सिपेट : इंस्टिट्यूट ऑफ प्लास्टिक्स टेक्नोलॉजी
(रसायन एवं उर्वरक मंत्रालय, भारत सरकार)
गिण्डी, चेन्नै - 600 032.
फोन : 91-44-2225 4701-6 फैक्स : 91-44-22254707
ई-मेल : chennai@cipet.gov.in वेब्साइट : www.cipet.gov.in

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E-mail : chennai@cipet.gov.in Website : www.cipet.gov.in

परीक्षण रिपोर्ट / TEST REPORT

को जारी / Issued to :

HI-TECH INTERNATIONAL
Near Airport, Sahnewal, Ludhiana 141010.

क्र.सं / Sl. No. : 27128
रिपोर्ट सं / REPORT NO. : **64058**
दिनाक / Date : **10-06-2021**
Pages.....Nos. Part A,B,C & D

संदर्भ / Customer Let. Ref :
परीक्षण मानक स्तर के अनुसार परीक्षण रिपोर्ट / TEST REPORT AS PER TEST STANDARD : Refer Part C

भाग - क / PART - A

प्रस्तुत सैंपिल का विवरण / PARTICULARS OF SAMPLE SUBMITTED

अ)	सैंपिल का नाम / a) Name of the Sample	:	Dr Bio Compostable Polymer & Film - as stated by the party
आ)	सैंपिल प्राप्त होने की तारीख / b) Date of Receipt of sample	:	27-10-2020
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	:	1.5 kg
ए)	पेंकिंग की रीति / h) Mode of Packing	:	Packed in Aluminium foil cover
ऐ)	मोहर बंद या नहीं / i) Sealed or not	:	Not Sealed
ओ)	कोई अन्य सूचना / j) Any other information	:	--

भाग - ख / PART - B

20100965

अनुपूरक सूचनाएँ / SUPPLEMENTARY INFORMATIONS

अ)	सैंपिलिंग कार्यवाहियों हेतु संदर्भ / a) Reference to sampling procedure	:	Sampling not done by this lab
आ) b)	माप करने हेतं लिए गए सहायक दस्तावेज एवं प्राप्त परिणाम Supporting documents for the measurement taken and result derived	:	As given in Part C
इ) c)	संबंधित कार्य अनुदेशों में निर्धारित के अनुसार परीक्षण रीति से कोई परिवर्तन Deviation from the test method as prescribed in relevant work instructions, if any	:	No deviation from the standard

सिपेट : इंस्टिट्यूट ऑफ प्लास्टिक्स टेक्नोलॉजी
(रसायन एवं उर्वरक मंत्रालय, भारत सरकार)
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परीक्षण रिपोर्ट / TEST REPORT

रिपोर्ट सं / **REPORT NO. :** **64058** क्र.सं / Sl. No. 27123

दिनाक / Date : **10-06-2021**

भाग - ग / **PART - C**

परीक्षण परिणाम / TEST RESULTS

Test Duration: 28.10.2020 to 10.06.2021

Sl.No	Name of the Test	Test Method/ Standard	Unit	Results Obtained	Specified Requirements
1	Material Identification	FTIR & DSC	-	Blend of Poly Lactic Acid (PLA) and Poly Butylene Adipate Co-Terephthalate (PBAT) with Starch	-
2	Disintegration (Dry mass remains in 2 mm sieve after 84 days)	ISO 17088:2012 / IS 17088:2008	%	8.2	No more than 10%
3	Ultimate aerobic Biodegradation (with reference to 100% degradation of positive reference)	ISO 17088:2012 / IS 17088:2008	%	90.04% (at the end of 133 days)	> 90 (at the end of the test period not more than 180 days.)
4	Plant Growth study				
	Monocotyledon (Rice) % Seed emergence	ISO 17088:2012 / IS 17088:2008	%	92	> 90
	Dicotyledon (Radish) % Seed Emergence		%	91	> 90

The detailed observation on biodegradability test is enclosed as Annexure

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परीक्षण परिणाम **/ TEST RESULTS**

दिनाक / Date : **10-06-2021**

PART C - TEST RESULTS

Sl.No	Name of the Test	Test Method/ Standard	Unit	Results Obtained	Specified Requirements*
5	Heavy metals concentration				
a.	Arsenic (As)			0.002	20
b.	Copper (Cu)			0.095	500
c.	Nickel (Ni)			BDL(DL-0.005)	100
d.	Zinc (Zn)	ISO 17088:2012 /		0.099	2500
e	Cobalt (Co)	IS 17088:2008	mg/L	0.228	-
f.	Chromium (Cr)			0.176	300
g.	Molybdenum (Mo)			0.845	-
h.	Mercury (Hg)			BDL(DL-0.0006)	10
i.	Cadmium (Cd)			0.002	20
j.	Lead (Pb)			0.187	500
k.	Selenium (Se)			0.022	-

* 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, and selenium is not mentioned in the notification.

Note: BDL - Below Detection Limit; DL - Detection Limit

PART D - REMARKS

NIL

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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परीक्षण परिणाम / **TEST RESULTS**

दिनाक / Date : **10-06-2021**

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

Name of the Party : M/s.Hi-Tech International
Near Airport, Sehnewal,Ludhiana
141010.

1 **Sample Details (As stated by Party):** Dr Bio compostable Polymer & Film

2 **Material Identification by FTIR :** Blend of Poly Lactic Acid (PLA) and Poly Butylene Adipate Co-Terephthalate (PBAT) with Starch

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 (%)	:	54.6
Volatile content (%)	:	13.6
CO_2 evolved during first 10days in blank vessels (mg/g of volatile content of compost)	:	74.2mg/g
Test duration (days)	:	133 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	7.2	7.1
2	Blank 2	7.2	7.1
3	Blank 3	7.2	7.1
4	Cellulose 1	7.4	7.2
5	Cellulose 2	7.4	7.2
6	Cellulose 3	7.3	7.1
7	Negative 1	7.2	7.1
8	Negative 2	7.2	7.1
9	Negative 3	7.2	7.1
10	Sample 1	7.3	7.1
11	Sample 2	7.3	7.1
12	Sample 3	7.2	7.2

Contd.,

रिपोर्ट सं / **REPORT NO. : 64058**

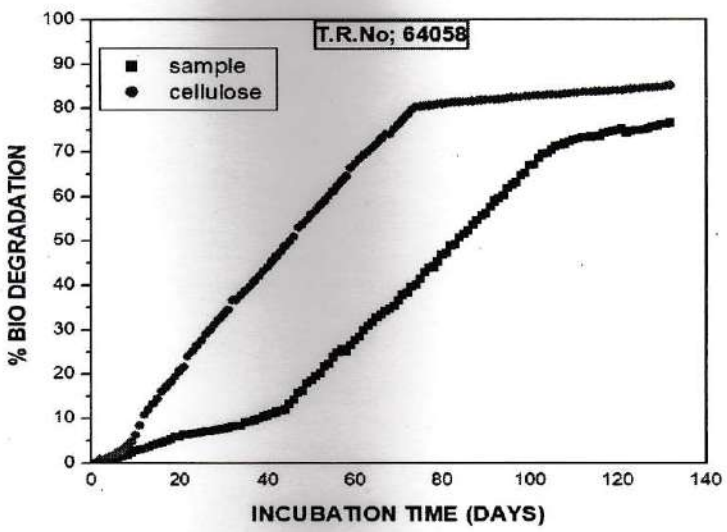
परीक्षण परिणाम / **TEST RESULTS**

दिनाक / Date : **10-06-2021**

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

Sample (Mean) : 90.04% at the end of 133 days

The reference Material - cellulose : ~ 100%



5 **Visual Observation of Sample**

Description	Week 3	Week 6	Week 9
Structure	Film sample	Film sample	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 12	Week 15	Week 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

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परीक्षण परिणाम / **TEST RESULTS**

दिनाक / Date : **10-06-2021**

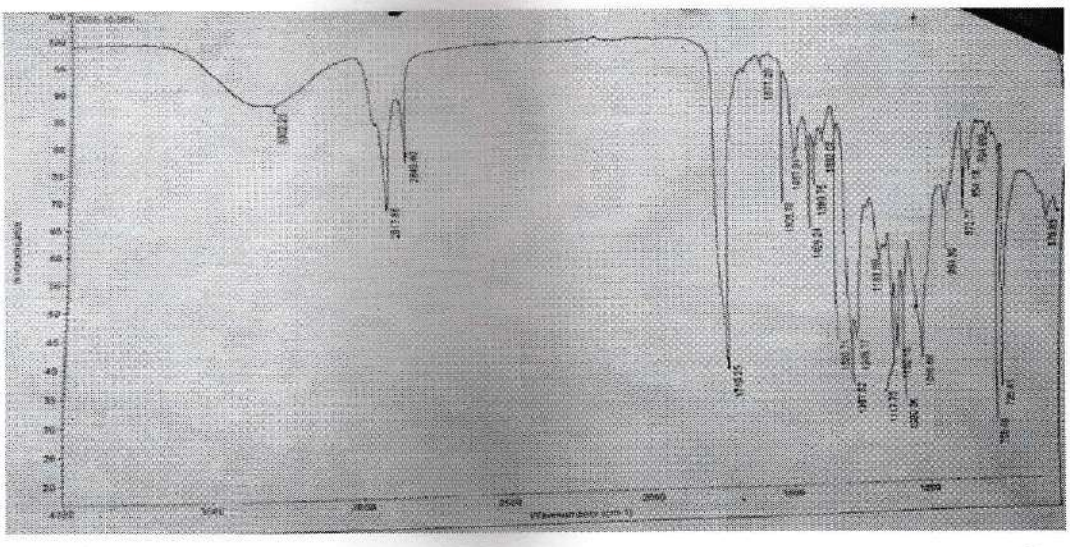
6 Visual Observation of Compost

Description	Week 3	Week 6	Week 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 12	Week 15	Week 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 FTIR Analysis

Sample Details (As stated by Party): Dr Bio compostable Polymer & Film



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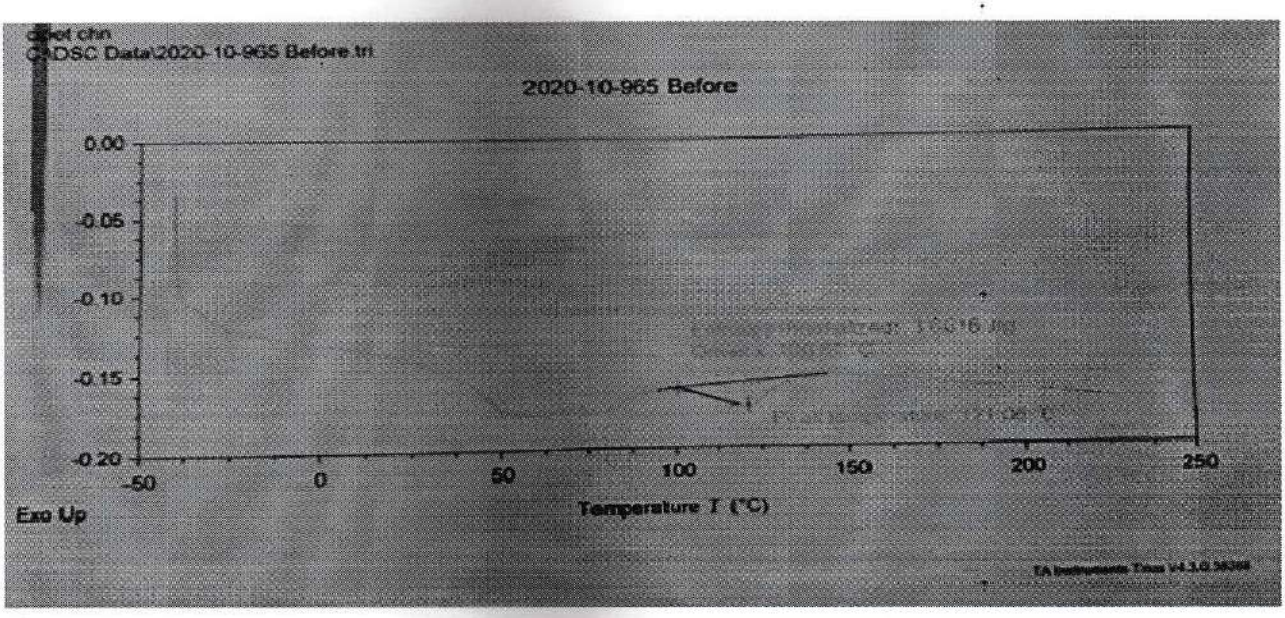
परीक्षण परिणाम / **TEST RESULTS**

दिनाक / Date : **10-06-2021**

FTIR Interpretation

Wave number (cm^{-1})	Nature of Bond
2917	CH_2 asymmetric stretching
1710	C=O in PLA and PBAT
1457	-CH_2 Plane Bending
1267	C-O bonds of PBAT
1117	C-O bonds of PBAT
1080	C-O bonds of PBAT
872	O-CH-CH_3 of ester
726	CH plane of benzene ring

8 DSC Analysis



Comment: The above DSC & FTIR analysis indicates the above sample is Blend of Poly Lactic Acid (PLA) and Poly Butylene Adipate Co-Terephthalate (PBAT) with Starch

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परीक्षण परिणाम / **TEST RESULTS**

दिनाक / Date : **10-06-2021**

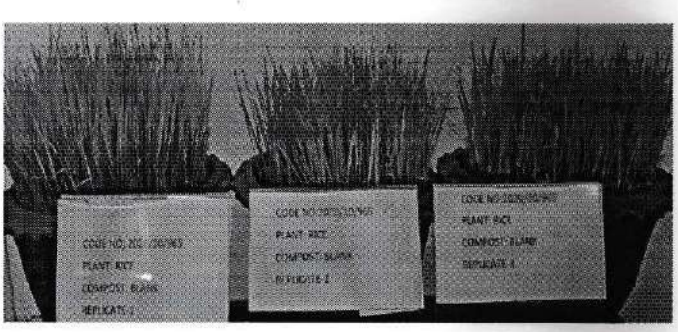
9 Disintegration After 12 Weeks

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 17088-2012/IS 17088: 2008 was found not more than 10% of original dry mass remain.

10 Seed Germination & Plant growth study



Rice Compost (Control)

Rice Compost (Sample)

Contd.,

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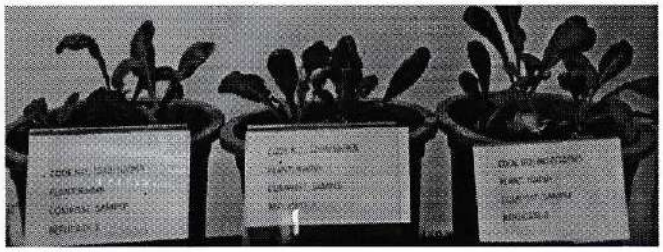
परीक्षण परिणाम **/ TEST RESULTS**

दिनाक / Date : **10-06-2021**

Radish Compost (Control)



Radish Compost (Sample)

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

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