.3	8.2
3	Blank 3	8.2	8.1
4	Cellulose 1	7.8	8.2
5	Cellulose 2	7.6	7.4
6	Cellulose 3	8.5	8.0
7	Negative 1	7.8	7.0
8	Negative 2	7.2	7.5
9	Negative 3	8.5	8.5
10	Sample 1	7.7	8.3
11	Sample 2	8.1	8.0
12	Sample 3	7.5	7.2

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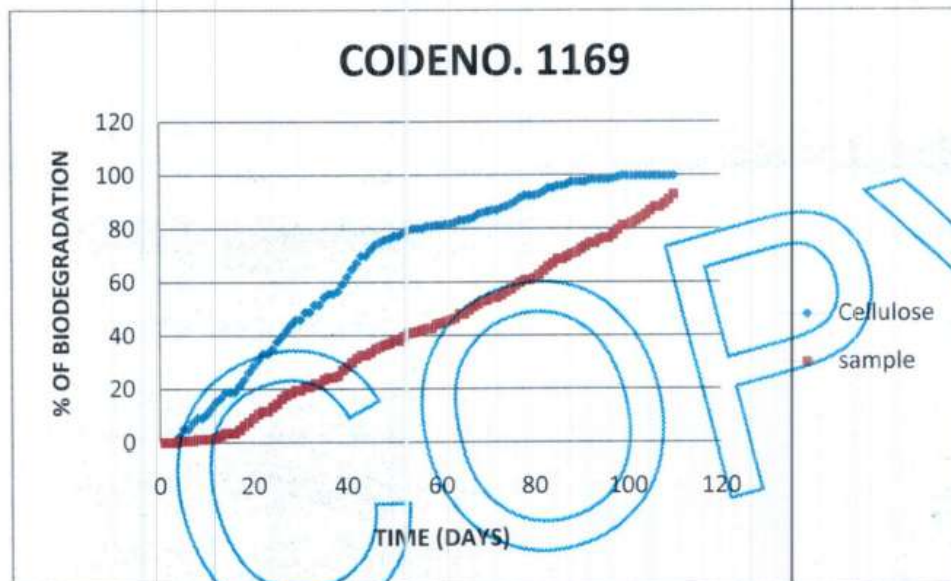
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4. Result : Percentage biodegradation relative to positive reference

MEAN (%) : 92.86 %

The reference material- Cellulose (%) : 100%



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5. Visual Observation of Sample

Description	Week 1	Week 3	Week 8	Week 13	Week 16
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 3	Week 8	Week 13	Week 16
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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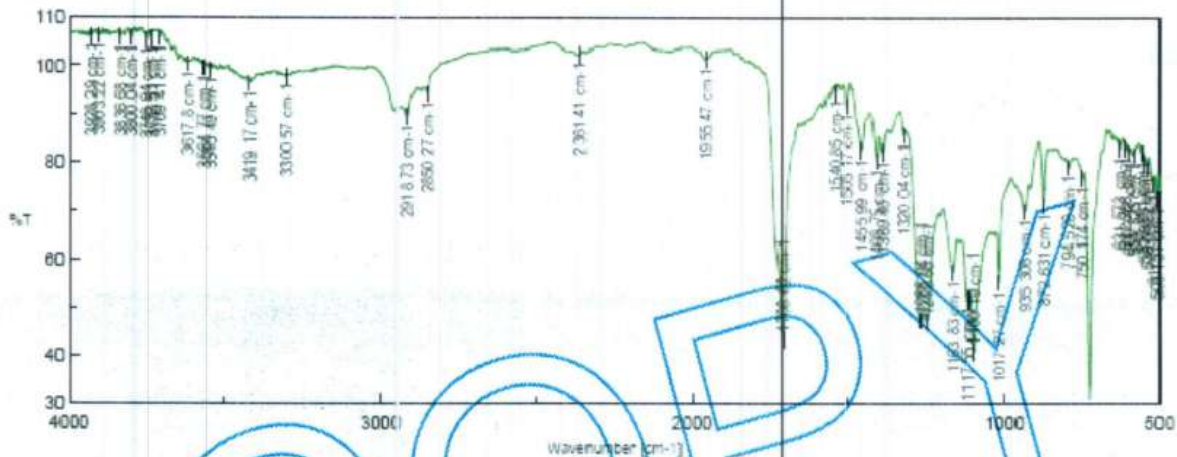
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7. FTIR Analysis

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

BIO 1169 JWS



Wave number (cm ⁻¹)	Nature of Bond
1) 2918.73	C - H Stretching vibrations
2) 1706.62	C = O Stretching vibrations
3) 1248.64	O - H Bending vibrations
4) 1017.27	C - N Stretching vibrations
5) 872.631	C = C Bending vibrations

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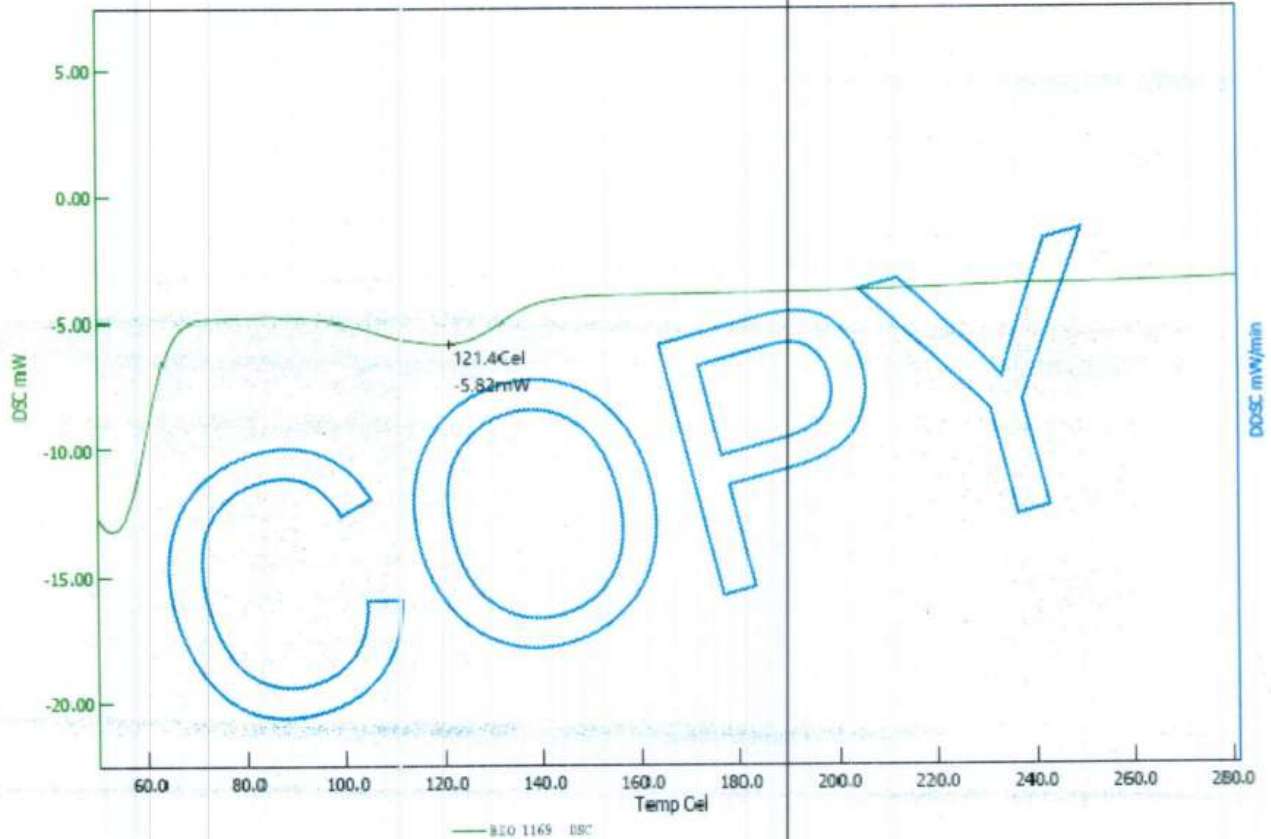
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ANALYSIS REPORT

Report No.: 1685

Date : 02.02.2024

8. DSC Analysis



Comment: The above FTIR & DSC analysis indicates the above sample is Blends of poly lactic Acid (PLA)/ Poly Butylene Adipate Co- Terephthalate (PBAT) Compostable Film .

AUTHORISED SIGNATORY

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सहा. तक. अधिकारी / **Asst. Technical Officer**

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तक. अधिकारी / **Technical Officer**

**सिपेट : पेट्रोकेमिकल्स तकनीकी
संस्थान (आई.पी.टी.)**

(पूर्व में केंद्रीय प्लास्टिक्स इंजीनियरिंग एवं तकनीकी संस्थान)

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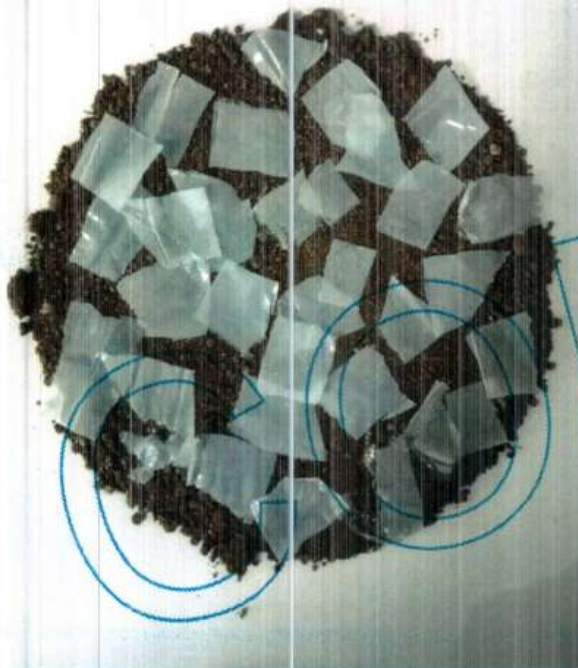
Report No.: 1685

Date : 02.02.2024

9. DISINTEGRATION - AFTER 12 WEEKS

CODE NO : 1169

Before Disintegration



BEFORE DISINTEGRATION

CODE NO : 1169

After Disintegration

(12 Weeks)



AFTER DISINTEGRATION

The disintegration of the sample by passing through 2 mm sieve after 12 week in composting condition as per ISO 17088-2021/ISO 17088: 2012 was found not more than 10% of original dry mass remain.


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(पूर्व में केंद्रीय प्लास्टिक्स इंजीनियरिंग एवं तकनीकी संस्था)

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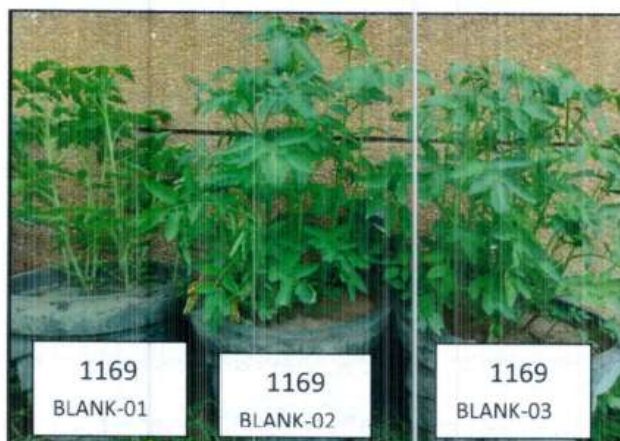
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ANALYSIS REPORT

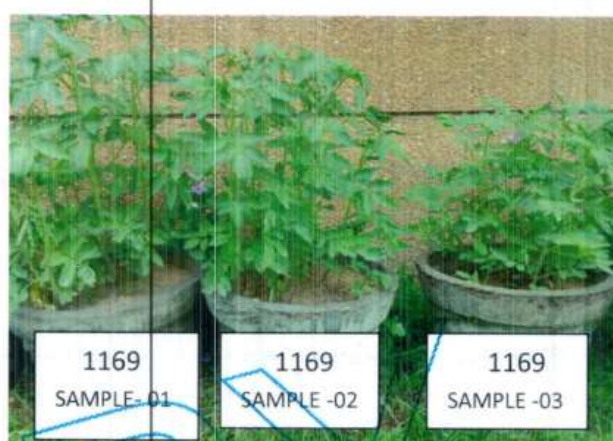
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10. GERMINATION AND PLANT GROWTH STUDY



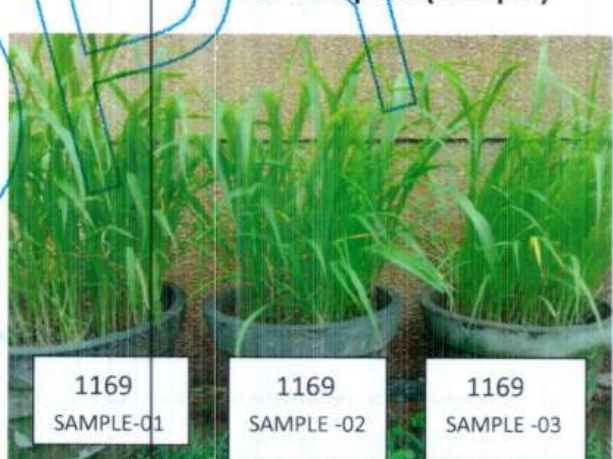
1169 Compost (Control)



1169 Compost (Sample)



1169 Compost (Control)



1169 Compost (Sample)

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

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