सिपेट : स्कूल फोर एडवांस्ड रिसर्च इन पोलिमरस
(एस.ए.आर.पि) - एल.ए.आर.पि.एम्
रसायन एवं पेट्रोरसायन विभाग
रसायन एवं उर्वरक मंत्रालय, भारत सरकार
बी-२५, सी.एन.आई काम्पलेक्स, पटिआ, भुबनेश्वर - 751024
दूरभाष : 0674-2742852 / 2740173 फैक्स - 0674-2740463
ई-मेल : larpmcipet@larpm.in, वेबसाइट : www.larpm.gov.in
मुख्यालय : सिपेट, गिण्डी, चेन्नई - 600 032

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Department of Chemicals & Petrochemicals
Ministry of Chemicals & Fertilizers, Govt. of India
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**LARPM/CIPET/Testing/2020-21/** 852 **Date- 16.12.2020**

**To**

**Mr. Rajen Bhagyoday**
**M/s. Green Dot Biopak**
**Godown No.1,Joshi Estate- 3,Block No.197,**
**Near Siddhi Oil Mill Canal Road,Sarkhej- Bavla Highway,**
**Changodar - 382213, Ahmedabad,Gujarat, India.**
**Mob-9925044422**

**Sub –Test Report –Reg.**

Dear Sir,

**Ref No: 1) Your letter dated 04.03.2020& SSF dated 05.03.2020 & Email dated 27.02.2020 & 15.12.2020**
**2) Our Work Order No.: LARPM/BBS./2019-20/249 dated 18.03.2020.**
**3) Interim Test Report No 00119 dated 23.11.2020.**

With reference to the above cited subject, please find enclosed herewith **Test Report No.00136 dated 16.12.2020.**

Kindly acknowledge the receipt of the same.

Thanks & Regards,

Smita Mohanty 16.12.2020

**Director & Head**
**(Principal Scientist)**

*Encl: As above*

ट : स्कूल फोर एडवांस्ड रिसर्च इन पोलिमरस
(एस.ए.आर.पि) - एल.ए.आर.पि.एम्
सायन एवं पेट्रोरसायन विभाग
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## CERTIFICATE OF ANALYSIS AS PER IS 17088:2008/ISO 17088:2012

**LARPM/CIPET/Testing/2020-21/** **Date-16.12.2020**

**To**
**M/s. Green Dot Biopak**
***Factory Address:-***
**Godown No.1,Joshi Estate- 3,Block No.197,**
**Near Siddhi Oil Mill Canal Road,Sarkhej- Bavla Highway,**
**Changodar - 382213, Ahmedabad,Gujarat, India.**
***Office Address:-***
**A/103, Mondeal Heights, Ramdevnagar, S.G.Highway,**
**Ahmedabad-380015,Gujurat, India**

**Sub –Test Report–Reg.**
Dear Sir,

**Ref No : 1) Your letter dated 04.03.2020 & SSF dated 05.03.2020 & Email dated 27.02.2020 & 15.12.2020**
**2) Our Work Order No.: LARPM/BBS./2019-20/249 dated 18.03.2020**
**3) Interim Test Report No 00119 dated 23.11.2020.**

With reference to the above, the submitted sample was analyzed as per IS 17088:2008/ISO 17088:2012.
The summary detail of testing & analysis is given below:

| | | |
|---|---|---|
| **Company Name & Address** | : | **M/s. Green Dot Biopak**<br>***Factory Address:-***<br>**Godown No.1,Joshi Estate- 3,Block No.197,**<br>**Near Siddhi Oil Mill Canal Road,Sarkhej- Bavla Highway,**<br>**Changodar - 382213, Ahmedabad,Gujarat, India.**<br>***Office Address:-***<br>**A/103, Mondeal Heights, Ramdevnagar, S.G.Highway,**<br>**Ahmedabad-380015,Gujurat, India** |
| **Test Standard** | : | IS 17088:2008/ISO 17088:2012 |
| **Sample Details** | : | **"Transparent Film", Sample ID- 6A** -as stated by the party. |
| **Test Report No** | : | **00136 & dated 16.12.2020** |
| **Date of Receipt of sample** | : | **18.03.2020** |
| **Date of Initiation** | : | **11.05.2020** |
| **Date of Completion** | : | **10.12.2020** |
| **Percentage of Compostability In 180 days** | : | **91.05** |
| **Requirement of Compostability in 180 days as per IS 17088:2008/ISO 17088:2012** | : | **90 %** |

The sample submitted by. **M/s. Green Dot Biopak** , is compostable and the percentage of Compostability in 180 days reported vide test report No. **00136** is **91.05%.**

The submitted sample also complies with the terms of Compostability, seed germination and disintegration as per ISO: 17088:2012/IS 17088: 2008.
Thanks & Regards,

16.12.2020
**Quality Manager**

*Encl : Analysis Report*

ट : स्कूल फोर एडवांस्ड रिसर्च इन पोलिमरस
(एस.ए.आर.पि) - एल.ए.आर.पि.एम्
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मुख्यालय : सिपेट, गिण्डी, चेन्नई - 600 032

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Email : larpmcipet@larpm.in, Web : www.larpm.gov.in
**Head Office** : CIPET, Guindy, Chennai - 600 032



## ANALYSIS REPORT

**Report No. : 00136**
**Date : 16.12.2020**

**Issued to**
**M/s. Green Dot Biopak**
***Factory Address*:-**
**Godown No.1,Joshi Estate- 3,Block No.197,**
**Near Siddhi Oil Mill Canal Road,Sarkhej- Bavla Highway,**
**Changodar - 382213, Ahmedabad,Gujarat, India.**
***Office Address*:-**
**A/103, Mondeal Heights, Ramdevnagar, S.G.Highway,**
**Ahmedabad-380015,Gujurat, India**

**Customer Ref. No. & Date : Your letter dated 04.03.2020 & SSF dated 05.03.2020 &**
**Email dated 27.02.2020** & 15.12.2020
**Work order Ref. No. & Date : LARPM/BBS./2019-20/249 dated 18.03.2020**
**As per Standard : As per part C**

### PART A: PARTICULARS OF SAMPLE SUBMITTED

| | |
|---|---|
| a) Name of the Sample | : **"Transparent Film"** -As stated by the party |
| b) Grade/verity/Type/Size/Class etc. | : Film Sample - as supplied by the party. |
| c) Code No. | : **6A**-as stated by the party. |
| d) Quantity (pcs.,/mtr/gm/nos) | : **2 Kg.** |
| e) Mode of packing (Sealed carton/polypouch/container or not) | : Packed in Envelope. |
| f) Date of receipt of sample | : 18.03.2020 |
| g) Date of Performance of test | : 11.05.2020 – 10.12.2020 |
| 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 |

Chatterjee 16.12.2020
**Mr. Pinaki Chatterjee**
**AUTHORISED SIGNATORY**

16.12.2020
**Dr. Manoranjan Biswal**
**AUTHORISED SIGNATORY**

ट : स्कूल फोर एडवांस्ड रिसर्च इन पोलिमरस
(एस.ए.आर.पि) - एल.ए.आर.पि.एम्
सायन एवं पेट्रोरसायन विभाग
रसायन एवं उर्वरक मंत्रालय, भारत सरकार
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**PART C: TEST RESULTS** **ANALYSIS REPORT**



**Report no : 00136**
**Date : 16.12.2020**

| Sl. No | Name of the Test | Test Method/Standard | Unit | Results Obtained | Specified Requirements |
|---|---|---|---|---|---|
| | **Sample Details: "Transparent Film", Sample ID-6A -As stated by the party.** | | | | |
| 1. | Material Identification | FTIR/DSC | -- | Polylactic Acid (PLA) & Polybutylene adipate terephthalate (PBAT) based material | --- |
| 2. | Disintegration (Dry mass remains in 2 mm sieve after 84 days) | ISO 17088:2012 / IS 17088:2008 | % | 7.49 | No more than 10% of original dry mass remain |
| 3. | Ultimate aerobic Biodegradation (with reference to 100% degradation of positive reference) | ISO 17088:2012 / IS 17088:2008 | % | 91.05 (at the end of 180 days ) | > 90 (at the end of the test period not more than 180 days.) |
| 4. | Plant Growth study<br>**a) Monocotyledon (Rice)**<br>% Seed Emergence<br>**b) Dicotyledon (Mungo)**<br>% Seed Emergence | ISO 17088:2012 / IS 17088:2008 | %<br>% | 92.33<br>92.63 | > 90<br>> 90 |

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

16.12.2020
**Mr. Pinaki Chatterjee**
**AUTHORISED SIGNATORY**

16.12.2020
**Dr. Manoranjan Biswal**
**AUTHORISED SIGNATORY**

पेट : स्कूल फोर एडवांस्ड रिसर्च इन पोलिमरस
(एस.ए.आर.पि) - एल.ए.आर.पि.एम्
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मुख्यालय : सिपेट, गिण्डी, चेन्नई - 600 032

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## ANALYSIS REPORT

**Report No.: 00136**
**Date : 16.12.2020**

| Sl. No | Name of the Test | Test Method/Standard | Unit | Results obtained | Specified Requirements |
|---|---|---|---|---|---|
| 5. | **Heavy metals concentration(#)** | ISO 17088:2012 / IS 17088:2008 | ppm | | |
| | Arsenic (As) | | | 0.006 | 20 |
| | Copper (Cu) | | | BDL(DL:0.002) | 500 |
| | Nickel (Ni) | | | BDL(DL:0.005) | 100 |
| | Zinc (Zn) | | | 0.136 | 2500 |
| | Cobalt (Co) | | | 0.216 | -- |
| | Chromium (Cr) | | | 0.017 | 300 |
| | Molybdenum (Mo) | | | 0.292 | -- |
| | Mercury (Hg) | | | 0.0007 | 10 |
| | Cadmium (Cd) | | | BDL(DL:0.0008) | 20 |
| | Lead (Pb) | | | 0.168 | 500 |
| | Selenium (Se) | | | 0.005 | -- |

- *BDL-Below Detection Limit, DL-Detection Limit.*

* Based on Municipal waste (Management and Handling) Rules, 1999 notified on 27th September, 1999 by Ministry of Environment and Forests, Government of India. Note that concentration of metals like cobalt, molybdenum, fluorine and selenium is not mentioned in the notification.

**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): Test marked as (#) Sub-contracted to the third party laboratory (CIPET, Chennai).

** End of the Report **

16.12.2020
**Mr. Pinaki Chatterjee**
**AUTHORISED SIGNATORY**

16.12.2020
**Dr. Manoranjan Biswal**
**AUTHORISED SIGNATORY**

**TR.NO. –00136** **ANALYSIS RESULT** **Date : 16.12.2020**

**OBSERVATION FOR BIODEGRADABILITY TEST AS PER ISO 17088:2012/IS17088:2008**

**To**
**M/s. Green Dot Biopak**
***Factory Address*:-**
**Godown No.1,Joshi Estate- 3,Block No.197,**
**Near Siddhi Oil Mill Canal Road,Sarkhej- Bavla Highway,**
**Changodar - 382213, Ahmedabad,Gujarat, India.**
***Office Address*:-**
**A/103, Mondeal Heights, Ramdevnagar, S.G.Highway,**
**Ahmedabad-380015,Gujurat, India**

**Date of Initiation** : **11.05.2020**
**Date of Completion** : **10.12.2020**

1. **Sample detail: "Transparent Film",Sample ID-6A - As Stated by the party.**
2. **Material Identification by DSC & FTIR:** DSC & FTIR graph indicates the base material of the supplied sample is Polylactic Acid (PLA) & Polybutylene adipate terephthalate (PBAT).
3. **Observation:-**

a. Conditions of reaction mixtures

Origin of compost: Livestock excreta, municipal and vegetable waste
Reaction Temperature : 58°C (±2°C)
Dry Solid : 52.34(%)
Volatile Solid : 22.24(%)
$CO_2$ evolved during 1st 10days in blank vessels : 56.60 mg/g of volatile solids of compost
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 | 7.5 | 7.4 |
| 2 | Blank 2 | 7.7 | 7.6 |
| 3 | Blank 3 | 7.4 | 7.3 |
| 4 | Cellulose1 | 7.6 | 7.6 |
| 5 | Cellulose2 | 7.5 | 7.4 |
| 6 | Cellulose3 | 7.7 | 7.5 |
| 7 | Negative 1 | 7.3 | 7.2 |
| 8 | Negative 2 | 7.6 | 7.5 |
| 9 | Negative3 | 7.5 | 7.4 |
| 10 | Sample 1 | 7.6 | 7.5 |
| 11 | Sample 2 | 7.4 | 7.3 |
| 12 | Sample 3 | 7.7 | 7.6 |

16.12.2020
**Mr. Pinaki Chatterjee**
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**Dr. Manoranjan Biswal**
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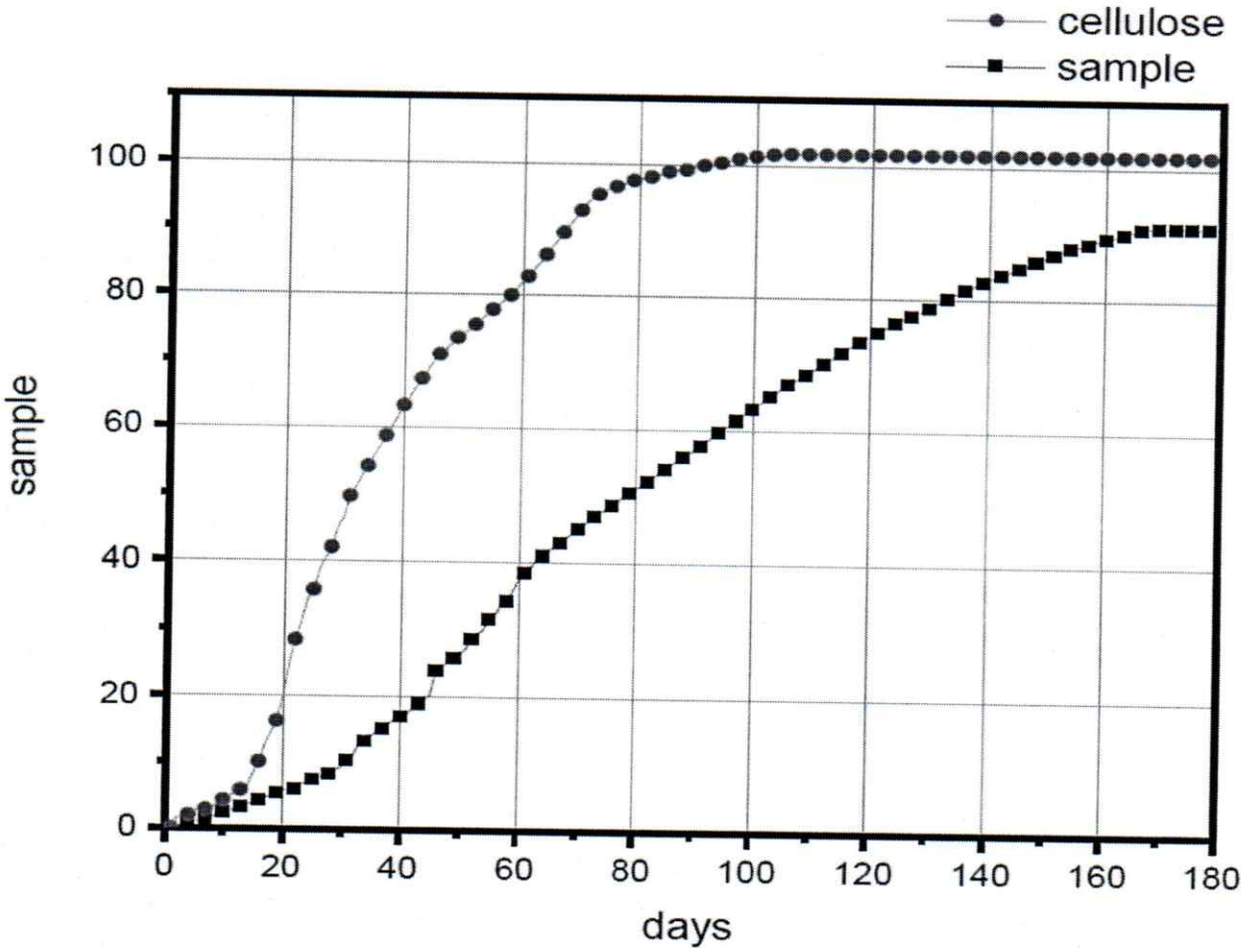
**4. Result:** Percentage biodegradation relative to positive reference

**MEAN(%)** **: 91.05**

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 |

Chatterjee 16.12.2020

**Mr. Pinaki Chatterjee**
**AUTHORISED SIGNATORY**

16.12.2020

**Dr. Manoranjan Biswal**
**AUTHORISED SIGNATORY**

**TR.NO. –00136** **ANALYSIS RESULT** **Date : 16.12.2020**

| | Week 6 | Week 7 | Week 8 | Week 9 | Week 10 |
|---|---|---|---|---|---|
| **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 |

| | 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 | 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 |

| | Week 21 | Week 22 | Week 23 | Week 24 | Week 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 |

16.12.2020

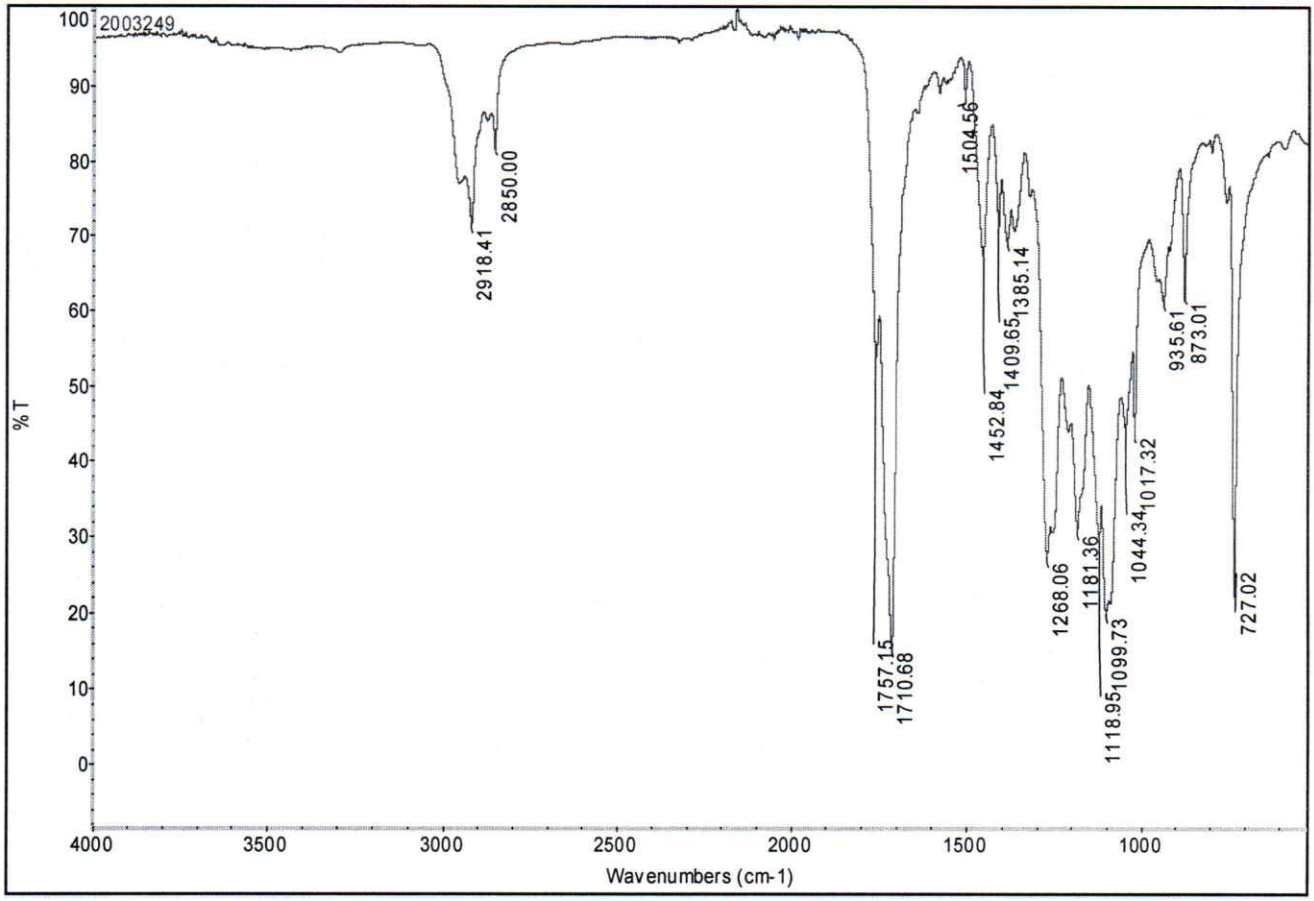
**Mr. Pinaki Chatterjee**
**AUTHORISED SIGNATORY**

16.12.2020

**Dr. Manoranjan Biswal**
**AUTHORISED SIGNATORY**

**TR.NO. –00136** **ANALYSIS RESULT** **Date : 16.12.2020**

**6. FTIR Analysis:**




| Wave number ($cm^{-1}$) | Possible Nature of Bond |
|---|---|
| 2850.00-2918.41 | CH Stretch |
| 1710.68-1757.15 | C=O Stretch |
| 1409.65-1452.84 | $CH_2$ Bend |
| 1268.06 | C-O Stretch |
| 1181.36 | C-O Stretch |
| 727.02 | Bending Vibration of CH plane of benzene ring |

16.12.2020

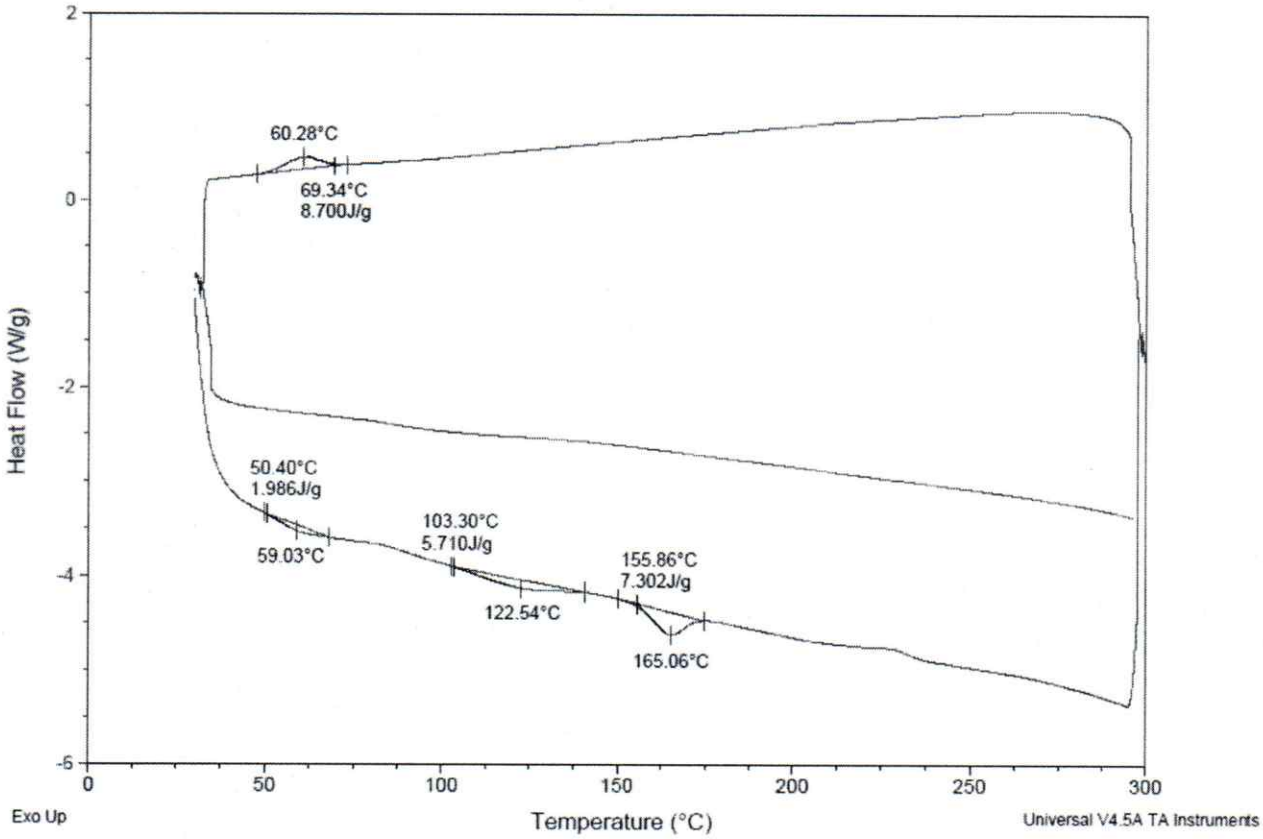
**Mr. Pinaki Chatterjee**
**AUTHORISED SIGNATORY**

16.12.2020

**Dr. Manoranjan Biswal**
**AUTHORISED SIGNATORY**

**TR.NO. –00136** **ANALYSIS RESULT** **Date : 16.12.2020**

7. **DSC Analysis:-**




**Comment**: DSC & FTIR graph indicates the base material of the supplied sample is Polylactic Acid(PLA) & Polybutylene adipate terephthalate (PBAT).

16.12.2020

**Mr. Pinaki Chatterjee**
**AUTHORISED SIGNATORY**

16.12.2020

**Dr. Manoranjan Biswal**
**AUTHORISED SIGNATORY**

## 8.DISINTEGRATION- AFTER 12 WEEKS

BEFORE DISINTEGRATION
2003249

AFTER DISINTEGRATION
2003249

**BEFORE DISINTEGRATION** **AFTER DISINTIGRATION**

**Comment:-**

The disintegration of the supplied sample by passing through 2 mm sieve after 12 week in composting condition as per ISO 17088-2012/IS 17088: 2008 was found not more than 10% of original dry mass remain.

16/12/2020
**Mr. Pinaki Chatterjee**
**AUTHORISED SIGNATORY**

16.12.2020
**Dr. Manoranjan Biswal**
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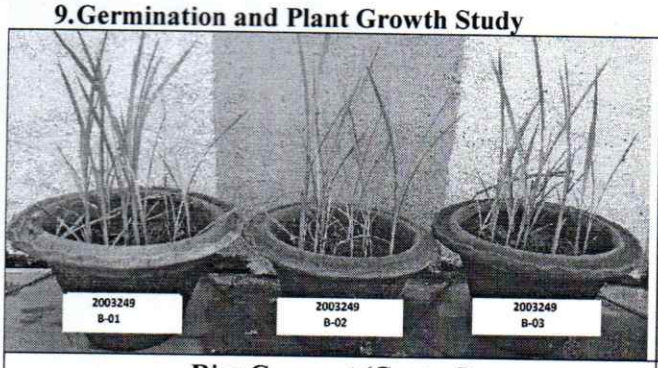
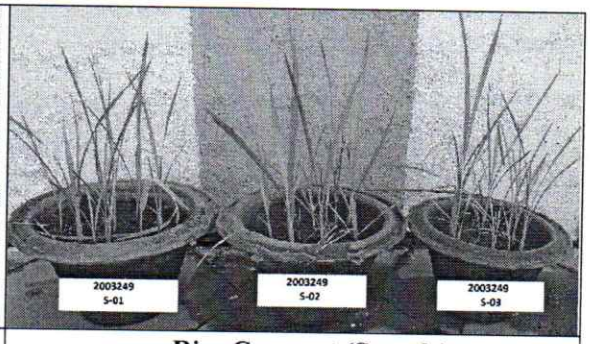
**9. Germination and Plant Growth Study**




**Rice Compost (Control)**




**Rice Compost (Sample)**


**Mungo Compost (Control)**


**Mungo Compost (Sample)**

The percentage of seedling germination rate is found to be greater than 90% for both Rice and Mungo Bean.

16.12.2020
**Mr. Pinaki Chatterjee**
**AUTHORISED SIGNATORY**

16.12.2020
**Dr. Manoranjan Biswal**
**AUTHORISED SIGNATORY**