

**सिपेट: पेट्रोकेमिकल्स तकनीकी
संस्थान (आईपीटी)**

रसायन एवं पेट्रोरसायन विभाग

रसायन एवं उर्वरक मंत्रालय, भारत सरकार
गिर्णी, चेन्नई - 600 032.

फोन : 91-44-2225 4701 (6 लाइन)

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वेबसाइट : www.cipet.gov.in



सिपेट CIPET



**CIPET: INSTITUTE OF PETROCHEMICALS
TECHNOLOGY (IPT)**

Department of Chemicals & Petrochemicals
Ministry of Chemicals & Fertilizers, Govt. of India
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Website : www.cipet.gov.in

संदर्भ/Ref: परीक्षण/TR/ 23061033

दिनांक/Date: 19-03-2024

प्रति /To,

Vasco Bio Bag Enterprises

D.P.No.81, SIDCO Industrial Estate Sengarai, Sengarai,
Uthukottai, Tamil Nadu 602026.

विषय/Sub : Testing of samples-reg.

संदर्भ/Ref : Your letter no. --

Dated: 30-06-2023

महोदय,

| | | | |
|--|-------|-----------------|------------|
| कृपया हमारी परीक्षण रिपोर्ट क्रमांक प्राप्त करें। Please find enclosed herewith our Test Report no. | 76005 | दिनांक dated | 19-03-2024 |
|--|-------|-----------------|------------|

धन्यवाद,

भवदीय
Balaji
अधिकृत हस्ताक्षरकर्ता

संलग्न : उपर्युक्तानुसार

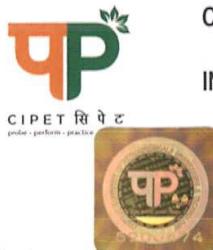
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मुख्यालय : सिपेट, गिर्णी, चेन्नई - 600 032. Head office : CIPET, Guindy, Chennai - 600 032.

केन्द्र : अहमदाबाद, अमृतसर, औरंगाबाद, अगरतला, बद्दी, बालासोर, बैंगलुर, ओपाल, भुवनेश्वर, भावनगर, भागलपुर, बन्द्रपुर, चेन्नई, देहरादून, दिल्ली, गुवाहाटी, ज्वालियर, हैदराबाद, हाजीपुर, हॉलिया, इम्काल, जयपुर, कोच्चि, कोरबा, लखनऊ, मुद्रे, मुरथल, मैसूरू, नवसारी, पालक्काड, रायपुर, रौची, तामोर, वालसाड, वाराणसी एवं विजयवाडा
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केंद्रीय पेट्रोरसायन अभियांत्रिकी एवं
प्रौद्योगिकी संस्थान
पेट्रोकेमिकल्स तकनीकी संस्थान

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CENTRAL INSTITUTE OF PETROCHEMICALS
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को जारी /
Issued to :

परीक्षण रिपोर्ट / TEST REPORT

क्र.सं / Sl. No. 34880

रिपोर्ट सं / REPORT NO. : 76005

दिनांक / Date : 19-03-2024

Pages..... Nos. Part A,B,C & D

30-06-2023

संदर्भ / Customer Ref. No. --

परीक्षण मानक स्तर के अनुसार परीक्षण रिपोर्ट / TEST REPORT AS PER TEST STANDARD : Refer Part C

भाग - क / PART - A

प्रस्तुत सैपिल का विवरण / PARTICULARS OF SAMPLE SUBMITTED

- | | |
|--|--|
| अ) सैपिल का नाम / a) Name of the Sample | : PBAT Compostable Film - as stated by the party |
| आ) सैपिल प्राप्त होने की तारीख / b) Date of Receipt of sample | : 30-06-2023 |
| इ) ग्रेड/प्रकार/आकार/वर्ग / c) Grade / variety / type / size / class | : Nil |
| ई) घोषित मूल्य / d) Declared value, If any | : Nil |
| उ) कोड सं. / e) Code No. | : Nil |
| ऊ) बैच सं. एवं निर्माण तारीख / f) Batch No. and Date of Manufacture: | : Nil |
| ऋ) मात्रा / g) Quantity | : 2 kg |
| ए) पैकिंग की रीति / h) Mode of Packing | : packed in film |
| ऐ) मोहर बंद या नहीं / i) Sealed or not | : Not Sealed |
| ओ) कोई अन्य सूचना / j) Any other information | : -- |

23061033

भाग - ख / PART - B

अनुपूरक सूचनाएँ / SUPPLEMENTARY INFORMATIONS

- | | |
|---|----------------------------------|
| अ) सैपिलिंग कार्यवाहियों हेतु संदर्भ / a) Reference to sampling procedure | : Sampling not done by this lab |
| आ) माप करने हेतु लिए गए सहायक दस्तावेज एवं प्राप्त परिणाम b) Supporting documents for the measurement taken and result derived | : As given in Part C |
| इ) संबंधित कार्य अनुदेशों में निर्धारित के अनुसार परीक्षण रीति से कोई परिवर्तन c) Deviation from the test method as prescribed in relevant work instructions, if any | : No deviation from the standard |

T.B.C.

Aditya

1 of 8

केंद्रीय पेट्रोरसायन अभियांत्रिकी एवं
प्रौद्योगिकी संस्थान
पेट्रोकेमिकल्स तकनीकी संस्थान

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परीक्षण रिपोर्ट/TEST REPORT

रिपोर्ट सं / REPORT NO. : **76005**

क्र.सं / Sl. No. **34880**

दिनांक / Date : **19-03-2024**

भाग - ग / PART - C

परीक्षण परिणाम / TEST RESULTS

Test Duration: 14.08.2023 to 19.03.2024

| Sl.No | Name of the Test | Test Method/ Standard | Unit | Results Obtained | Specified Requirements |
|-------|--|----------------------------|------|--|--|
| 1 | Material Identification | FTIR & DSC | - | Poly butylene adipate co- terephthalate (PBAT) | - |
| 2 | Disintegration (Dry mass remains in 2 mm sieve after 84 days) | ISO 17088:2021 | % | 8.4 | No more than 10% |
| 3 | Ultimate aerobic Biodegradation (with reference to 100% degradation of positive reference) | ISO 17088:2021 | % | 91.2 (at the end of 135 days) | > 90 (at the end of the test period not more than 180 days.) |
| 4 | Plant Growth study Monocotyledon (Onion) % Seed emergence | ISO 17088:2021 | % | 100 | > 90 |
| | Dicotyledon (Fenugreek) % Seed Emergence | Cl.6.4.3 | % | 91 | > 90 |
| 5 | Acute Ecotoxic effects to earthworm | | | | |
| a | Survival of adult earthworm at the end of 7 days | ISO:17088:2021 Cl.6.4.4 | % | 100 | > 90 |
| b | Survival of adult earthworm at the end of 14 days | | | 100 | > 90 |
| c | Biomass end of the 14 days | | | 98 | > 90 |
| 6 | Chronic Ecotoxic effects to earthworm | | | | |
| a | Survival of adult earthworm at the end of 28 days | ISO:17088:2021 Cl.6.4.5 | % | 93 | > 90 |
| b | Survival of adult earthworm at the end of 56 days | | | 98 | > 90 |
| c | Offspring at the end of 56 days | | | 94 | > 90 |
| d | Biomass end of the 56 days | | | 100 | > 90 |

The detailed observation on biodegradability test is enclosed as Annexure

Contd.

Issued to:
M/s. Vascō Bio Bag Enterprises
D.P.No.81, SIDCO Industrial Estate Sengarai,
Uthukottai, Tamil Nadu 602026.
Ref. Letter Dated. 30-06-2023

2 of 8

AUTHORISED SIGNATORY

Dr. Radhashyam Giri
Technical Officer

AUTHORISED SIGNATORY

S. Udhayamalar,
Sr. Technical Officer

रिपोर्ट सं / REPORT NO. :

परीक्षण परिणाम / TEST RESULTS

दिनांक /Date :

76005

19-03-2024

Issued to: M/s. Vasco Bio Bag Enterprises
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Sengarai, Uthukottai, Tamil Nadu 602026.

Customer Letter Ref. Letter dated. 30-06-23.

PART C - TEST RESULTS

| SI.No | Name of the Test | Test Method/ Standard | Unit | Results Obtained | Specified Requirements* |
|-------|----------------------------|--------------------------|-------|------------------|-------------------------|
| 7 | Heavy metals concentration | | | | |
| a. | Arsenic (As) | | | 1.365 | 10 |
| b. | Copper (Cu) | | | 2.094 | 300 |
| c. | Nickel (Ni) | | | 0.998 | 50 |
| d. | Zinc (Zn) | | | 4.661 | 1000 |
| e | Cobalt (Co) | ISO 17088:2021 | mg/kg | 2.189 | - |
| f. | Chromium (Cr) | | | 6.904 | 50 |
| g. | Molybdenum (Mo) | | | 0.045 | - |
| h. | Mercury (Hg) | | | 0.005 | 0.15 |
| i. | Cadmium (Cd) | | | 0.198 | 5 |
| j. | Lead (Pb) | | | 3.975 | 100 |
| k. | Selenium (Se) | | | 0.489 | - |

* Based on Municipal solid waste (Management and Handling) Rules, 2016 notified on 8th April, 2016 by Ministry of Environment , Forests and climate change, Government of India. Note that concentration of metals like cobalt, molybdenum, and selenium is not mentioned in the notification.

PART D - REMARKS

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): Nil

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76005

परीक्षण परिणाम / TEST RESULTS

दिनांक /Date :
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Sengarai, Uthukottai, Tamil Nadu 602026.

Customer Letter Ref. Letter dated. 30-06-23.

OBSERVATION FOR BIODEGRADABILITY TEST AS PER ISO 17088:2021

- 1 Sample Details (As stated by Party): PBAT Compostable Film
- 2 Material Identification by FTIR : Poly butylene adipate co- terephthalate (PBAT)

BIODEGRADABILITY TEST AS PER ISO:14855-1

- (i) Conditions of reaction mixtures
Origin of Compost: Livestock excrement, municipal and vegetable waste
Reaction Temperature (°C) : 58
Dry Solid (%) : 54.2
Volatile content (%) : 13.5
CO₂ evolved during first 10days in blank : 51.92 mg/g
Test duration (days) : 135 days
Reference material : Cellulose
Volume of reaction vessel (mL) : 3000 mL
(ii) pH of test medium :

| S.No. | Compost Vessel | pH (Before) | pH (After) |
|-------|----------------|-------------|------------|
| 1 | Blank 1 | 7.2 | 7.1 |
| 2 | Blank 2 | 7.2 | 7.1 |
| 3 | Blank 3 | 7.3 | 7.1 |
| 4 | Cellulose 1 | 7.4 | 7.2 |
| 5 | Cellulose 2 | 7.4 | 7.2 |
| 6 | Cellulose 3 | 7.3 | 7.3 |
| 7 | Negative 1 | 7.2 | 7.2 |
| 8 | Negative 2 | 7.2 | 7.1 |
| 9 | Negative 3 | 7.3 | 7.2 |
| 10 | Sample 1 | 7.2 | 7 |
| 11 | Sample 2 | 7.4 | 7.3 |
| 12 | Sample 3 | 7.3 | 7.2 |

Contd.,


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रिपोर्ट सं / REPORT NO. :
76005

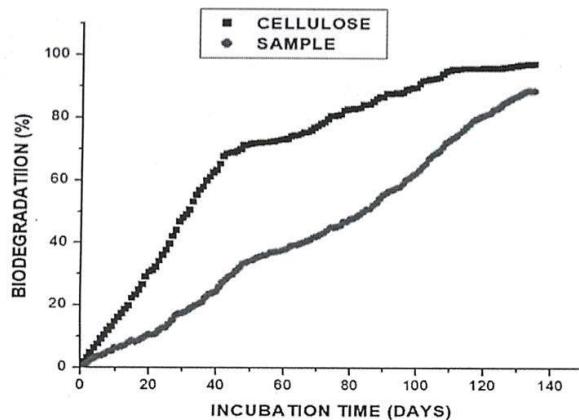
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दिनांक /Date :
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4 Result: Percentage biodegradation relative to positive reference

Sample (Mean) : 91.2 % at the end of 135 days
The reference Material - cellulose : ~ 100%



5 Visual Observation of Sample

| Description | Week 1-3 | Week 4-6 | Week 7-9 |
|--------------------|-------------------------|-------------------------|-------------------------|
| Structure | Cut pieces | Cut pieces | Fragmented pieces |
| Moisture | Adequate moisture Level | Adequate moisture Level | Adequate moisture Level |
| Colour | White | Dirty | Dirty |
| Fungal Development | None | None | None |
| Smell | Organic/dirt like | Organic/dirt like | Organic/dirt like |
| Description | Week 10-12 | Week 13-15 | Week 16-19 |
| Structure | Fragmented pieces | Fragmented pieces | Fragmented pieces |
| Moisture | Adequate moisture Level | Adequate moisture Level | Adequate moisture Level |
| Colour | Dirty | Dirty | Dirty |
| Fungal Development | None | None | None |
| Smell | Organic/dirt like | Organic/dirt like | Organic/dirt like |

Contd.,

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5 of 8
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परीक्षण परिणाम / TEST RESULTS

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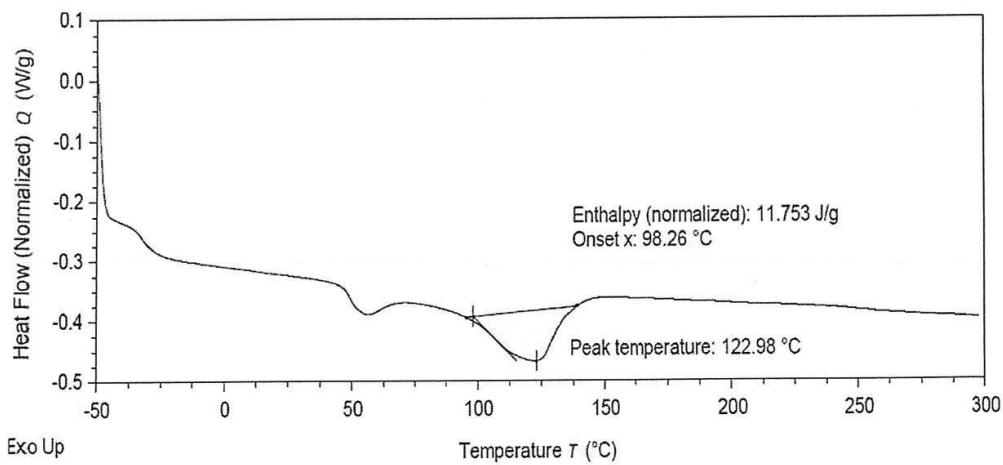
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6 Visual Observation of Compost

| Description | Week 1-3 | Week 4-6 | Week 7-9 |
|--------------------|-------------------------|-------------------------|-------------------------|
| Structure | Fine Particles | Fine Particles | Fine Particles |
| Moisture | Adequate moisture Level | Adequate moisture Level | Adequate moisture Level |
| Colour | Dark Brown | Dark Brown | Dark Brown |
| Fungal Development | Nil | Nil | Nil |
| Smell | Organic/dirt like | Organic/dirt like | Organic/dirt like |

| Description | Week 10-12 | Week 13-15 | week 16-19 |
|--------------------|-------------------------|-------------------------|-------------------------|
| Structure | Fine Particles | Fine Particles | Fine Particles |
| Moisture | Adequate moisture Level | Adequate moisture Level | Adequate moisture Level |
| Colour | Dark Brown | Dark Brown | Dark Brown |
| Fungal Development | Nil | Nil | Nil |
| Smell | Organic/dirt like | Organic/dirt like | Organic/dirt like |

7 DSC Analysis



Contd.,

6 of 8


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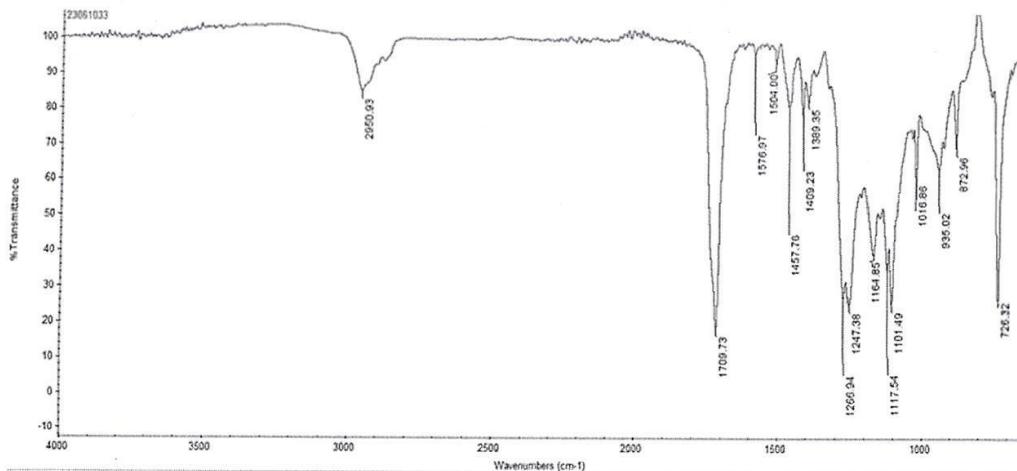
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8 FTIR Analysis



FTIR Interpretation

| Wave number (cm⁻¹) | Nature of Bond |
|--------------------|-------------------|
| 2950 | C-H stretch |
| 1709 | C=O stretch |
| 1389 | C=C stretch |
| 1247 | C-H in Plane bend |
| 1016 | C-O stretch |
| 872 | C-H bend |
| 726 | C-H bend |

Comment: The above DSC & FTIR analysis indicates the above sample is Poly butylene adipate co- terephthalate (PBAT)

Contd.,

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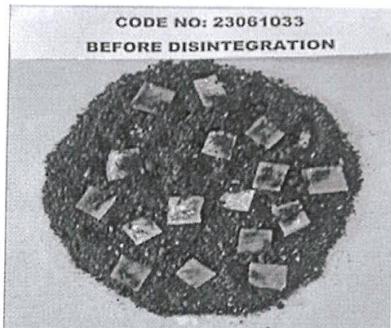
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9 Disintegration After 12 Weeks



Before Disintegration



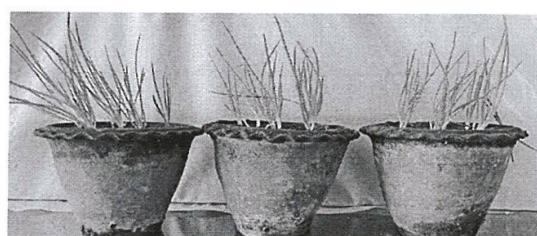
After Disintegration

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

10 Plant growth study



Fresh compost with Onion seeds



Bio-degradation tested compost with Onion seeds



Fresh compost with Fenugreek seeds



Bio-degradation tested compost with Fenugreek seeds *8 of 8*

The percentage of seed germination rate is found to be greater than 90% for both Onion and Fenugreek

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