सिपेट : स्कूल फार एडवांस्ड
रिसर्च इन पेट्रोकेमिकल्स् (एस. ए. आर. पी)
एडवांस्ड पॉलीमर डिसैन रिसर्च & डेवेलपमेन्ट
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(आईटी सेक्टर), जलाहोवली, बेंगलुरू - 562149
ई-मेल : apddrl@cipet.gov.in
मुख्यालय : सिपेट, गिंडी, चेन्नै - **600032**

सिपेट CIPET

CIPET : SCHOOL FOR ADVANCED RESEARCH IN PETROCHEMICALS (SARP)- ADVANCED POLYMER DESIGN & DEVELOPMENT RESEARCH LABORATORY (APDDRL)
Dept. of Chemicals & Petrochemicals,
Ministry of Chemicals & Fertilizers, Govt. of India
Plot No. 7P. Hi Tech Defence and Aerospace Park
(IT Sector), Jala Hobli, Bengaluru - 562 149
E-mail : apddrl@cipet.gov.in
Head Office : CIPET, Guindy, Chennai - 600032

CIPET/SARP-APDDRL/Testing/2023-24/

Date- 06.02.2024

To,

M/s. Vishvamitra Packaging
Near Sondongiri, Pulia,
Balajee Petrol Pump,
Ring Road No-2,
Gogaon, Raipur- 492003

Sub: Test Report-Reg.

Ref. No: **1) Letter dated 24.06.2023**
2) Interim Test Report No. 23483 dated 20.11.2023

Dear Sir,

We are enclosing herewith Test Report No.23483 (Final) dtd. 06.02.2024 pertaining to testing of your submitted sample.

Customer Feedback form is enclosed herewith, which you are requested to fill-up and send us back.

Kindly acknowledge the receipt of the same.

Thanks & Regards,

06/02/2024

AUTHORISED SIGNATORY

Encl: As above

सिपेट : स्कूल फार एडवांस्ड
रिसर्च इन पेट्रोकेमिकल्स् (एस. ए. आर. पी)
एडवांस्ड पॉलीमर डिसैन रिसर्च & डेवेलपमेन्ट
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सिपेट CIPET

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CERTIFICATE OF ANALYSIS AS PER ISO 17088:2021

CIPET/SARP-APDDRL/Testing/2023-24/ **Date- 06.02.2024**

To,
M/s. Vishvamitra packaging,
Near Sondongiri, Pulia,
Balajee Petrol Pump,
Ring Road No-2,
Gogaon, Raipur- 492003

Sub: Test Report- Reg.

Ref. No: **1) Letter dated 24.06.2023**
2) Interim Test Report No. 23483 dated 20.11.2023

Dear Sir,

With reference to the above, the submitted sample was analyzed as per ISO 17088:2021.The summary detail of testing & analysis is given below:

Company Name & Address	: **M/s. Vishvamitra packaging, Near Sondongiri, Pulia, Balajee Petrol Pump, Ring Road No-2, Gogaon, Raipur- 492003**
Test Standard	: **ISO 17088:2021**
Sample Details	: **"Compostable bag 13x16"** - As stated by the party
Test Report No	: **23483 (Final) & dated 06.02.2024**
Date of Receipt of sample	: **30.06.2023**
Date of Initiation	: **04.07.2023**
Date of Completion	: **01.02.2024**
Percentage of Compostability In 137 days	: **92.40 %**
Requirement of Compostability in 180 days as ISO 17088:2021	: **90 %**

The sample submitted by **M/s. Vishvamitra Packaging** is compostable and the percentage of compostability in **155** days reported vide test report No.**23483** is **92.40 %**

The submitted sample also complies with the terms of Compostability, Seed germination and Disintegration as per ISO 17088:2021

Thanks & Regards,

Authorized Signatory 06.02.2024
Encl : Analysis Report

सिपेट : स्कूल फार एडवांस्ड
रिसर्च इन पेट्रोकेमिकल्स् (एस. ए. आर. पी)
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रिसर्च लॉबोरेटोरी, (ए.पी.डी.डी.आर.एल)
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सिपेट CIPET

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Head Office : CIPET, Guindy, Chennai - 600032

ANALYSIS REPORT

Report No.: 23483 (Final)
Date: 06.02.2024

Issued to

M/s. Vishvamitra Packaging
Near Sondongiri, Pulia,
Balajee Petrol Pump,
Ring Road No-2,
Gogaon, Raipur- 492003

Ref. No **1) Letter dated 24.06.2023**
2) Interim Test Report No. 23483 dated 20.11.2023

PART A: PARTICULARS OF SAMPLE SUBMITTED

a) Name of the Sample : **"Compostable bag 13x16"** – As stated by the party
b) Grade/variety/Type/Size/Class etc. : **Film Sample** – as supplied by the party
c) Code No. : NA
d) Quantity (pcs./mtr/gm/nos) : 1 Kg
e) Mode of packing
(Sealed carton/Polypouch/Container or not): Sealed carton
f) Date of receipt of sample : 30.06.2023
g) Date of Performance of test : 04.07.2023 to 01.02.2024
h) Any other information : NIL

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- : Nil

06.02.2024 06.02.2024

सिपेट : स्कूल फार एडवांस्ड
रिसर्च इन पेट्रोकेमिकल्स् (एस. ए. आर. पी)
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सिपेट CIPET

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ANALYSIS REPORT

Report no.: 23483 (Final)
Date: 06.02.2024

PART-C					
Test Result					
Sl. No.	**Name of test**	**Test Method**	**Unit**	**Test Result**	**Specified requirements**
01	Material Identification	FTIR / DSC	--	PBAT based material	--
02	Disintegration (Dry mass remains in 2mm sieve after 84 days)	Cl. 6.2 of ISO 17088 : 2021	%	8.45	Not more than 10
03	Ultimate aerobic Biodegradation (with reference to 100% degradation of positive reference)	Cl. 6.3 of ISO 17088 : 2021	%	92.40 (At the end of 137 days)	>90% (At the end of the test period not more than 180 days)
04	Plant Growth study **Monocotyledon** % Seed emergence **Dicotyledon** % Seed emergence	Cl 6.4.3 ISO 17088 : 2021	 % %	 92.45 93.65	 >90 >90
05	**Acute Ecotoxic Effects of Earthworm**				
a	Survival of adult earthworm at the end of 7 days	Cl.No.6.4.4 of ISO 17088 : 2021	%	100	Shall be more than 90
b	Survival of adult earthworm at the end of 14 days		%	99	Shall be more than 90
c	Biomass end of the 14 days		%	98	Shall be more than 90
06	**Chronic ecotoxic effects to earthworm**				
a	Survival of adult earthworm at the end of 28 days	Cl.No.6.4.5 of ISO 17088 : 2021	%	98	Shall be more than 90
b	Offspring at the end of 56 days		%	97	Shall be more than 90
c	Biomass end of the 56 days		%	96	Shall be more than 90

Note: The detailed observation on biodegradability test is enclosed as **Annexure-I.**

06.02.2024 06.02.2024

सिपेट : स्कूल फार एडवांस्ड
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सिपेट CIPET

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ANALYSIS REPORT

Report No.: 234833 (Final)
Date: 06.02.2024

Sl. No	Name of the Test	Test Method/Standard	Unit	Specified Requirements	Results Obtained
07.	**Heavy metals concentration**				
	Arsenic (As)	Cl. No. 6.5.2 of ISO 17088:2021 AAS	ppm	10	0.0009
	Copper (Cu)			300	7.8439
	Nickel (Ni)			50	4.0141
	Zinc (Zn)			1000	1.7679
	Chromium (Cr)			50	0.0193
	Molybdenum (Mo)			--	0.0081
	Mercury (Hg)			0.15	0.0000 *BDL
	Cadmium (Cd)			5	0.0073
	Lead (Pb)			100	0.0926
	Selenium (Se)			--	0.0116

*BDL- Below detection limit
Based on solid waste management Rules, 2016 notified on 8th April 2016 by Ministry of Environment and Forests, Government of India.

PART D: REMARKS: NIL

Note:

1. This Test Report / Certificate is issued only for the samples submitted to CIPET: SARP-APDDRL.
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 CIPET: SARP-APDDRL within 30 days from the date of issue.
6. Sub contracted Tests (if any): Heavy metals concentration

** End of the Report **

Sonalee 06.02.2024

Reviewed By
Dr. Sonalee Das
Jr. Scientist

06.02.2024

Authorized By
Dr. Manoranjan Biswal
Sr. Scientist

TR.NO. –23483 (Final) **ANALYSIS RESULT** **Date:06.02.2024**

OBSERVATION FOR BIODEGRADABILITY TEST AS PER ISO 17088:2021

To,
M/s. Vishvamitra Packaging
Near Sondongiri, Pulia,
Balajee Petrol Pump,
Ring Road No-2,
Gogaon, Raipur- 492003

Date of Initiation : **04.07.2023**
Date of Completion : **01.02.2024**

1. **Sample detail** : **"Compostable bag 13x16"** – As stated by the party
2. **Material Identification by DSC & FTIR:** DSC & FTIR graph indicates that the supplied material is PBAT based film.

3. Observation: -

a. Conditions of reaction mixtures

Origin of compost: Livestock excreta, municipality waste and vegetable waste

Reaction Temperature	: 58 °C (± 2°C)
Dry Solid	: 52.86 (%)
Volatile Solid	: 28.18 (%)
Test duration	: 137 days (Under compost condition)
Reference material	: Cellulose
Volume of reaction vessel	: 3000 ml

b. p^H of test medium :-

Composting Vessel	p^H (Before Test)	p^H (After Test)
Blank 1	7.3	7.4
Blank 2	7.3	7.4
Blank 3	7.4	7.5
Cellulose1	7.5	7.6
Cellulose2	7.5	7.6
Cellulose3	7.6	7.7
Negative 1	7.5	7.6
Negative 2	7.4	7.5
Negative3	7.4	7.5
Sample 1	7.6	7.7
Sample 2	7.6	7.7
Sample 3	7.5	7.6

06.02.2024

Reviewed By
Dr. Sonalee Das
Jr. Scientist

06.02.2024

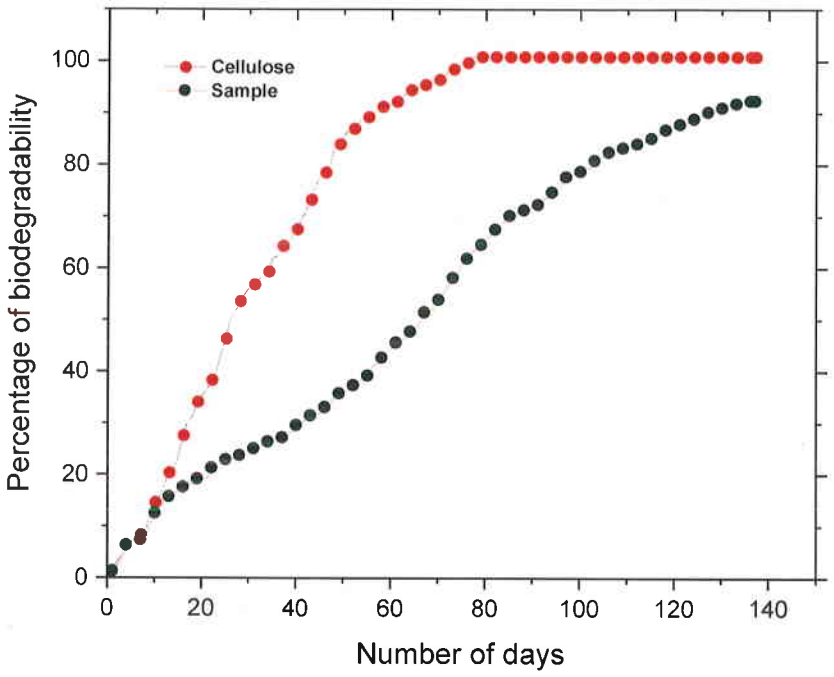
Authorized By
Dr. Manoranjan Biswal
Sr. Scientist

TR.NO. –23483 (Final) ANALYSIS RESULT Date: 06.02.2024

4. Result: Percentage biodegradation relative to positive reference

MEAN (%) : **92.40**

The reference material-cellulose (%) : **100**



5. Visual Observation:-

	Week 1	Week 2	Week 3	Week 4	Week 5
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
Color	White	White	White	White	White
Fungal Development	None	None	None	None	None
Smell	Organic/dirt like	Organic/dirt like	Organic/dirt like	Organic/dirt like	Organic/dirt like

Sonalee 06.02.2024

Reviewed By
Dr. Sonalee Das
Jr. Scientist

06.02.2024

Authorized By
Dr. Manoranjan Biswal
Sr. Scientist

TR.NO. –23483 (Final) **ANALYSIS RESULT** Date: 06.02.2024

	Week 6	Week 7	Week 8	Week 9	Week 10
Structure	Film Sample	Film Sample	Film Sample	Film Sample	Disintegration Initiated
Moisture	Appropriate moisture level	Appropriate moisture level	Appropriate moisture level	Appropriate moisture level	Appropriate moisture level
Color	White	White	White	White	White
Fungal Development	None	None	None	None	None
Smell	Organic/dirt like	Organic/dirt like	Organic/dirt like	Organic/dirt like	Organic/dirt like

	Week 11	Week 12	Week 13	Week 14	Week 15
Structure	Disintegration Observed	Disintegration Observed	Disintegration Observed	Disintegration Observed	Disintegration Observed
Moisture	Appropriate moisture level	Appropriate moisture level	Appropriate moisture level	Appropriate moisture level	Appropriate moisture level
Color	-------	---------	---------	---------	-----
Fungal Development	None	None	None	None	None
Smell	Organic/dirt like	Organic/dirt like	Organic/dirt like	Organic/dirt like	Organic/dirt like

	Week 16	Week 17	Week 18	Week 19	Week 20
Structure	Disintegration Observed	Disintegration Observed	Disintegration Observed	Disintegration Observed	Disintegration Observed
Moisture	Appropriate moisture level	Appropriate moisture level	Appropriate moisture level	Appropriate moisture level	Appropriate moisture level
Color	----	----	----	----	----
Fungal Development	None	None	None	None	None
Smell	Organic/dirt like	Organic/dirt like	Organic/dirt like	Organic/dirt like	Organic/dirt like

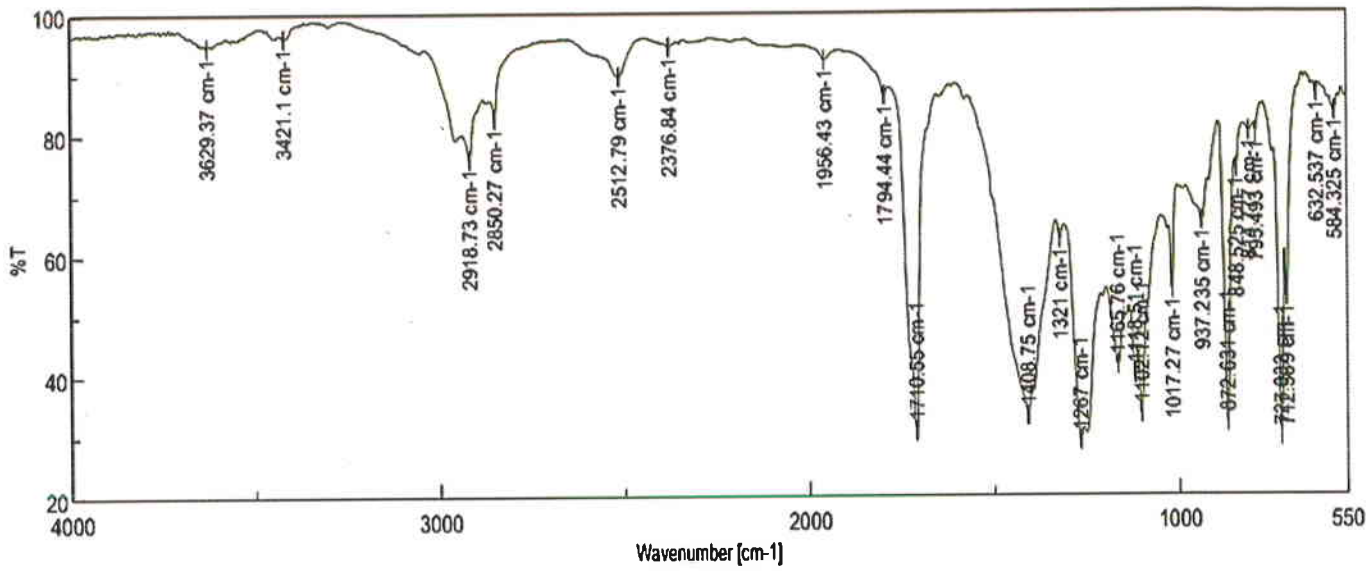
Sonalee 06.02.2024

Reviewed By
Dr. Sonalee Das
Jr. Scientist

06.02.2024

Authorized By
Dr. Manoranjan Biswal
Sr. Scientist

6. FTIR Analysis:



Wave number (cm^{-1})	Possible Nature of Bond
2918.73-2850.27	-CH_3 symmetric/anti-symmetric stretching
1710.55	-C=O stretching
1408.75	O–CH_2 bending
1267, 1165.76, 1118.51	C-O stretching/stretching absorption of C-O-C
1017.27	In-plane bending mode of = C–H in benzene ring
872.63, 727.03	Out-plane bending mode of = C–H in benzene ring

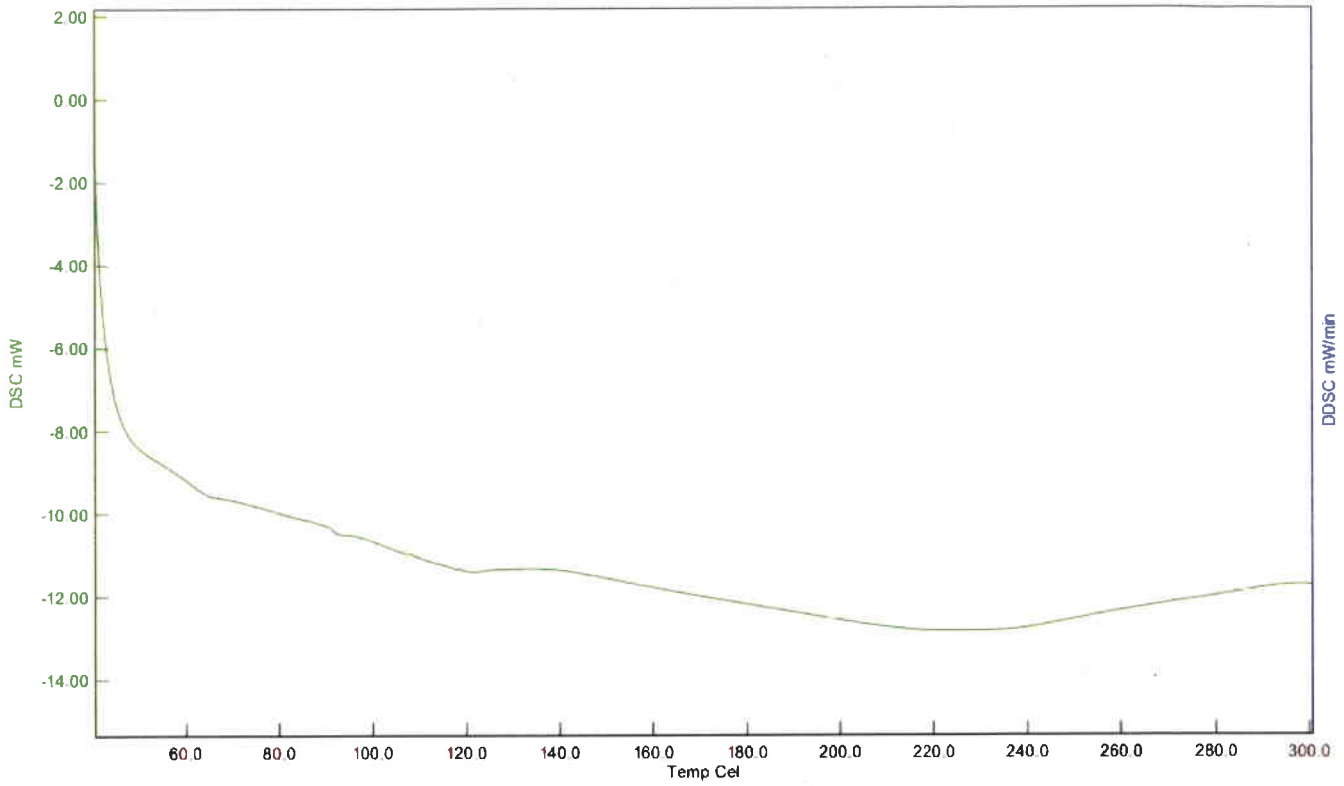
Sonalee 06.02.2024

Reviewed By
Dr. Sonalee Das
Jr. Scientist

06.02.2024

Authorized By
Dr. Manoranjan Biswal
Sr. Scientist

7. DSC Analysis:-



Comment: DSC & FTIR graph indicates that the supplied material is PBAT based film.

Sonalee 06.02.2024

Reviewed By
Dr. Sonalee Das
Jr. Scientist

06.02.2024

Authorized By
Dr. Manoranjan Biswal
Sr. Scientist

8. Disintegration- After 12 Weeks

BEFORE DISINTEGRATION
230670

BEFORE DISINTEGRATION

AFTER DISINTEGRATION
230670

AFTER DISINTEGRATION

Comments:-

The disintegration of the supplied sample by passing through 2 mm sieve after 12 weeks in composting conditionas per ISO 17088:2021 was found to be not more than 10 % of original dry mass remain.

Sonalee 06.02.2024

Reviewed By
Dr. Sonalee Das
Jr. Scientist

06.02.2024

Authorized By
Dr. Manoranjan Biswal
Sr. Scientist

7. Germination and Plant Growth Study

	
230670 B-01 230670 B-02 230670 B-03	230670 S-01 230670 S-02 230670 S-03
Wheat Compost (Control)	**Wheat Compost (Sample)**
	
230670 B-01 230670 B-02 230670 B-03	230670 S-01 23670 S-02 230670 S-03
Mung Bean Compost (Control)	**Mung Bean Compost (Sample)**

The percentage of seedling germination rate was found to be greater than 90% for both Wheat and Mung Bean.

Sonalee 06.02.2024

Reviewed By
Dr. Sonalee Das
Jr. Scientist

06.02.2024

Authorized By
Dr. Manoranjan Biswal
Sr. Scientist