सिपेट : स्कूल फार एडवांस्ड रिसर्च इन पेट्रोकेमिकल्स् (एस. ए. आर. पी) एडवांस्ड पॉलीमर डिसैन रिसर्च & डेवेलपमेन्ट रिसर्च लॉबोरेटोरी, (ए.पी.डी.डी.आर.एल)

रसायन एवं पेट्रोरसायन विभाग

रसायन एवं उर्वरक मंत्रालय, भारत सरकार

प्लॉट नंबर : ७ पि, हार्ट टेक रक्ष और एयरोस्पेस पार्क (आईटी सेक्टर), जलाहोवली, बेंगलुरू - 562149

ई-मेल : apddrl@cipet.gov.in

मुख्यालय : सिपेट, गिंडी, चेन्नै - 600032



# **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

Date: -08-11-2024





CIPET/SARP-APDDRL/Testing/2024-25/ 721

To.

M/s Gen Bhoomi Green Products LLP, Plot No.21, R.S.NO.536, Honaga Industrial Area Honaga, Belagavi - 591156

Sub: Test Report-Reg.

Ref. No:

1) Letter dtd 23.02.2024

2) Interim report no: 24472 dated 11.09.2024

Dear Sir,

We are enclosing herewith Test Report No. 24472 (Final) dtd. 08.11.2024 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,

Encl: As above

सिपेट: स्कूल फार एडवांस्ड रिसर्च इन पेट्रोकेमिकल्स् (एस. ए. आर. पी) एडवांस्ड पॉलीमर डिसैन रिसर्च & डेवेलपमेन्ट रिसर्च लॉबोरेटोरी, (ए.पी.डी.डी.आर.एल)

रसायन एवं पेट्रोरसायन विभाग

रसायन एवं उर्वरक मंत्रालय, भारत सरकार

प्लॉट नंबर : ७ पि, हार्ट टेक रक्ष और एयरोस्पेस पार्क (आईटी सेक्टर), जलाहोवली, बेंगलुरू - 562149

ई-मेल : apddrl@cipet.gov.in

मुख्यालय : सिपेट, गिंडी, चेन्नै - 600032



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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

Date: - 08-11-2024



### CERTIFICATE OF ANALYSIS AS PER ISO 17088:2021

CIPET/SARP-APDDRL/Testing/2024-25/

To, M/s Gen Bhoomi Green Products LLP, Plot No.21,R.S.No.536,Honaga Industrial Area Honaga,Belagavi - 591156

Sub: Test Report- Reg.

Ref. No:

1) Letter dtd 23.02.2024

2) Interim report no:24472 dated 11.09.2024

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 Gen Bhoomi Green Products LLP, Plot No.21,R.S. No.536,Honaga Industrial Area Honaga, Belagavi -591156

Test Standard Sample Details

Test Report No
Date of Receipt of sample

Date of Initiation
Date of Completion

Percentage of compostability Requirement of Compostability in

180 days as ISO 17088:2021

: ISO 17088:2021

"Compostable Film/ Cover" - As stated by the party

: 24472 (Final) & dated 08.11.2024

: 23.02.2024

: 18.03.2024

: 05.11.2024

: 92.25% in 169 days

: 90 %

The sample submitted by **M/s Gen Bhoomi Green Products LLP**, is compostable and the percentage of compostability in **169** days reported vide test report No.24472is **92.25**%

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

Thanks & Regards,

Authorized Signatory 11.707

Encl: Analysis Report

केन्द्र : अहमदाबाद, अमृतसर, औरंगाबाद, अगरतला, बद्दी, बालासोर, बेंगलुरू, भोपाल,भुवनेश्र्वर, चन्दपुर, चेन्नै, देहरादून, गुरूग्राम, गुवाहाटी, ग्वालियर, हैदराबाद, हाजीपुर, हिन्दया, इम्फाल, जयपुर, कोच्चि, कोरब, लखनउ, मदुरै, मुरथल, मैसूरु, रायपुर, रॉची, बलसाड एवं विजयवाडा

सिपेट: स्कूल फार एडवांस्ड रिसर्च इन पेट्रोकेमिकल्स् (एस. ए. आर. पी) एडवांस्ड पॉलीमर डिसैन रिसर्च & डेवेलपमेन्ट रिसर्च लॉबोरेटोरी, (ए.पी.डी.डी.आर.एल) रसायन एवं पेट्रोरसायन विभाग

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# 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





### ANALYSIS REPORT



Page: 01 of 03

Report No: 24472 (Final)

Date: 08-11-2024

Issued to

M/s Gen Bhoomi Green Products LLP, Plot No.21,R.S.NO.536,Honaga Industrial Area Honaga,Belagavi - 591156

Ref. No

- 1) Letter dtd 23.02.2024
- 2) Interim report no:24472 dtd 11.09.2024

### PART A: PARTICULARS OF SAMPLE SUBMITTED

a) Name of the Sample

: " Compostable Film/Cover "As stated by the party

b) Grade/variety/Type/Size/Class etc.

: Film- as supplied by the party

c) Code No.

: NA

d) Quantity (pcs./mtr/gm/nos)

: 1.60 kg.

e) Mode of packing

(Sealed carton/Polypouch/Container or not): Polypouch

f) Date of receipt of sample

: 23.02.2024

g) Date of Performance of test

: 18.03.2024 to 05.11.2024

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

18.11.202 May 08.11.202

केन्द्र : अहमदाबाद, अमृतसर, औरंगाबाद, अगरतला, बद्दी, बालासोर, बेंगलुरू, भोपाल,भुवनेश्र्वर, चन्दपुर, चेन्नै, देहरादून, गुरूग्राम, गुवाहाटी, ग्वालियर, हैदराबाद, हाजीपुर, हिन्दिया, इम्फाल, जयपुर, कोच्चि, कोरब, लखनउ, मदुरै, मुरथल, मैसूरु, रायपुर, रॉची, बलसाड एवं विजयवाडा

सिपेट: स्कूल फार एडवांस्ड रिसर्च इन पेट्रोकेमिकल्स् (एस. ए. आर. पी) एडवांस्ड पॉलीमर डिसैन रिसर्च & डेवेलपमेन्ट रिसर्च लॉबोरेटोरी, (ए.पी.डी.डी.आर.एल) रसायन एवं पेट्रोरसायन विभाग

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प्लॉट नंबर : ७ पि, हार्ट टेक रक्ष और एयरोस्पेस पार्क (आईटी सेक्टर), जलाहोवली, बेंगलुरू - 562149

ई-मेल : apddrl@cipet.gov.in

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# CIPET: SCHOOL FOR ADVANCED RESEARCH IN PETROCHEMICALS (SARP)-ADVANCED POLYMER DESIGN & DEVELOPMENT RESEARCH LABORATORY (APDDRL)



E-mail: apddrl@cipet.gov.in

Head Office: CIPET, Guindy, Chennai - 600032





## **ANALYSIS REPORT**

ALYSIS REPO

Page: 02 of 03 Report no: 24472 (Final)

Date: 08-11-2024

		PART-C			
		Test Result			,
SI. No.	Name of t <mark>est</mark>	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	%	9.1	Not more than 10
03	Ultimate aerobic Biodegradation (with reference to 100% degradation of positive reference)	Cl. 6.3 of ISO 17088 : 2021	%	92.25 (At the end of 169 days)	>90% (At the end of the test period not more than 180 days)
04	Plant Growth study Monocotyledon % Seed emergence Dicotyledon	CI 6.4.3 ISO 17088 : 2021	%	92.66	>90
	% Seed emergence		%	91.15	>90
05	Acute Ecotoxic Effects of Earthwo	rm 1968 - 7			
а	Survival of adult earthworm at the end of 7 days	OLNI- C 4 4 - 5	%	100	Shall be more than 90
b	Survival of adult earthworm at the end of 14 days	CI.No.6.4.4 of ISO 17088 :	%	98	Shall be more than 90
С	Biomass end of the 14 days	2021	%	98	Shall be more than 90
06	Chronic ecotoxic effects to earthw	orm			
а	Survival of adult earthworm at the end of 28 days	CINOCAE of	%	97	Shall be more than 90
b	Offspring at the end of 56 days	CI.No.6.4.5 of ISO 17088 : 2021	%	96	Shall be more than 90
С	Biomass end of the 56 days	2021	%	97	Shall be more than 90

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

केन्द्र : अहमदाबाद, अमृतसर, औरंगाबाद, अगरतला, बद्दी, बालासोर, बेंगलुरू, भोपाल,भुवनेश्र्वर, चन्दपुर, चेन्नै, देहरादून, गुरूग्राम, गुवाहाटी, ग्वालियर, हैदराबाद, हाजीपुर, हल्दिया, इम्फाल, जयपुर, कोच्चि, कोरब, लखनउ, मदुरै, मुरथल, मैसुरु, रायपुर, रॉची, बलसाड एवं विजयवाडा

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Dept. of Chemicals & Petrochemicals,
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Page: 03 of 03

Report No: 24472(Final)

Date: 08-11-2024





### ANALYSIS REPORT

SI. No	Name of the Test	Test Method/Standard	Unit	Specified Requirements	Results Obtained
E 15	Heavy metals concent	ration		~ "1"	
	Arsenic (As)			-	0.0018
	Copper (Cu)			-	0.1560
07.	Nickel (Ni)			-	0.2352
	Zinc (Zn)		207.27	-	0.0092
	Chromium (Cr)	ISO 17088;2021		(V)	0.0101
	Molybdenum (Mo)				0.0013
	Mercury (Hg)	3 /4/1000			BDL
	Cadmium (Cd)	E WAIT			0.0022
	Lead (Pb)				0.0393
	Selenium (Se)	3 \ 5		x 7/87	0.0043

\*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): NIL

\*\* End of the Report \*\*

Reviewed By

Dr. V H Sangeetha

Scientist

Authorized By

Dr. Manoranjan Biswal

Sr. Scientist

केन्द्र : अहमदाबाद, अमृतसर, औरंगाबाद, अगरतला, बद्दी, बालासोर, बेंगलुरू, भोपाल,भुवनेश्र्वर, चन्दपुर, चेन्नै, देहरादून, गुरूग्राम, गुवाहाटी, ग्वालियर, हैदराबाद, हाजीपुर, हल्दिया, इम्फाल, जयपुर, कोच्चि, कोरब, लखनउ, मदुरै, मुरथल, मैसुरु, रायपुर, रॉची, बलसाड एवं विजयवाडा

TR.NO. -24472 (Final)

**ANALYSIS RESULT** 

Page: 1 of 7

Date: 08-11-2024

### OBSERVATION FOR BIODEGRADABILITY TEST AS PER ISO 17088:2021

To,

M/s Gen Bhoomi Green Products LLP, Plot No.21,R.S.NO.536,Honaga Industrial Area Honaga,Belagavi - 591156

Date of Initiation
Date of Completion

: 18.03.2024 : 05.11.2024

1. Sample detail

: " Compostable Film/Cover""

- As stated by the party

2. Material Identification by DSC & FTIR: DSC & FTIR graph indicates that the supplied

material is PBAT Based material.

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

: 52.07(%)

Volatile Solid

: 30.16 (%)

Test duration

: 169 days (Under compost condition)

Reference material

: Cellulose

Volume of reaction vessel

: 3000 ml

b. pH of test medium:-

Composting Vessel	p <sup>H</sup> (Before Test)	p <sup>H</sup> (After Test)
Blank 1	7.1	7.2
Blank 2	7.2	7.3
Blank 3	7.2	7.3
Cellulose1	7.3	7.4
Cellulose2	7.4	7.5
Cellulose3	7.4	7.5
Negative 1	7.2	7.4
Negative 2	7.4	7.5
Negative3	7.2	7.3
Sample 1	7.6	7.7
Sample 2	7.5	7.6
Sample 3	7.5	7.6

Reviewed By Dr. V H Sangeetha

Scientist

Authorized By

Dr. Manoranjan Biswal

Page: 2 of 7 Date: 08-11-2024

TR.NO. - 24472 (Final)

ANALYSIS RESULT

4. Result:

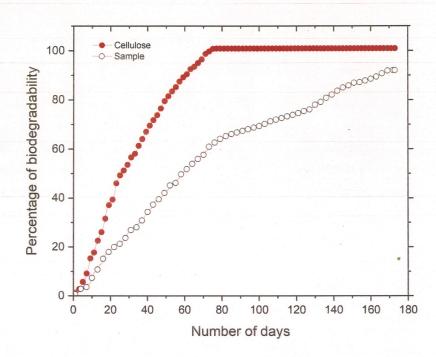
Percentage biodegradation relative to positive reference

MEAN (%)

: 92.25

The reference material-cellulose (%)

: 100



### 5. Visual Observation:-

	Week 1	Week 2	Week 3	Week 4	Week 5
Structure	Film sample				
Moisture	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

Reviewed By Dr. V H Sar-Scia-

Scientist

68.11.202 **Authorized By** 

Dr. Manoranjan Biswal

Page: 3 of 7 Date:08.11.2024

	Week 6	Week 7	Week 8	Week 9	Week 10
Structure	Film sample				
Moisture	Appropriate moisture level				
Color	and and tool tool and	WH AND AND AND AND	and that that the that		
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 initiated	Disintegration Observed	Disintegration Observed	Disintegration Observed	Disintegration Observed
Moisture	Appropriate moisture level				
Color			MM 100 MM 100 MM 100 MM		
Fungal Development	None	None	None	None	None
Smell	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				
Color	and ton 100 and 100 and				
Fungal Development	None	None	None	None	None
Smell	Organic/dirt like				

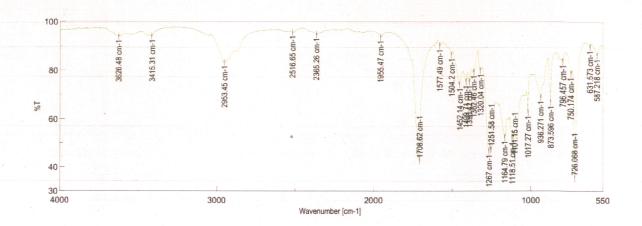
	Week 21	Week 22	Week 23	Week 24	Week 25/26
Structure	Disintegration Observed	Disintegration Observed	Disintegration Observed	Disintegration Observed	
Moisture	Appropriate moisture level	Appropriate moisture level	Appropriate moisture level	Appropriate moisture level	Appropriate moisture level
Color			and that that that that the	that may mad mad task you with you had	NOT THE COLUMN AND AND AND AND AND
Fungal Development	None	None	None	None .	None
Smell	Organic/dirt like	Organic/dirt like	Organic/dirt like	Organic/dirt like	Organic/dirt like

Reviewed By

Dr. V H Sangeetha Scientist Authorized By

Authorized By Dr. Manoranjan Biswal

## 6. FTIR Analysis:

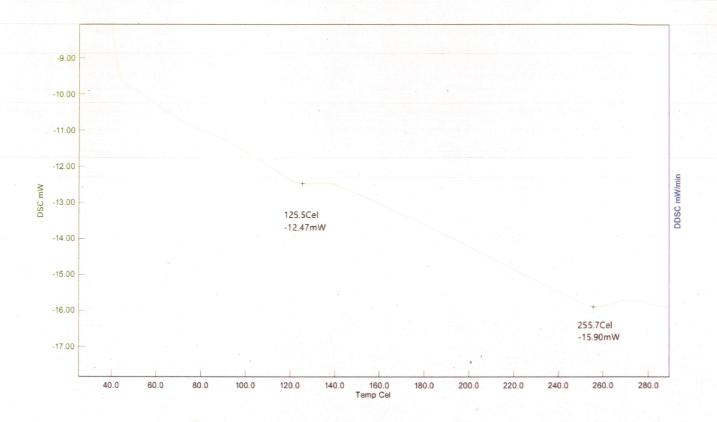


Wave number (cm <sup>-1</sup> )	Possible Nature of Bond
2953.45	CH <sub>3</sub> stretching mode
1708.62	C=O stretching
1452.14	CH <sub>2</sub> In–plane bending mode
1390.42	Out – Plane bending mode of CH <sub>2</sub>
1267,1101.15,1164.79	-C-O stretching
1017.27	In-plane bending Mode of =CH in benzene ring
873.596,726.068	Out-plane bending mode of =CH in benzene ring

68.11.2024 Reviewed By Dr. V H Sangeetha Scientist

Authorized By
Dr. Manoranjan Biswal
Sr. Scientist

### 7. DSC Analysis:-



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

Reviewed By Dr. V H Sangeetha

Scientist

Authorized By
Dr. Manoranjan Biswal
Sr. Scientist

TR.NO. - 24472(Final)

**ANALYSIS RESULT** 

Page: 6 of 7 Date: 08-11-2024

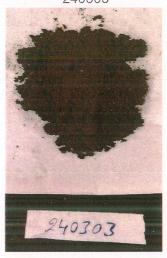
### Disintegration- After 12 Weeks

BEFORE DISINTEGRATION 240303



BEFORE DISINTEGRATION

AFTER DISINTEGRATION 240303



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.

Reviewed By Dr. V H S.

Scientist

Authorized By

Dr. Manoranjan Biswal

Page: 7 of 7 Date: 08-11-2024

### 9. Germination and Plant Growth Study(240303)



Wheat Compost (Control)



Wheat Compost (Sample)



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.

Reviewed By Dr. V H So.

Scientist

**Authorized By** Dr. Manoranjan Biswal Sr. Scientist