

सिपेट : एस. ए. आर. पि.-पॉलीमेरीक, मटेरीयल में अत्याधुनिक अनुसंधान हेतु प्रयोगशाला

रसायन एवं पेट्रोसायन विभाग, रसायन एवं उर्वरक मंत्रालय, भारत सरकार

बी/२५, सि.एन.आई.कॉम्प्लेक्स, पटिआ, भुवनेश्वर-751024, ओडिशा

CIPET : SARP - LABORATORY FOR ADVANCED RESEARCH IN POLYMERIC MATERIALS



Dept. of Chemicals & Petrochemicals, Ministry of Chemicals & Fertilizers, Govt. of India

B/25, C.N.I. Complex, Patia, Bhubaneswar-751 024, Odisha

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CIPET सिपेट
probe - perform - practice - Plastics

LARPM/CIPET/Testing/2023-24/

Date- 04.08.2023

To,

Mr. Girish Dharaskar

M/s. Pugmark Foods India Inc.

B-1002, Parksyde Residences, Indira Nagar Annex,

Nashik, Maharsashtra-422009

Phone: 9326465209

Sub –Test Report –Reg.

Dear Sir,

Ref No: 1) SSF dated 20.05.2022

2) Our Work Order No.: LARPM/BBS./2022-23/048 dated 25.05.2022

With reference to the above cited subject, please find enclosed herewith **Test Report No. 00925 dated 04.08.2023.**

Kindly acknowledge the receipt of the same.

Thanks & Regards,


Quality Manager

Encl: As above

सिपेट : एस. ए. आर. पि.-पॉलीमेरीक, मटेरीयल में अत्याधुनिक अनुसंधान हेतु प्रयोगशाला

रसायन एवं पेट्रोरसायन विभाग, रसायन एवं उर्वरक मंत्रालय, भारत सरकार

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LARPM/CIPET/Testing/2023-24/

Date-04.08.2023

To,

Mr. Girish Dharaskar

M/s. Pugmark Foods India Inc.

B-1002, Parksyde Residences, Indira Nagar Annex,

Nashik, Maharsahtra-422009

Sub –Test Report–Reg.

Dear Sir,

Ref No : 1) SSF dated 20.05.2022

2) Our Work Order No.: LARPM/BBS./2022-23/048 dated 25.05.2022

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. Pugmark Foods India Inc. B-1002, Parksyde Residences, Indira Nagar Annex, Nashik, Maharsahtra-422009
Sample Details	: "Compostable Bags in size 10"×13"" - as stated by the party
Test Report No	: 00925 & dated 04.08.2023
Date of Receipt of sample	: 25.05.2022
Date of Initiation	: 25.08.2022
Date of Completion	: 02.08.2023
Percentage of Compostability	: 91.07
In 180 days	
Requirement of Compostability in	: 90 %
180 days as per ISO 17088:2021	

The sample submitted by M/s. Pugmark Foods India Inc. is compostable and the percentage of Compostability in 180 days reported vide test report No. 00925 is 91.07%.

The submitted sample also complies with the terms of compostability seed germination and disintegration as per ISO 17088:2021.

Thanks & Regards,


Dr. Akshaya Kumar Palai
(Quality Manager)
Encl : Analysis Report



ANALYSIS REPORT

Report No. : 00925

Date : 04.08.2023

Issued to

M/s. Pugmark Foods India Inc.

B-1002, Parksyde Residences, Indira Nagar Annex,

Nashik, Maharsahtra-422009

Customer Ref. No. & Date : SSF dated 20.05.2022

Work order Ref. No. & Date : LARPM/BBS./2022-23/048 dated 25.05.2022

As per Standard : Refer part C

PART A: PARTICULARS OF SAMPLE SUBMITTED

- | | |
|--|---|
| a) Name of the Sample | : "Compostable Bags in size 10"×13"-as stated by the party. |
| b) Grade/verity/Type/Size/Class etc. | : Nil. |
| c) Code No. | : Nil. |
| d) Quantity (pcs./mtr/gm/nos) | : 1 Kg. |
| e) Mode of packing | |
| (Sealed carton/polypouch/container or not) | : Packed in Carton. |
| f) Date of receipt of sample | : 25.05.2022 |
| g) Date of Performance of test | : 25.08.2022 – 02.08.2023 |
| h) Any other information | : Interim Report No. 00777 dated 17.02.2023 |

PART B: SUPPLEMENTARY INFORMATION

- | | |
|--|---------------------------------|
| a) Reference to sampling procedure | : Drawn & Supplied by the party |
| b) Supporting documents for | |
| Measurements taken and results derived | : As per part -C |
| like graphs, tables, sketches and/or | |
| Photographs as appropriate to | |
| test report if any (to be attached) | |
| c) Deviation from the test methods as | : Nil |
| Prescribed in relevant ASTM/ISO/BIS/ | |
| Work Instructions, If any- | |

Mr. Pinaki Chatterjee

(Technical Manager)

AUTHORISED SIGNATORY

Dr. Akshaya Kumar Palai

(Quality Manager)

AUTHORISED SIGNATORY

सिपेट : एस. ए. आर. पि.-पॉलीमेरीक, मटेरीयल में अत्याधुनिक अनुसंधान हेतु प्रयोगशाला

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PART C: TEST RESULTS

ANALYSIS REPORT

Report No : 00925

Date : 04.08.2023

Sl. No	Name of the Test	Test Method/Standard	Unit	Results Obtained	Specified Requirements
Sample Details: "Compostable Bags in size 10"×13"- as stated by the party					
1.	Material Identification	FTIR/DSC	--	Polybutylene adipate terephthalate (PBAT) based material	---
2.	Disintegration (Dry mass remains in 2 mm sieve after 84 days)	Cl. 6.2 of ISO 17088:2021	%	7.76	Not more than 10% of its original dry mass
3.	Ultimate aerobic Biodegradation (with reference to 100% degradation of positive reference)	Cl. 6.3.1 of ISO 17088:2021 ISO:14855-1	%	91.07 (at the end of 180 days)	> 90 (at the end of the test period not more than 180 days.)
4.	Plant Growth study a) Monocotyledon (Onion) % Seed Emergence b) Dicotyledon (Mung) % Seed Emergence	Cl. 6.4.3 of ISO 17088:2021 (Annex C)	% %	96.85 96.05	> 90 > 90

Mr. Pinaki Chatterjee

Mr. Pinaki Chatterjee
(Technical Manager)

AUTHORISED SIGNATORY

Dr. Akshaya Kumar Palai

Dr. Akshaya Kumar Palai
(Quality Manager)

AUTHORISED SIGNATORY



PART C: TEST RESULTS

ANALYSIS REPORT

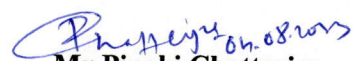
Report No : 00925

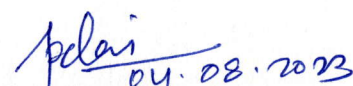
Date : 04.08.2023

Date : 04.08.2023

Sl. No	Name of the Test	Test Method/Standard	Unit	Results obtained	Specified Requirements
5.	Acute Ecotoxic Effects to earthworm				
a.	Survival of adult earthworm at the end of 7 days	Cl. 6.4.4 of ISO 17088-2021 (Annex D)	%	100	> 90% of those from the corresponding blank compost
b.	Survival of adult earthworm at the end of 14 days		%	100	
c.	Biomass at the end of 14 days		%	98.19	
6.	Chronic Ecotoxic Effects to earthworm				
a.	Survival of adult earthworm at the end of 28 days	Cl. 6.4.5 of ISO 17088-2021 (Annex E)	%	100	> 90% of those from the corresponding blank compost
b.	Offspring at the end of 56 days		%	100	
c.	Biomass at the end of 56 days		%	91.3	

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


Mr. Pinaki Chatterjee
(Technical Manager)
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Dr. Akshaya Kumar Palai
(Quality Manager)
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ANALYSIS REPORT

Report No.: 00925

Date : 04.08.2023

Sl. No	Name of the Test	Test Method/ Standard	Unit	Results obtained	Specified Requirements (*)
7.	Heavy metals concentration				
a	Arsenic (As)	ISO 17088: 2021	mg/kg	0.05	10
b	Cadmium (Cd)			1.73	5
c	Chromium (Cr)			2.21	50
d	Copper (Cu)			0.65	300
e	Lead (Pb)			8.34	100
f	Mercury (Hg)			0.06	0.15
g	Nickel (Ni)			0.98	50
h	Zinc (Zn)			14.37	1000

(*) – Based on the solid waste management Rules, 2016 notified on 08th April 2016 by Ministry of Environment, Forests & Climate Change, Government of India.

PART D: REMARKS: NIL

- Note:**
1. This Test Report / Certificate is issued only for the samples submitted to CIPET:SARP-LARPM.
 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-LARPM within 30 days from the date of issue.
 6. Subcontracted Tests (if any): Nil.

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

Pinaki
04.08.2023

Mr. Pinaki Chatterjee
(Technical Manager)

AUTHORISED SIGNATORY

Dr. Akshaya Kumar Palai
04.08.2023

Dr. Akshaya Kumar Palai
(Quality Manager)

AUTHORISED SIGNATORY

OBSERVATION FOR BIODEGRADABILITY TEST AS PER ISO 17088:2021

To

M/s. Pugmark Foods India Inc.
B-1002, Parksyde Residences, Indira Nagar Annex,
Nashik, Maharsashtra-422009

Date of Initiation : 25.08.2022

Date of Completion : 02.08.2023

1. Sample detail: Compostable Bags in size 10"×13 - as stated by the party.
2. Material Identification by DSC & FTIR: DSC & FTIR graph indicates the base material of the supplied sample is Polybutylene adipate terephthalate (PBAT) based material.

3. Observation:-**a. Conditions of reaction mixtures**

Origin of compost: Livestock excrement, municipal and vegetable waste

Reaction Temperature : 58°C (±2°C)

Dry Solid : 53.06(%)

Volatile Solid : 36.85 (%)

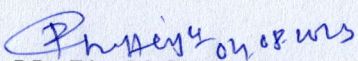
Test duration : 180 days

Reference material : Cellulose

Volume of reaction vessel : 3000 ml

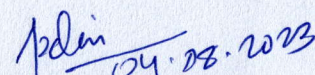
b. pH of test medium:-

Sl. No.	Composting Vessel	pH(before)	pH(After)
1	Blank 1	7.3	7.5
2	Blank 2	7.4	7.1
3	Blank 3	7.5	7.4
4	Positive 1	7.6	7.5
5	Positive 2	7.4	7.3
6	Positive 3	7.5	7.4
7	Negative 1	7.3	7.3
8	Negative 2	7.4	7.3
9	Negative 3	7.5	7.4
10	Sample-1	7.4	7.5
11	Sample-2	7.2	7.4
12	Sample-3	7.3	7.5



Mr. Pinaki Chatterjee
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Dr. Akshaya Kumar Palai
(Quality Manager)

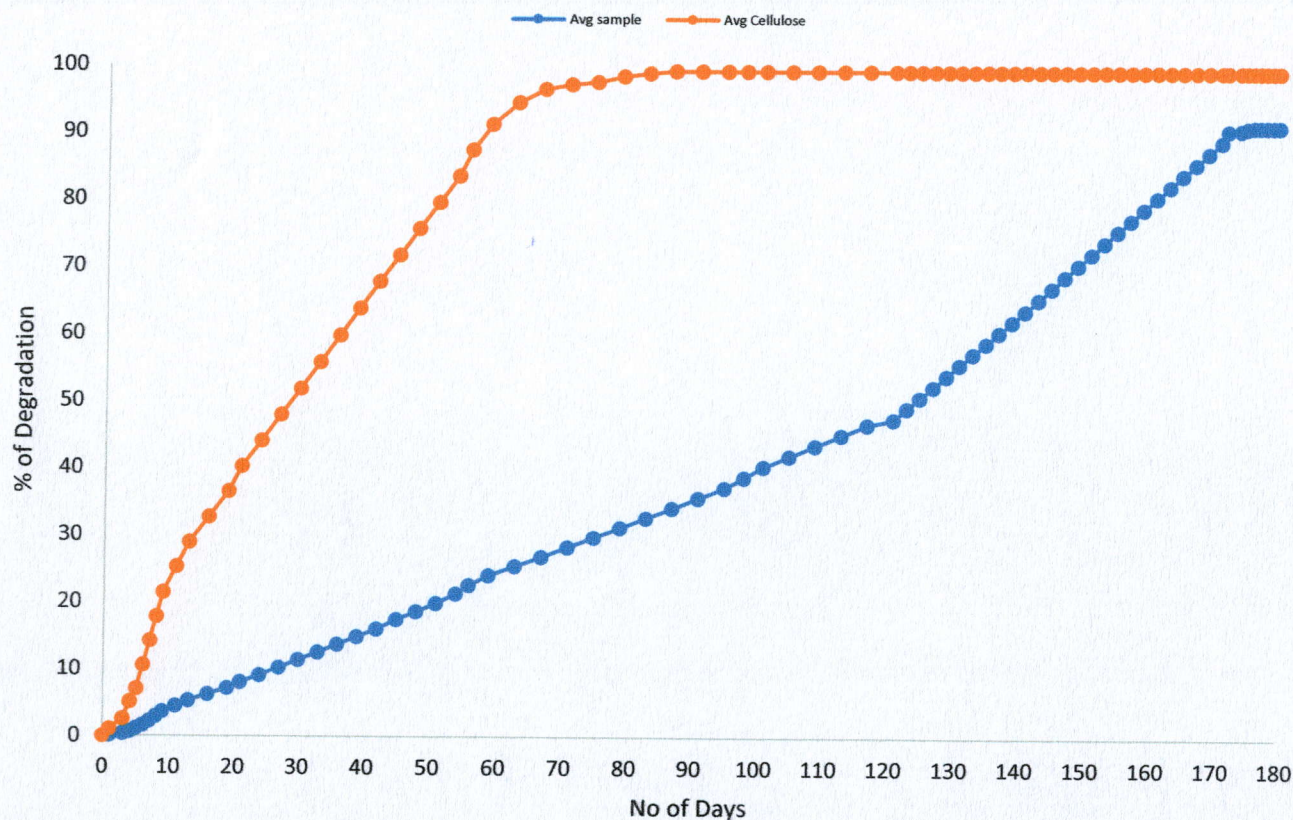
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4. **Result:** Percentage biodegradation relative to positive reference

MEAN(%) : 91.07 %

The reference material-cellulose (%) : 100

Degradation Graph of Sample & Cellulose



5. **Visual Observation:-**

	Week 1	Week 2	Week 3	Week 4	Week 5
Structure	Carry Bag	Carry Bag	Carry Bag	Carry Bag	Carry Bag
Moisture	Appropriate moisture Level	Appropriate moisture Level	Appropriate moisture Level	Appropriate moisture Level	Appropriate moisture Level
Color	Milky White	Milky White	Milky White	Milky White	Milky White
Fungal Development	None	None	None	None	None
Smell	Organic/dirt like	Organic/dirt like	Organic/dirt like	Organic/dirt like	Organic/dirt like

Mr. Pinaki Chatterjee

Mr. Pinaki Chatterjee
(Technical Manager)

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Dr. Akshaya Kumar Palai

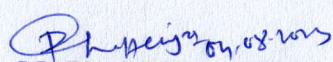
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(Quality Manager)

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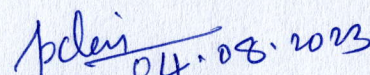
	Week 6	Week 7	Week 8	Week 9	Week 10
Structure	Carry Bag	Carry Bag	Carry Bag	Disintegration initiated	Disintegration observed
Moisture	Appropriate moisture Level	Appropriate moisture Level	Appropriate moisture Level	Appropriate moisture Level	Appropriate moisture Level
Color	Milky White	Milky White	Milky White	Milky 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

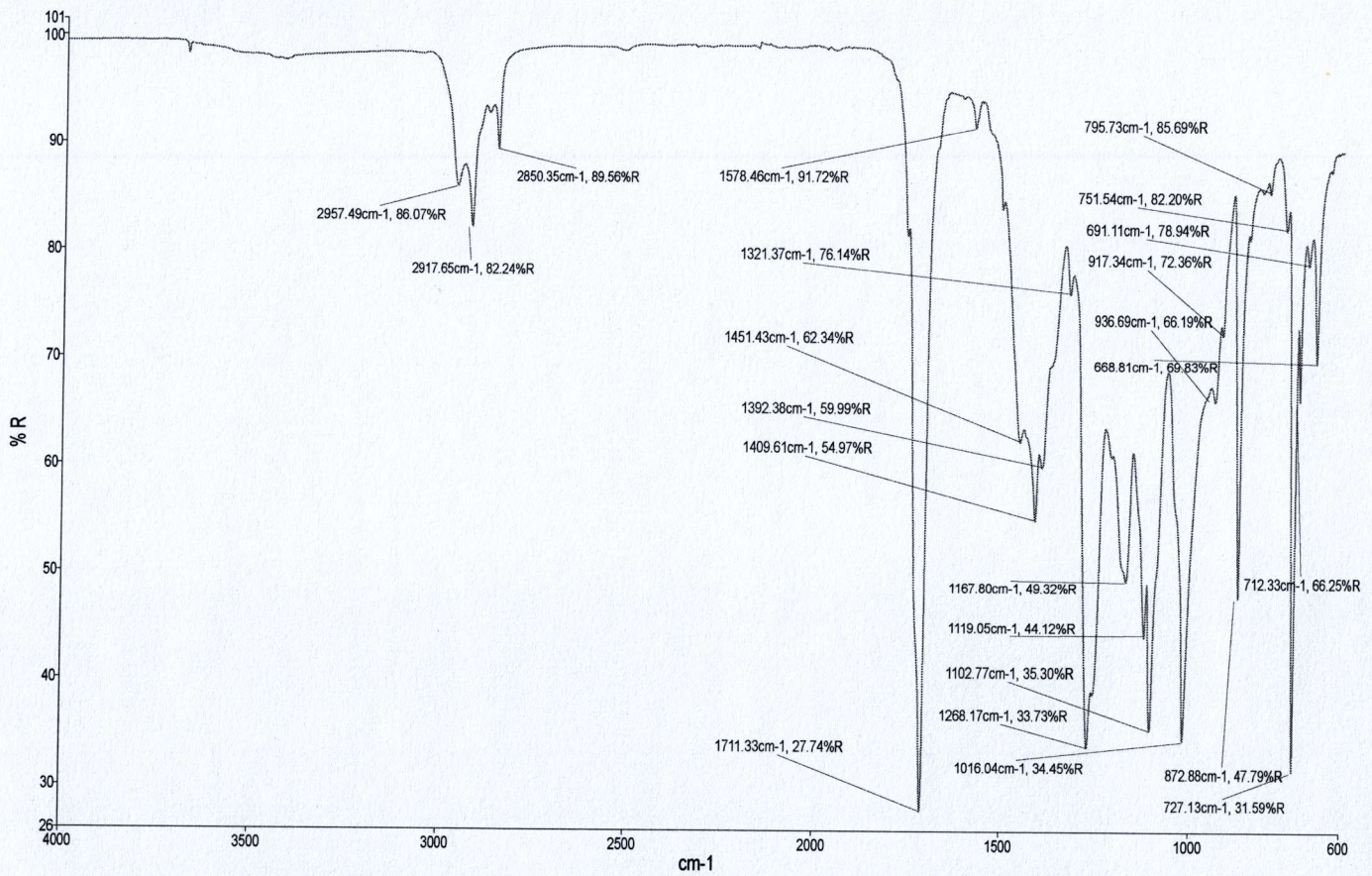
	Week 16/17	Week 18/19	Week 20/21	Week 22/23	Week 24/25/26
Structure	Disintegration observed	Disintegration observed	Disintegration observed	Disintegration observed	Disintegration observed
Moisture	Appropriate moisture Level	Appropriate moisture Level	Appropriate moisture Level	Appropriate moisture Level	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



Mr. Pinaki Chatterjee
(Technical Manager)
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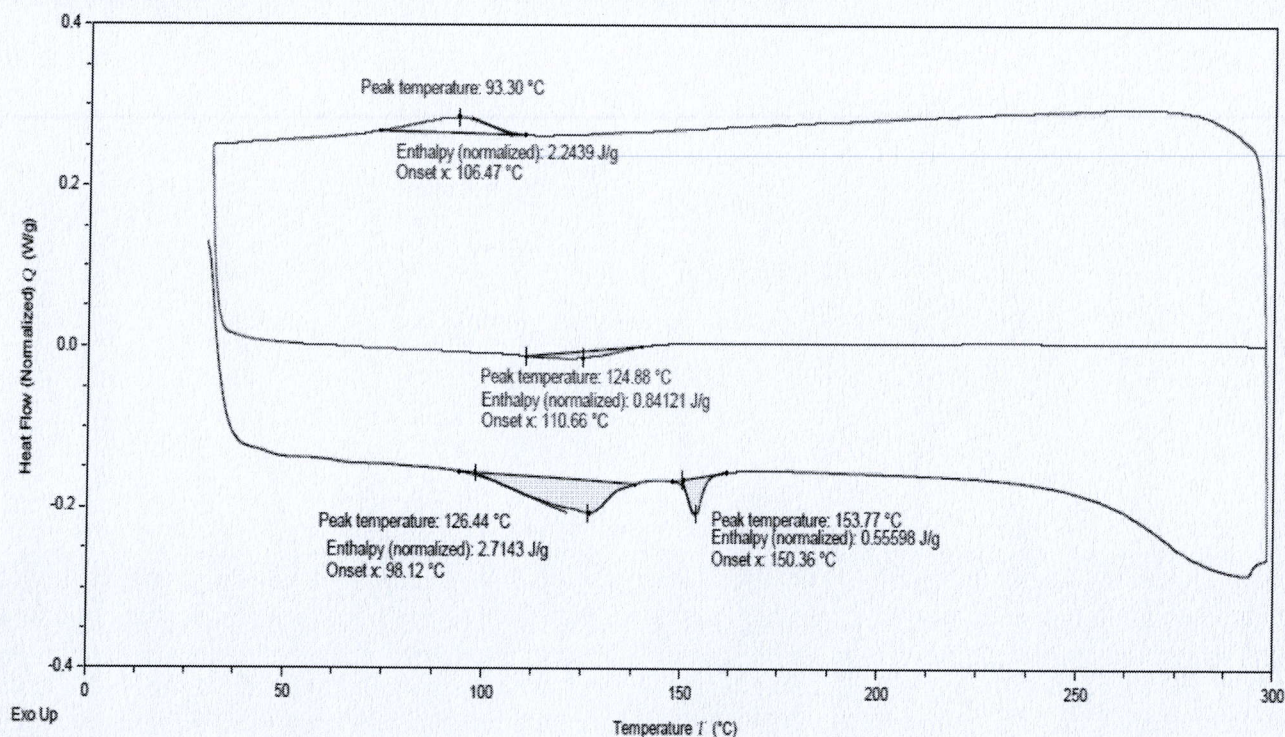
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(Quality Manager)
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6. FTIR Analysis:-

Wave number (cm ⁻¹)	Possible Nature of Bond
2957.49, 2917.65, 2850.35	CH Stretch
1711.33	C=O Stretch
1409.61	CH ₂ Bend
1268.17, 1102.77	C-O Stretch
729.13	Bending Vibration of CH plane of benzene ring

Pinaki Chatterjee
Mr. Pinaki Chatterjee
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Dr. Akshaya Kumar Palai
 (Quality Manager)
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7. DSC Analysis:-

Comment: DSC & FTIR graph indicates the above sample is Polybutylene adipate terephthalate (PBAT) based material.

Pinaki Chatterjee
04.08.2023

Mr. Pinaki Chatterjee
(Technical Manager)
AUTHORISED SIGNATORY

Dr. Akshaya Kumar Palai
04.08.2023

Dr. Akshaya Kumar Palai
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8. DISINTEGRATION- AFTER 12 WEEKS**BEFORE DISINTEGRATION****AFTER DISINTEGRATION****Comment:-**

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.

Pinaki Chatterjee 04.08.2023

Mr. Pinaki Chatterjee

(Technical Manager)

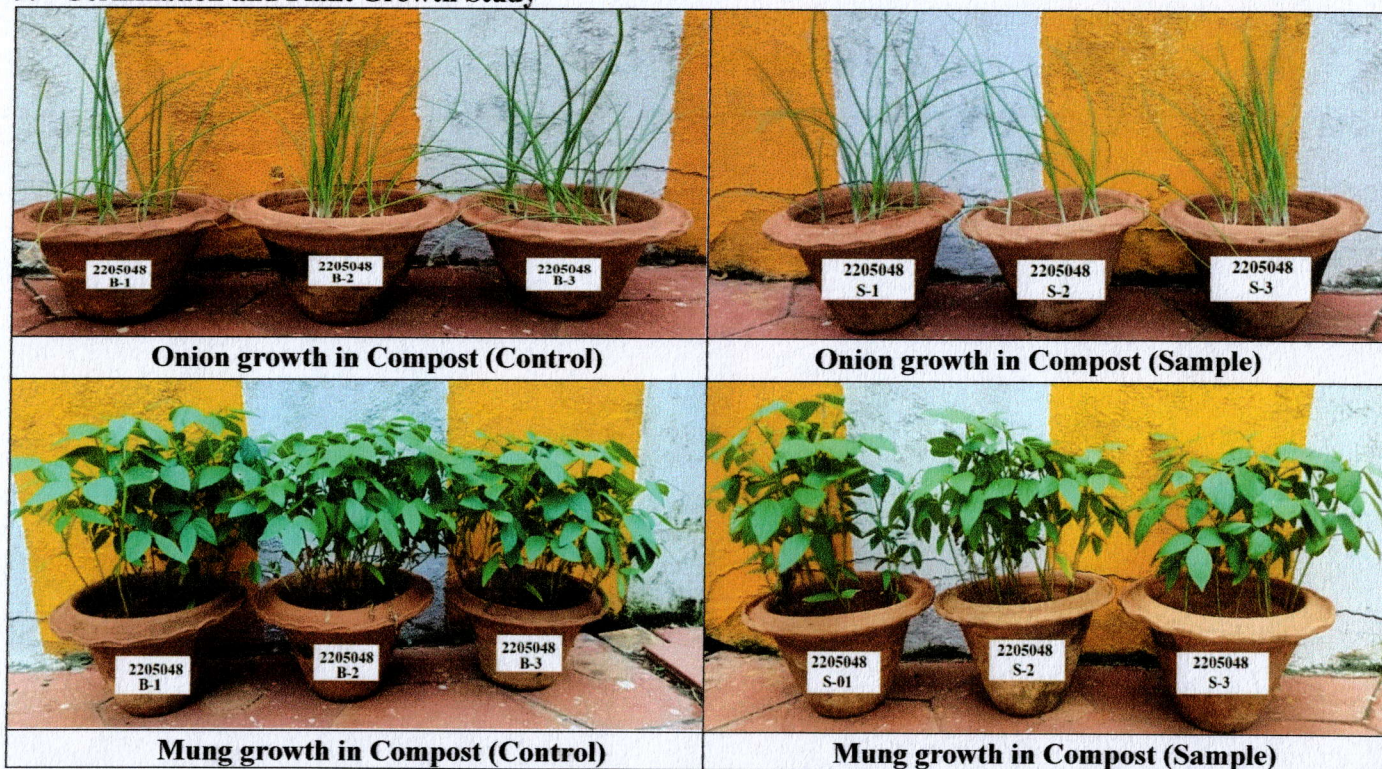
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Dr. Akshaya Kumar Palai 04.08.2023

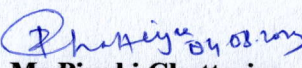
Dr. Akshaya Kumar Palai

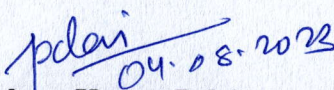
(Quality Manager)

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9. Germination and Plant Growth Study

The percentage of seedling germination rate was found greater than 90% for both control and sample.


Mr. Pinaki Chatterjee
(Technical Manager)
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Dr. Akshaya Kumar Palai
(Quality Manager)
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