

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



CIPET : INSTITUTE OF PLASTICS
TECHNOLOGY (IPT)

Department of Chemicals & Petrochemicals
Ministry of Chemicals & Fertilizers, Govt. of India
Plot No. 630, Phase-IV, G.I.D.C., Vatva,
Ahmedabad - 382 445.

Tele : (079) 40103900-902, 925, Fax : (079) 40083905
E-mail : cipetahmd@gmail.com | ahmedabad@cipet.gov.in
Web.: www.cipet.gov.in

Head Office : CIPET, Guindy, Chennai - 600 032

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रसायन एवं उर्वरक मंत्रालय, भारत सरकार
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PLASTICS TESTING CENTRE
TEST CERTIFICATE

S.L. No. 2703

Series : I ANALYSIS REPORT

Issued to : M/S .Himalaya Greens-Sirmour
Shop No. 10, Below Hotel Prem Nisarga,
Nahan, Dist. Sirmour
Sirmour- 173 001
Phone No. 7730000012
E-mail: himalayagreens@gmail.com

Test Report No : 2768
Dated : 20.07.2021
Your Ref. No. : NIL
Dated : 27.11.2020

Test Report as per Standard : As per part C

PART A

ULR No. TC816421000001742P

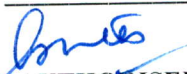
PARTICULARS OF SAMPLE SUBMITTED

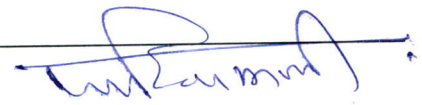
- a) Name of the sample(as stated by the party) : Compostable Film Material
b) Grade/Variety/Type/Size/Class etc. : ---
c) Code No. : ---
d) Quantity (pcs/mtr/gm/nos) : 2.5 Kg
e) Mode of packing : Individual Packs
(Sealed carton/poly pouch/container or not)
f) Date of receipt of sample : 27.11.2020
g) 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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PLASTICS TESTING CENTRE

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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 Material (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 | % | 9.3 | Not more than 10% |
| 3. | Ultimate aerobic Biodegradation (with reference to 100% degradation of positive reference) | IS 17088:2008 | % | 91.84 | >90 (At the end of the test period not more than 180 days) |
| 4. | Plant growth study Monocotyledon(Rice) % Seed emergence | IS 17088:2008 | % | 97.5 | >90 |
| | Dicotyledon(tomato) % 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) | | | 2.67 | 500 |
| iii. | Nickel (Ni) | | | 0.17 | 100 |
| iv. | Zinc (Zn) | | | 9.44 | 2500 |
| v. | Cobalt (Co) | | | B.L.Q (Q.L=0.05) | ---- |
| vi. | Chromium (Cr) | | | 0.37 | 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) | | | 0.97 | 500 |
| xi. | Selenium (Se) | | | B.L.Q (Q.L=0.05) | ---- |

*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.

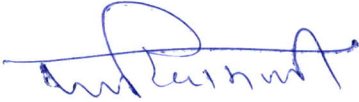
PART D

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 :- Himalaya Greens -Sirmour

1. Sample Details :- Compostable Film Material (As declared by the party)
2. Material Identification by FTIR &DSC : Blends of Polylactic Acid (PLA) /
Polybutyleneadipate 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 | : 54.9% |
| Volatile Solid | : 38.9% |
| CO ₂ evolved during 1 st 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 | 7.7 | 8.0 |
| 11 | Sample 2 | 8.3 | 8.3 |
| 12 | Sample 3 | 8.1 | 8.2 |

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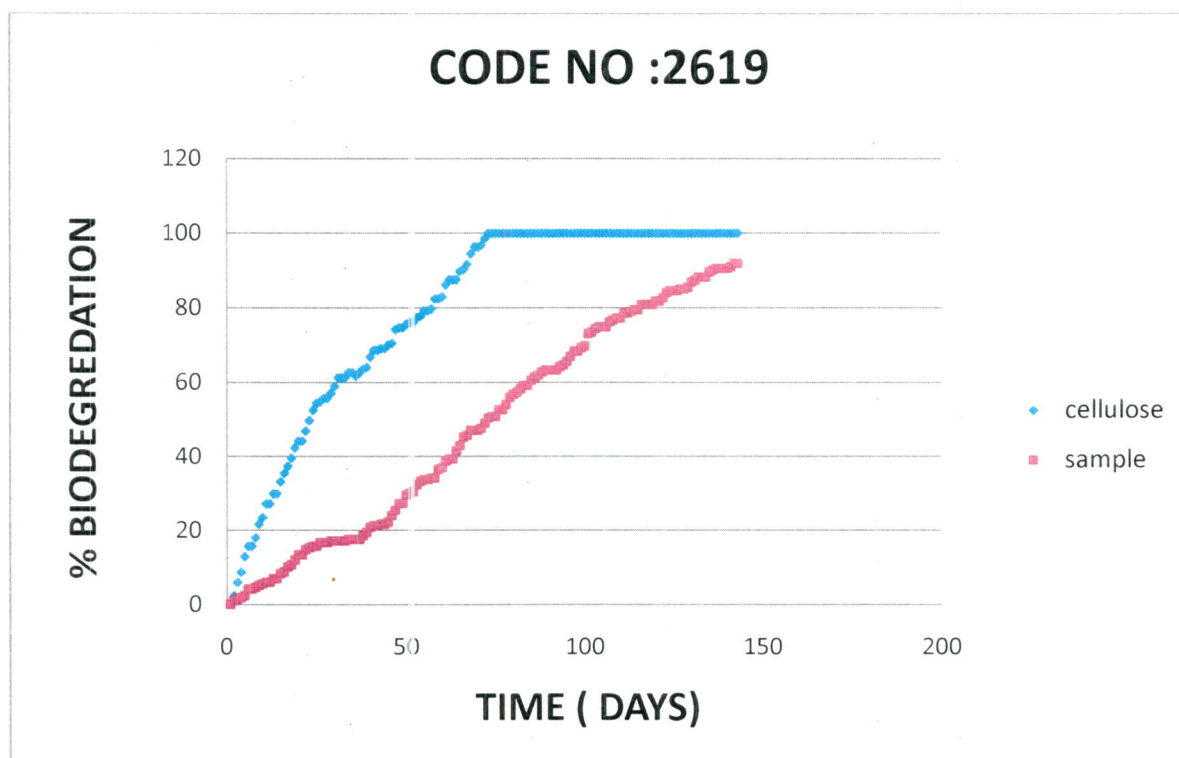
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4. Result: Percentage biodegradation relative to positive reference

MEAN (%) : 91.84%

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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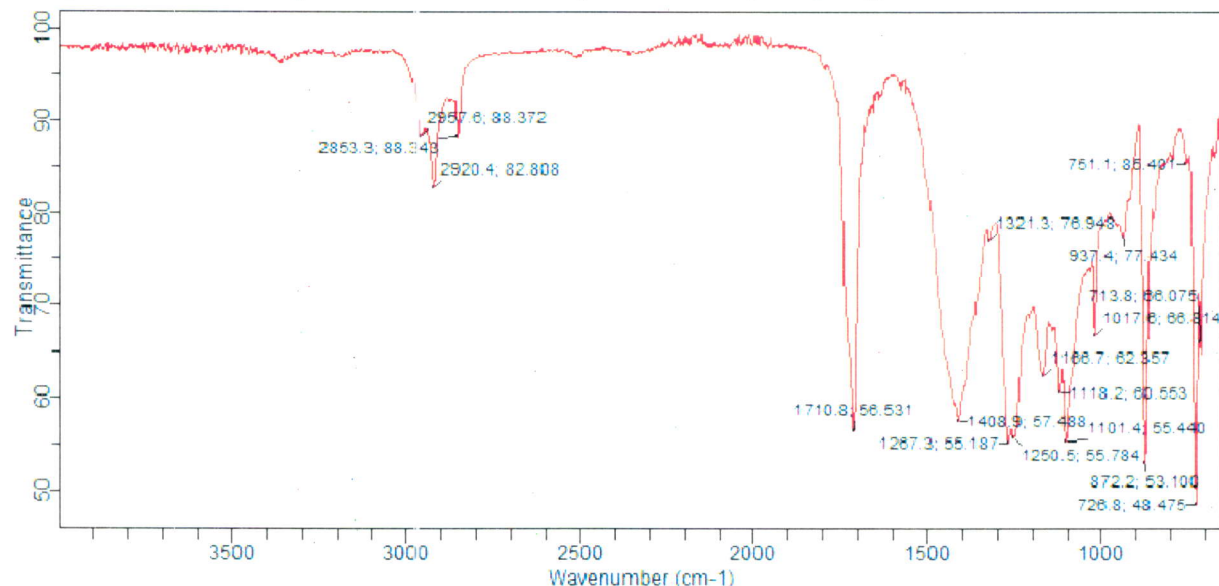
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7. FTIR Analysis

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



| Wave number (cm ⁻¹) | Nature of Bond |
|---------------------------------|-----------------------------|
| 1) 2920.4 | C - H Stretching vibrations |
| 2) 1710.8 | C = O Stretching vibrations |
| 3) 1408.9 | C - H Bending vibrations |
| 4) 1166.7 | C - O Stretching vibrations |
| 5) 726.8 | C - H Bending vibrations |


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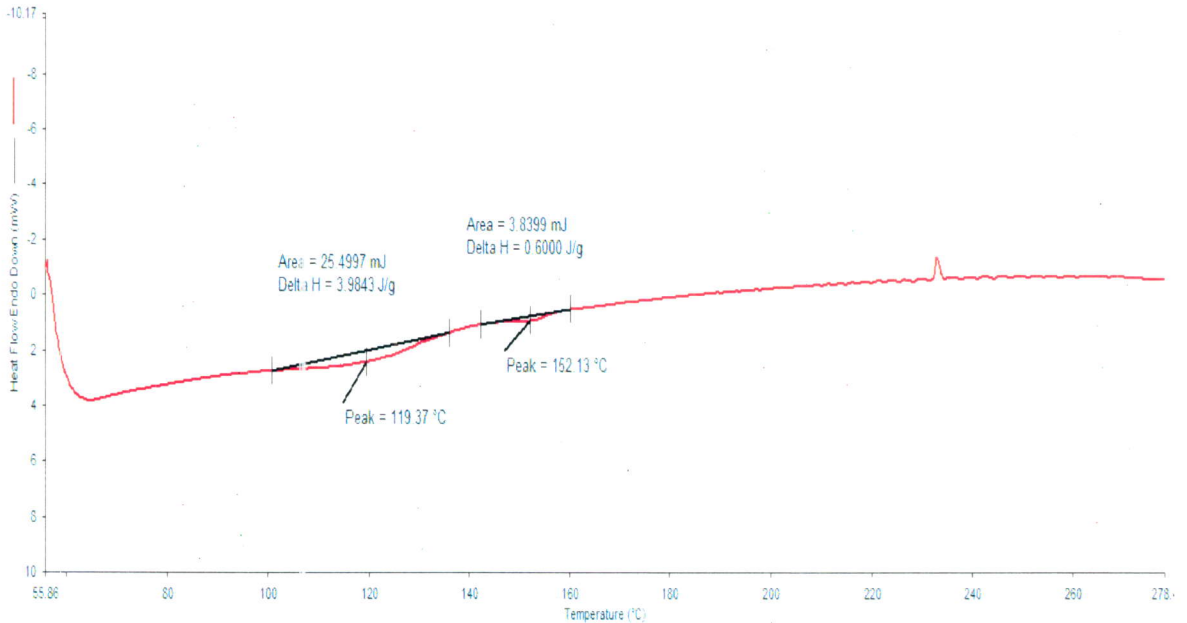
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8. DSC Analysis



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

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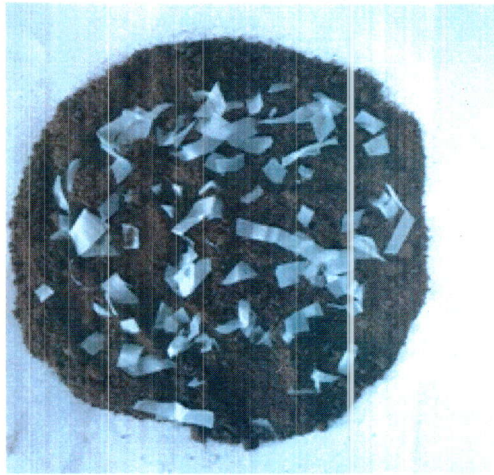
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9. DISINTEGRATION - AFTER 12 WEEKS



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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रसायन एवं पेट्रो रसायन विभाग
रसायन एवं उर्वरक मंत्रालय, भारत सरकार
प्लॉट नं. 630, फेज 4, जी.आई.डी.सी., वटवा, अहमदाबाद - 382 445.
दूरभाष : (079) 40103900-902, 925 फेक्स : (079) 40083905
ई-मेल : cipetahmd@gmail.com • ahmedabad@cipet.gov.in
वेबसाईट : www.cipet.gov.in
मुख्यालय : सिपेट, गिण्डी, चेन्नै - 600 032.



CIPET : INSTITUTE OF PLASTICS
TECHNOLOGY (IPT)

Department of Chemicals & Petrochemicals
Ministry of Chemicals & Fertilizers, Govt. of India
Plot No. 630, Phase-IV, G.I.D.C., Vatva,
Ahmedabad - 382 445.

Tele : (079) 40103900-902, 925, Fax : (079) 40083905
E-mail : cipetahmd@gmail.com | ahmedabad@cipet.gov.in
Web.: www.cipet.gov.in

Head Office : CIPET, Guindy, Chennai - 600 032

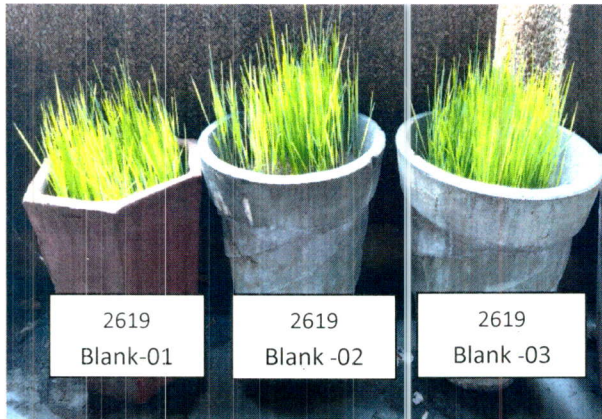
PLASTICS TESTING CENTRE

ANALYSIS REPORT

Report No.: 2768

Date : 20.07.2021

10. GERMINATION AND PLANT GROWTH STUDY



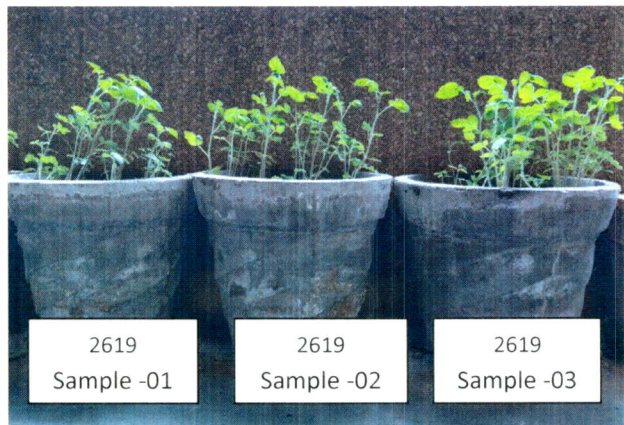
2619 Compost (Control)



2619 Compost (Sample)



2619 Compost (Control)



2619 Compost (Sample)

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

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