

केंद्रीय पेट्रोसायन अभियांत्रिकी
एवं प्रौद्योगिकी संस्थान (सिपेट)

(पूर्व में केंद्रीय प्लास्टिक्स इंजीनियरिंग एवं तकनीकी संस्थान)

रसायन एवं पेट्रोसायन विभाग

रसायन एवं उर्वरक मंत्रालय, भारत सरकार

डी सी आर यू एस टी कैम्पस, 50 माईल स्टोन,

एन एच-1 मुरथल, जिला-सोनीपत-131039 (हरियाणा)

फोन : 0130-2203000-29

ई-मेल : murthal@cipet.gov.in

वेबसाइट : www.cipet.gov.in

मुख्यालय : गिण्डी, चेन्नै-600 032



सिपेट CIPET



CENTRAL INSTITUTE OF PETROCHEMICALS
ENGINEERING & TECHNOLOGY (CIPET)

(Formerly Central Institute of Plastics Engineering & Technology)

Department of Chemicals & Petrochemicals

Ministry of Chemicals & Fertilizers, Govt. of India

Near DCRUST Campus, 50th Mile Stone, NH-1

Murthal, Distt. Sonapat-131039 (Haryana)

Phone : 0130-2203000-29

E-mail : murthal@cipet.gov.in

Website : www.cipet.gov.in

Head Office : Guindy, Chennai - 600 032

सिपेट / मुरथल / परीक्षण / 2023-24 / 1297

दिनांक : 30/01/2024

सेवा में,

Kesarinandan Industries

183-184, Bileshwar Industrial Estate,

Opp GVMM, Odhav Road, Odhav,

Ahmedabad - 382415, Gujarat

विषय : Interim: परीक्षण प्रतिवेदन संख्या 0159 (Revised) भेजने के सम्बन्ध में।

संदर्भ : आपका पत्र Ref. No. - Nil. दिनांक:-05/12/2022.

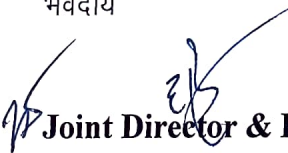
महोदय,

कृपया आपके **Testing of Biodegradable Film Sample - reg.** के परीक्षण के संदर्भ में इस पत्र के साथ परीक्षण प्रतिवेदन संख्या 0159 (Revised) संलग्न प्राप्त करें।

इस पत्र के साथ ग्राहक संतुष्टि पत्र को भी संलग्न कर रहे हैं, कृपा करके आप इसे भरकर हमारे रिकार्ड के लिए वापस भेज दे।

धन्यवाद,

भवदीय


Joint Director & Head

संलग्नक: परीक्षण प्रतिवेदन संख्या 0159 (Revised)

केंद्रीय पेट्रोसायन अभियांत्रिकी
एवं प्रौद्योगिकी संस्थान (सिपेट)

(पूर्व में केंद्रीय प्लास्टिक्स इंजीनियरिंग एवं तकनीकी संस्थान)
रसायन एवं पेट्रोसायन विभाग
रसायन एवं उर्वरक मंत्रालय, भारत सरकार
डी सी आर यू एस टी कैम्पस, 50 माईल स्टोन,
एन एच -1 मुख्यालय, जिला - सोनीपत-131039 (हरियाणा)
फोन : 0130-2203000-29
ई-मेल : murthal@cipet.gov.in
वेबसाइट : www.cipet.gov.in
मुख्यालय : गिण्डी, चेन्नई - 600 032



सिपेट CIPET



CENTRAL INSTITUTE OF PETROCHEMICALS
ENGINEERING & TECHNOLOGY (CIPET)

(Formerly Central Institute of Plastics Engineering & Technology)
Department of Chemicals & Petrochemicals
Ministry of Chemicals & Fertilizers, Govt. of India
Near DCRUST Campus, 50th Mile Stone, NH-1
Murthal, Distt. Sonapat-131039 (Haryana)
Phone : 0130-2203000-29
E-mail : murthal@cipet.gov.in
Website : www.cipet.gov.in
Head Office : Guindy, Chennai - 600 032

PLASTIC TESTING CENTRE
TEST CERTIFICATE

14037

Test Report No: 0159 (Revised)

Date: 09/01/2024

Issued to

Kesarinandan Industries
183-184, Bileshwar Industrial Estate,
Opp GVMM, Odhav Road, Odhav,
Ahmedabad - 382415, Gujarat



Ref. No. and Date: आपका पत्र Ref. No. Nil. दिनांक:-05/12/2022.

Test Report as per party requirement

PART - A

PARTICULARS OF SAMPLE SUBMITTED

a)	Name of the Sample	:	Biodegradable Film Sample as stated by party- reg.
b)	Grade / Variety / Type / Size/ Class	:	Nil
c)	Declared Value, if any	:	Nil
d)	Code No.	:	Nil
e)	Batch No. and Date of Manufacture	:	Nil
f)	Quantity	:	1.5kg Film sample as submitted by Party.
g)	Mode of Packing	:	Packed.
h)	Sealed or not	:	Not Sealed
i)	Any other information	:	Test Report received without signature of IO's.
j)	Date of receipt of Sample	:	12.12.2022
i.	Disintegration & Ultimate aerobic biodegradation test	Date of Commencement	04.01.2023
		Date of Completion	04.06.2023
ii.	Plant Growth Study	Date of Commencement	12.06.2023
		Date of Completion	26.06.2023
iii.	Acute ecotoxic effects of earthworm test	Date of Commencement	03.07.2023
		Date of Completion	17.07.2023
iv.	Chronic ecotoxic effects of earthworm test	Date of Commencement	17.07.2023
		Date of Completion	11.09.2023
v.	Heavy Metal Analysis	Date of Commencement	20.07.2023
		Date of Completion	06.11.2023


Note:

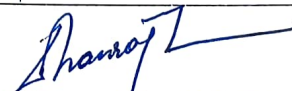
- This report, in full of part, shall not be published, advertised, used for any legal action, unless prior permission has been secured
- This test report is only for the sample tested.

PART - B

SUPPLEMENTRY INFORMATIONS

a)	Reference to sampling procedure wherever applicable	:	Sample Supplied by the Party
b)	Supporting documents for the measurements taken and results derived like graphs, tables, sketches and/or Photographs as appropriate to test report, if any (to be attached).	:	As given in Part-C
c)	Deviation from the test methods as prescribed in relevant work instruction, if any	:	Nil


Naved Siraj - (A.T.O.)
Authorized Signatory


Dhanraj J. - (S.T.O.)
Authorized Signatory





Part- C

Test results of Biodegradable Film as per party requirement.

Sl. No.	CL. No.	Name of the Test	Test Standard/ Method (Followed)	Unit	Specified Requirement	Test Value Obtained
1.	-	Material Identification	ASTM E 1252 & ASTM D 3418	-	-	PLA + PBAT
2.	6.2	Disintegration (Dry mass remains in 2mm sieve after 84 days)	ISO 17088:2021	%	Not more than 10% of its original dry mass	0.86
3.	6.3	Ultimate Aerobic Biodegradation (With reference to 100% degradation of positive reference)	ISO 17088:2021	%	> 90% (At the end of the test period not more than 180 days)	90.31 (At the end of 151 days)
Plant Growth study (Germination Period : 12.06.2023 to 26.06.2023)						
4.	6.4	Monocotyledon (Vigna radiata) % Seed emergence	ISO 17088:2021 (Annex C)	%	> 90% of those from the corresponding blank compost	93.54

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


 Naved Siraj - (A.T.O.)
 Authorized Signatory


 Dhanraj J. - (S.T.O.)
 Authorized Signatory



सिपेट CIPET

Continuation Sheet

ULR No.: Nil
Test Report No. 0159 (Revised)
Date: 09/01/2024

ANALYSIS REPORT**Part- C****Test results of Biodegradable Film as per party requirement.**

Sl. No.	CL. No.	Name of the Test	Test Standard/ Method (Followed)	Unit	Specified Requirement	Test Value Obtained
5. Acute ecotoxic effects to earthworm (Survival Period : 03.07.2023 to 17.07.2023)						
a.	6.4.4	Survival of adult earthworm at the end of 7 days.	ISO 17088:2021 (Annex D)	%	> 90% of those from the corresponding blank compost	98.94
b.		Survival of adult earthworm at the end of 14 days.		%		97.68
c.		Biomass at the end of 14 days		%		96.82
6. Chronic ecotoxic effects to earthworm (Survival Period : 17.07.2023 to 11.09.2023)						
a.	6.4.5	Survival of adult earthworm at the end of 28 days.	ISO 17088:2021 (Annex E)	%	> 90% of those from the corresponding blank compost	95.78
b.		Survival of adult earthworm at the end of 56 days.		%		94.14
c.		Offspring at the end of 56 days		%		92.22
d.		Biomass at the end of 56 days		%		93.14

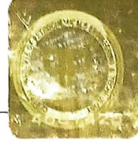
**Naved Siraj - (A.T.O.)
Authorized Signatory**

**Dhanraj J. - (S.T.O.)
Authorized Signatory**



सिपेट CIPET

Continuation Sheet



ULR No.: Nil
Test Report No. 0159 (Revised)
Date: 09/01/2024

Part- C

Test results of Biodegradable Film as per party requirement.

Sl. No.	CL. No.	Name of the Test	Test Standard/ Method	Unit	Test Value Obtained	Specified Requirement
7.	6.5.2	Heavy Metal Analysis (On dry mass basis)	ISO 17088:2021	mg/kg		
		Arsenic (As)			10	0.016
		Copper (Cu)			300	0.64
		Nickel (Ni)			50	50
		Zinc (Zn)			1000	1.03
		Chromium (Cr)			50	1.98
		Mercury (Hg)			0.15	0.01
		Cadmium (Cd)			5	1.23
Lead (Pb)	100	3.86				

PART - D

Remarks: Nil

End of report

Note:

1. This Test Report / Certificate is issued only for the samples submitted to CIPET
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. The test certificate shall not be reproduced in full except without the written approval of the laboratory.
5. Selection of the samples for individual test have been done in accordance with respective clauses of standard
6. Details of the subcontracted: Sr. No. (1*) test has been subcontracted.
7. Statement of conformity of a specification or standard is provided by laboratory taking into account the level of risk associated/borderline case with the decision rule employed.
8. This report no.0159(Revised) supersedes all other report given prior interim no. 0159N(Interim) & 0159(Final).

Naved Siraj - (A.T.O.)
Authorized Signatory

Dhanraj J. - (S.T.O.)
Authorized Signatory

**Continuation Sheet****ANALYSIS RESULTS**

Name of the customer: **Kesarinandan Industries**
183-184, Bileshwar Industrial Estate,
Opp GVMM, Odhav Road, Odhav,
Ahmedabad – 382415, Gujarat

1. Sample Description : Biodegradable Film Sample as stated by party
 2. Material identification : PLA + PBAT
 3. Observations :
 (i) Condition of reaction mixture :
 Origin of compost : Livestock excrement, municipal & vegetable waste
 Reaction Temperature : 58 °C (±2 °C)
 Dry Solid Content (%) : 54.9
 Volatile solid Content (%) : 38.9
 CO₂ evolved during 1st
 10 days in blank vessel : 52.20 mg/gm of volatile solid of compost
 Test Duration (days) : 151 days
 Reference Material : Cellulose
 Volume of reaction vessel : 3000 mL
 (ii) pH of test medium

S. No.	Composting Vessel	pH (Before test)	pH (After test)
1	Blank 1	7.8	8.0
2	Blank 2	8.2	7.9
3	Blank 3	7.3	7.1
4	Cellulose 1	7.6	7.8
5	Cellulose 2	7.9	8.2
6	Cellulose 3	8.3	8.0
7	Negative 1	8.1	7.8
8	Negative 2	7.5	7.7
9	Negative 3	7.4	7.6
10	Sample 1	7.6	7.3
11	Sample 2	8.0	7.5
12	Sample 3	8.2	8.0



Naved Siraj - (A.T.O.)
Authorized Signatory

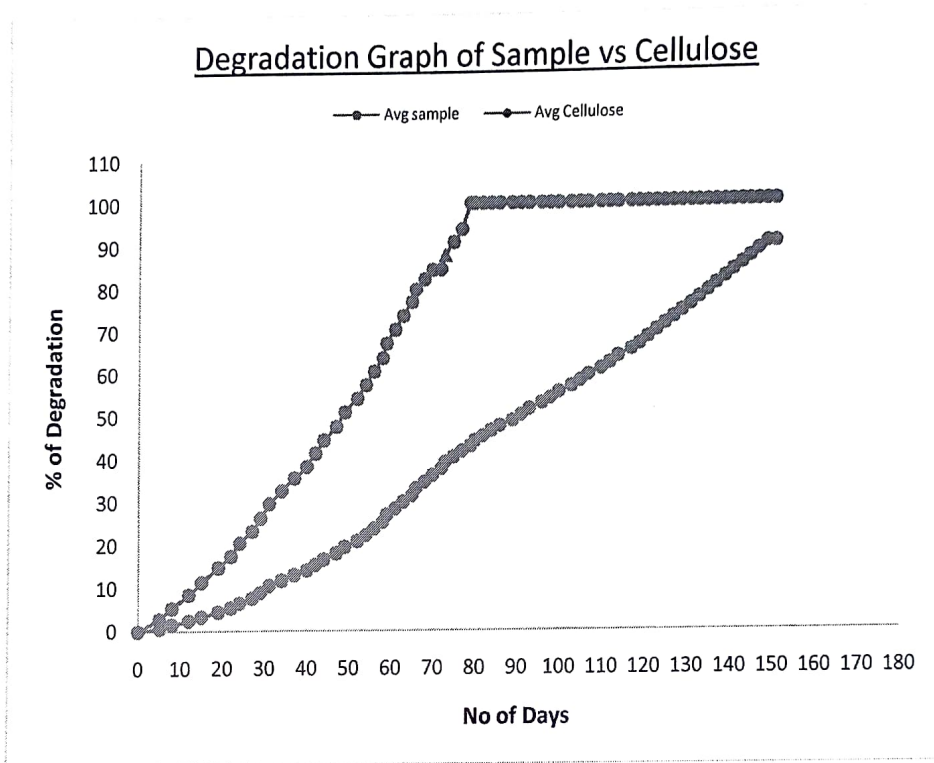


Dhanraj J. - (S.T.O.)
Authorized Signatory



4. Results: Percentage biodegradation relative to positive reference

Mean (%) : 90.31%
Reference material – Cellulose (%) : 100 %

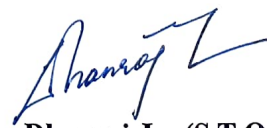


5. Visual observation of Sample:

S. no.	Description	Week 1	Week 5	Week 12	Week 16	Week 22
1	Structure	Film sample	Film sample	Film sample	Film sample	Film sample
2	Moisture	Adequate moisture level	Adequate moisture level	Adequate moisture level	Adequate moisture level	Adequate moisture level
3	Colour	Milky White	Milky White	Milky White	Faded White	-
4	Fungal development	Nil	Nil	Nil	Nil	Nil
5	Smell	Organic/Dirt like	Organic/Dirt like	Organic/Dirt like	Organic/Dirt like	Organic/Dirt like



Naved Siraj - (A.T.O.)
Authorized Signatory

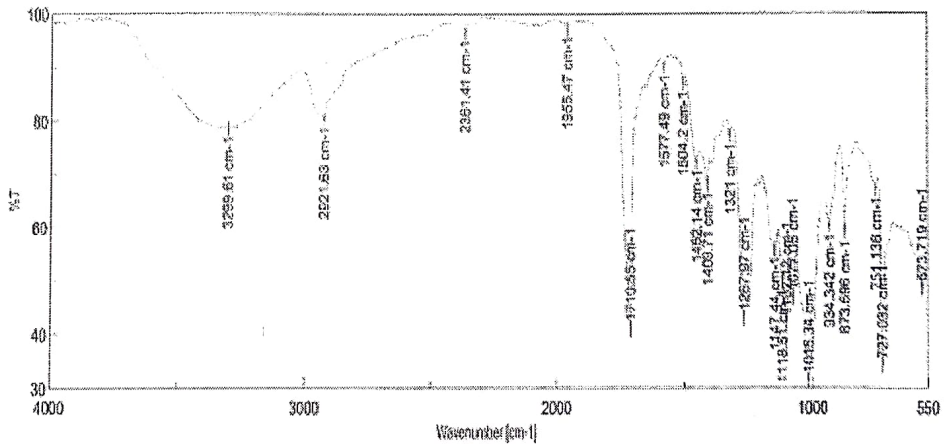



Dhanraj J. - (S.T.O.)
Authorized Signatory

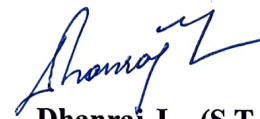
6. Visual observation of compost:

S. no.	Description	Week 1	Week 5	Week 12	Week 16	Week 22
1	Structure	Fine Particles	Fine Particles	Fine Particles	Fine Particles	Fine Particles
2	Moisture	Adequate moisture level	Adequate moisture level	Adequate moisture level	Adequate moisture level	Adequate moisture level
3	Colour	Dark Brown	Dark Brown	Dark Brown	Dark Brown	Dark Brown
4	Fungal development	Nil	Nil	Nil	Nil	Nil
5	Smell	Organic/Dirt like	Organic/Dirt like	Organic/Dirt like	Organic/Dirt like	Organic/Dirt like

7. FTIR Analysis:

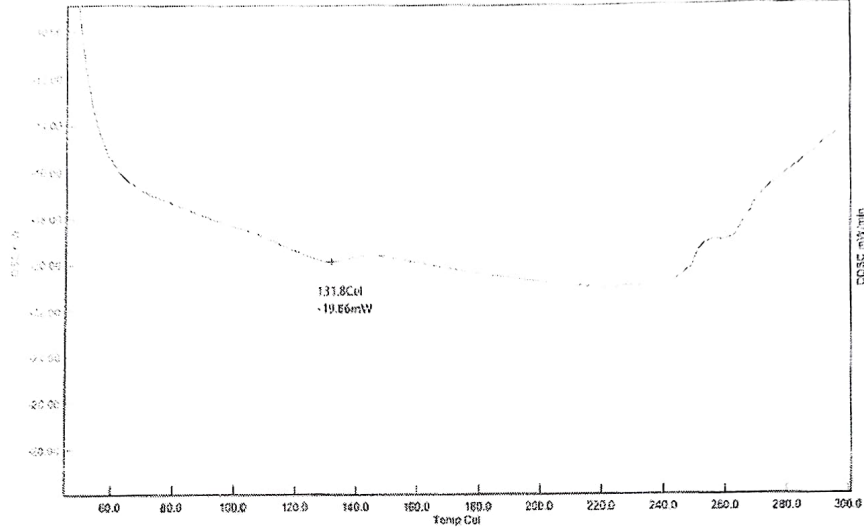



Naved Siraj - (A.T.O.)
Authorized Signatory


Dhanraj J. - (S.T.O.)
Authorized Signatory



8. DSC Analysis:



Comment: The above DSC & FTIR analysis indicates that the submitted sample may be Poly (Lactic Acid) and Poly (Butylene adipate-co-Terephthalate)

9. Disintegration After 12 weeks



Before Disintegration



After Disintegration

The disintegration of 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 dry mass remain.

**Naved Siraj - (A.T.O.)
Authorized Signatory**

**Dhanraj J. - (S.T.O.)
Authorized Signatory**



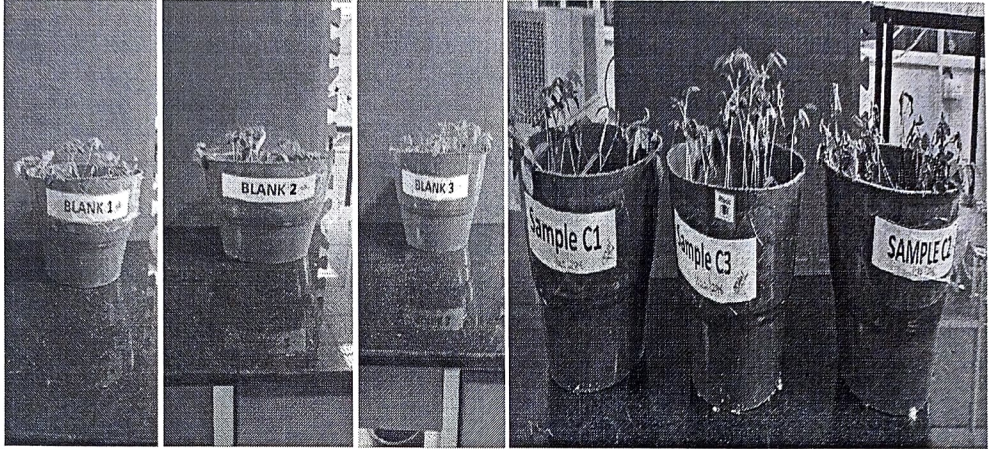
सिपेट CIPET

Continuation Sheet



ULR No.: Nil
Test Report No. 0159 (Revised)
Date: 09/01/2024

10. Germination and plant Growth Study



Compost (Control)

Compost (Sample)

The percentage of seed germination rate is found to be greater than 90% for Monocotyledon (*Vigna radiata*)

Naved Siraj - (A.T.O.)
Authorized Signatory

Dhanraj J. - (S.T.O.)
Authorized Signatory