

सिपेट: पेट्रोकेमिकल्स तकनीकी
संस्थान (आईपीटी)

रसायन एवं पेट्रोसायन विभाग
रसायन एवं उर्वरक मंत्रालय, भारत सरकार
गिण्डी, चेन्नई - 600 032.
फोन : 91-44-2225 4701 (6 लाइन)
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वेबसाइट : www.cipet.gov.in



CIPET: INSTITUTE OF PETROCHEMICALS
TECHNOLOGY (IPT)

Department of Chemicals & Petrochemicals
Ministry of Chemicals & Fertilizers, Govt. of India
Guindy, Chennai - 600 032.
Phone : 91 - 44 2225 4701 (6 Lines)
Email : chennai@cipet.gov.in
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
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धन्यवाद,

भवदीय

अधिकृत हस्ताक्षरकर्ता

संलग्न : उपर्युक्तानुसार
Encl:1.a/a.

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

केन्द्र : अहमदाबाद, अमृतसर, औरंगाबाद, अगरतला, बर्ही, बालासोर, बेंगलूर, भोपाल, भुवनेश्वर, भावनगर, भागलपुर, चन्द्रपुर, चेन्नई, देहरादून, दिल्ली, गुवाहाटी, ग्वालियर, हैदराबाद, हाजीपुर, हल्दिया, इम्फाल, जयपुर, कोच्चि, कोरबा, लखनऊ, मद्रुरै, मुरथल, मैसूरु, नवसारी, पारादीप, पालक्काड, रायपुर, राँची, तामोत, वालसाड, वाराणसी एवं विजयवाडा
Centers : Ahmedabad, Amritsar, Aurangabad, Agartala, Baddi, Bengaluru, Bhopal, Bhubaneswar, Bhavnagar, Bhagalpur, Chandrapur, Chennai, Dehradun, Delhi, Guwahati, Gwalior, Hyderabad, Hajipur, Haldia, Imphal, Jaipur, Kochi, Korba, Lucknow, Madurai, Murthal, Mysuru, Navsari, Paradip, Palakkad, Rajpur, Ranchi, Tamot, Valsad, Varanasi & Vijayawada

केंद्रीय पेट्रोसायन अभियांत्रिकी एवं
प्रौद्योगिकी संस्थान
पेट्रोकेमिकल्स तकनीकी संस्थान

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परीक्षण रिपोर्ट / TEST REPORT

को जारी /
Issued to :

Vasco Bio Bag Enterprises

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

क्र.सं / SI. No. **34880**

रिपोर्ट सं / REPORT NO. : **76005**

दिनांक / Date : **19-03-2024**

Pages.....**8**.....Nos. Part A,B,C & D

संदर्भ / Customer Let. Ref : --

30-06-2023

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

PPC

Aditya

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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	CI.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 CI.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 CI.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. Vasco Bio Bag Enterprises
D.P.No.81, SIDCO Industrial Estate Sengarai,
Uthukotta i, Tamil Nadu 602026.
Ref. Letter Dated. 30-06-2023

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AUTHORISED SIGNATORY
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Technical Officer


AUTHORISED SIGNATORY
S. Udhayamalar,
Sr. Technical Officer

रिपोर्ट सं / REPORT NO. :

परीक्षण परिणाम / TEST RESULTS

दिनांक /Date :

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19-03-2024

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PART C - TEST RESULTS

Sl.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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रिपोर्ट सं / REPORT NO. :
76005

परीक्षण परिणाम / TEST RESULTS

दिनांक /Date :
19-03-2024

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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

- 3 Observation
 - (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		
2	Blank 2	7.2	7.1
	Blank 3	7.2	7.1
4	Cellulose 1	7.3	7.1
5	Cellulose 2	7.4	7.2
6	Cellulose 3	7.4	7.3
7	Negative 1	7.3	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	7.4	7.3
		7.3	7.2

Contd.,


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रिपोर्ट सं / REPORT NO. :
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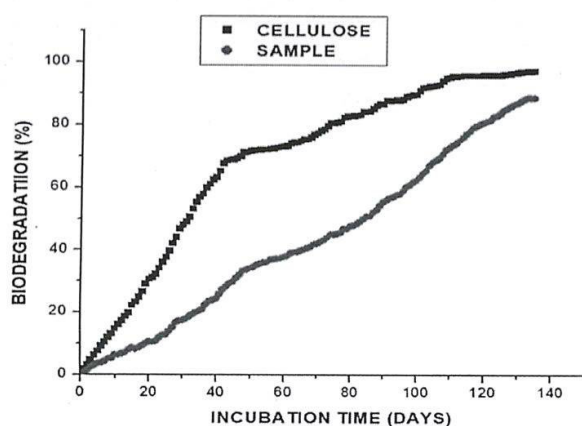
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दिनांक /Date :
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Customer Letter Ref. Letter dated. 30-06-23.

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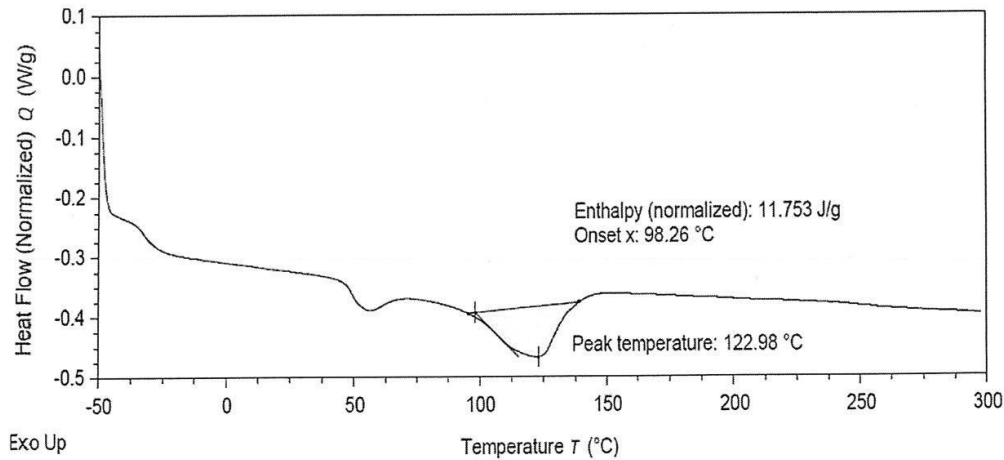
Customer Letter Ref. Letter dated. 30-06-23.

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.,

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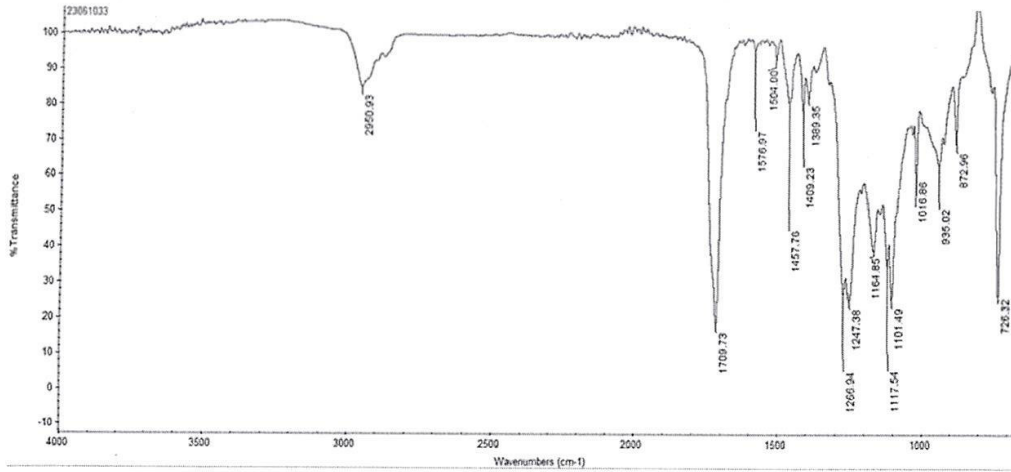
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8 FTIR Analysis



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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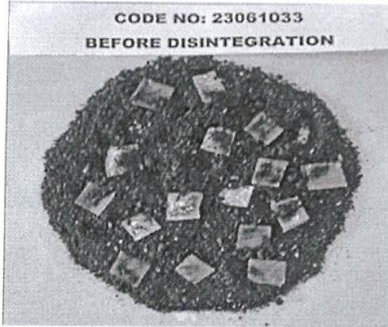
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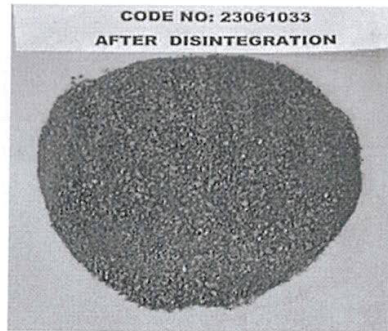
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9 Disintegration After 12 Weeks



Before Disintegration



After Disintegration

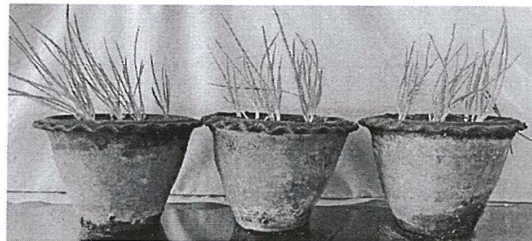
The disintegration of the supplied sample by passing through 2 mm sieve after 12 week in composting condition as per ISO 17088-2021 was found not more than 10% of original dry mass remain.

10 Plant growth study



REP-1 REP-2 REP-3

Fresh compost with Onion seeds



REP-1 REP-2 REP-3

Bio-degradation tested compost with Onion seeds



REP-1 REP-2 REP-3

Fresh compost with Fenugreek seeds




REP-1 REP-2 REP-3

Bio-degradation tested compost with Fenugreek seeds

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


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