

परीक्षण रिपोर्ट / TEST REPORT

को जारी /
Issued to :

Suhasini Enterprises
Patel Building, Station Road, Jalna 431203,
Maharashtra.

क्र.सं / SI. No.

29624

रिपोर्ट सं / REPORT NO. : 67802

दिनांक / Date : 05-07-2022

13-12-2021 Pages... 09 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 सैपिल का विवरण / PARTICULARS OF SAMPLE SUBMITTED

- अ) सैपिल का नाम / a) Name of the Sample : Compostable Film/bag - as stated by the party
- आ) सैपिल प्राप्त होने की तारीख / b) Date of Receipt of sample : 13-12-2021
- 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 : 2 kg
- ए) पैकिंग की रीति / h) Mode of Packing : Packed in Polythene bag
- ऐ) मोहर बंद या नहीं / i) Sealed or not : Not Sealed
- ओ) कोई अन्य सूचना / j) Any other information : --

भाग - ख / PART - B

21121996

अनुपूरक सूचनाएँ / SUPPLEMENTARY INFORMATIONS

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

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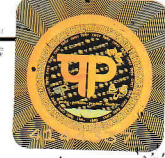
दिनांक / **Date :**

05-07-2022

भाग - ग / PART - C

परीक्षण परिणाम / TEST RESULTS

Test Duration: 13.12.2021 to 05.07.2022



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)	
2	Disintegration (Dry mass remains in 2 mm sieve after 84 days)	ISO 17088:2021	%	8.2	No more than 10%
3	Ultimate aerobic Biodegradation (with reference to 100% degradation of positive reference)	ISO 17088:2021	%	90.09% (at the end of 131days)	> 90 (at the end of the test period not more than 180 days.)
4	Plant Growth study	ISO 17088:2021	%	94	> 90
	Monocotyledon (Onion) % Seed emergence				
4	Dicotyledon (Fenugreek) % Seed Emergence	ISO 17088:2021	%	91	> 90
5	Acute Ecotoxic effects to earthworm	ISO:17088:2021 Cl.6.4.4	%	100	> 90
a	Survival of adult earthworm at the end of 7 days				
b	Survival of adult earthworm at the end of 14 days				
c	Biomass end of the 14 days			98	> 90
6	Chronic Ecotoxic effects to earthworm	ISO:17088:2021 Cl.6.4.5	%	96	> 90
a	Survival of adult earthworm at the end of 28 days				
b	Survival of adult earthworm at the end of 56 days				
c	Offspring at the end of 56 days				
d	Biomass end of the 56 days			97	> 90

The detailed observation on biodegradability test is enclosed as Annexure

Contd.

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Continuation Sheet

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परीक्षण परिणाम / TEST RESULTS

दिनांक / Date : 05-07-2022

PART C - TEST RESULTS

Sl.No	Name of the Test	Test Method/ Standard	Unit	Results Obtained	Specified Requirements*
7	Heavy metals concentration				
a.	Arsenic (As)			BDL: DL (0.006)	20
b.	Copper (Cu)			0.013	500
c.	Nickel (Ni)			0.014	100
d.	Zinc (Zn)			7.214	2500
e.	Cobalt (Co)	ISO 17088:2021	mg/L	BDL: DL (0.004)	-
f.	Chromium (Cr)			BDL: DL(0.009)	300
g.	Molybdenum (Mo)			8.429	-
h.	Mercury (Hg)			BDL:DL(0.007)	10
i.	Cadmium (Cd)			0.004	20
j.	Lead (Pb)			0.001	500
k.	Selenium (Se)			BDL:DL(0.013)	-

* 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-Blow Detection Limit ; DL-Detection Limit

PART D - REMARKS

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
6. Subcontracted Tests (if any): Nil

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परीक्षण परिणाम / TEST RESULTS

दिनांक / Date : 05-07-2022

OBSERVATION FOR BIODEGRADABILITY TEST AS PER ISO 17088:2021

Name of the Party : M/s. Suhasini Enterprises,
Patel Building, Station Road, Jalna 431203, Maharashtra.

- 1 **Sample Details (As stated by Party):** Compostable Film/bag
- 2 **Material Identification by FTIR :** Blend of Poly Lactic Acid (PLA) and Poly Butylene Adipate Co-Terephthalate (PBAT)

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 (%) : 53.8
Volatile content (%) : 17.9
CO₂ evolved during first 10days in blank : 71.6 mg/g

Test duration (days) : 131days

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	7.4	7.2
2	Blank 2	7.3	7.2
3	Blank 3	7.4	7.2
4	Cellulose 1	7.3	7.1
5	Cellulose 2	7.5	7.3
6	Cellulose 3	7.4	7.2
7	Negative 1	7.3	7.1
8	Negative 2	7.3	7.1
9	Negative 3	7.3	7.1
10	Sample 1	7.3	7.1
11	Sample 2	7.4	7.3
12	Sample 3	7.3	7.1

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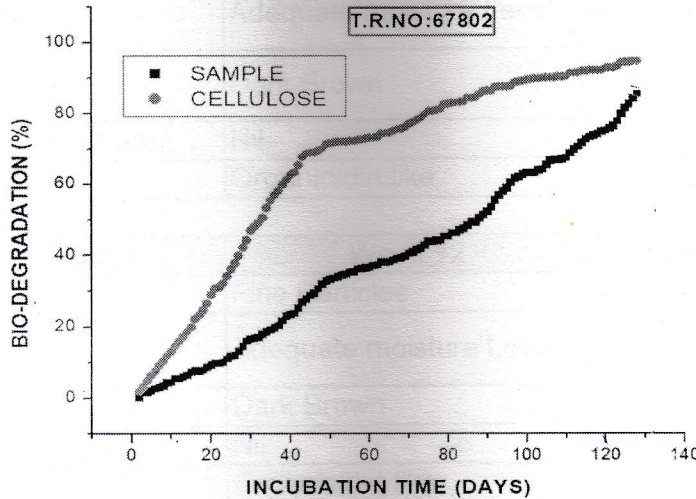
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- 4 **Result:** Percentage biodegradation relative to positive reference
 Sample (Mean) : 90.09% at the end of 131days
 The reference Material - cellulose : ~ 100%

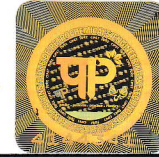


5 Visual Observation of Sample

Description	Week 3	Week 6	Week 9
Structure	Cut pieces	Cut pieces	Fragmented pieces
Moisture	Adequate moisture Level	Adequate moisture Level	Adequate moisture Level
Colour	Pale 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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6 Visual Observation of Compost

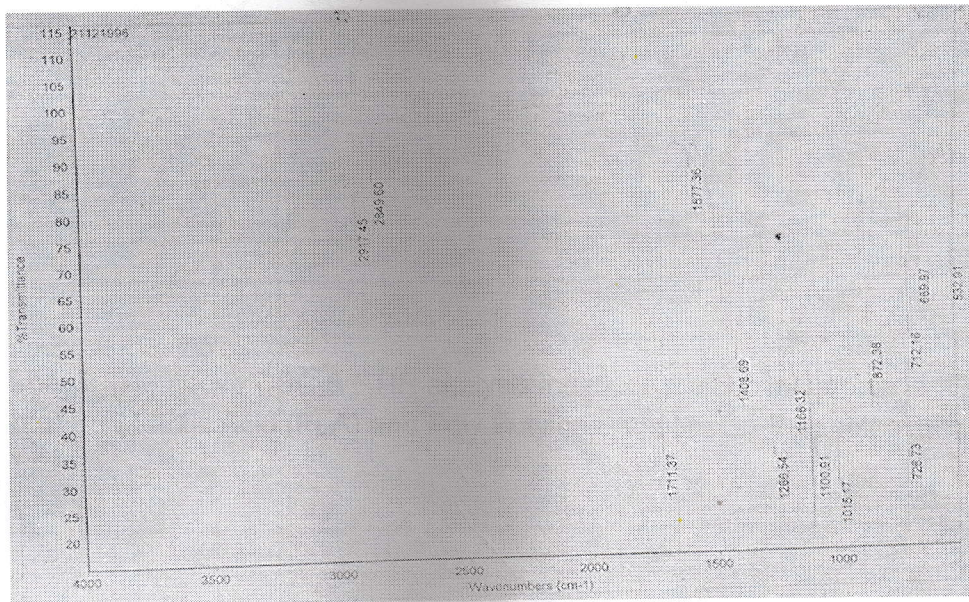
Description	Week 3	Week 6	Week 9
Structure	Fine Particles	Fine Particles	Fine Particles
Moisture	Adequate moisture Level	Adequate moisture Level	Adequate moisture Level
Colour	Dark Brown	Dark Brown	Dark Brown
Fungal Development	Nil	Nil	Nil
Smell	Organic/dirt like	Organic/dirt like	Organic/dirt like

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):

Compostable Film/bag



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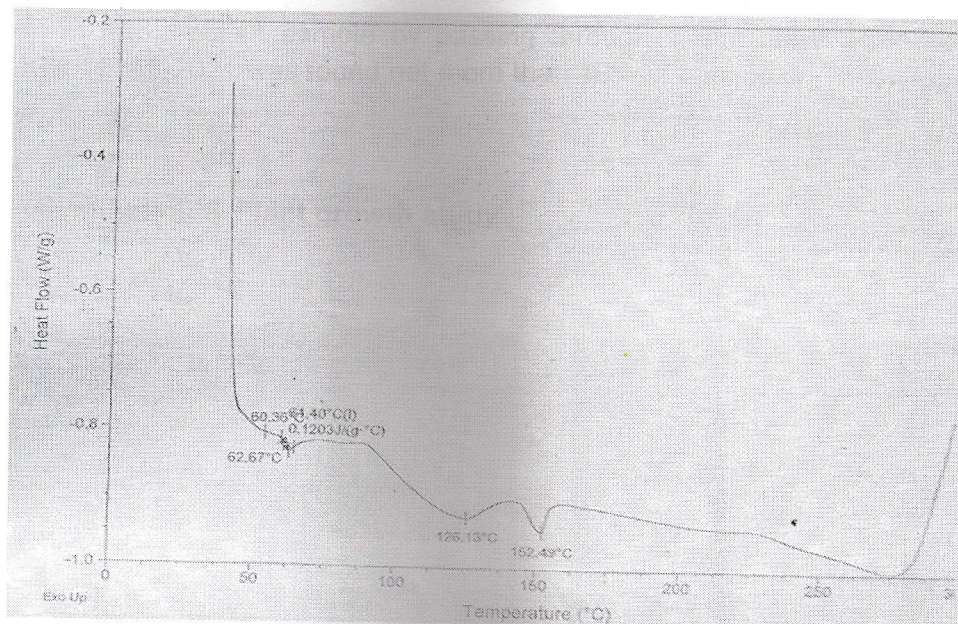
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FTIR Interpretation

Wave number (cm ⁻¹)	Nature of Bond
2917	CH ₂ asymmetric stretching
1711	C=O in PLA and PBAT
1408	-CH ₂ Plane Bending
1266	C-O bonds of PBAT
1100	C-O bonds of PBAT
1015	C-O bonds of PBAT
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)

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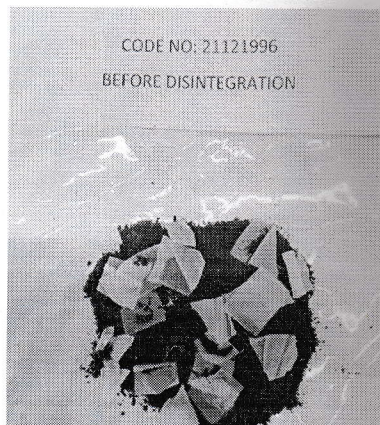

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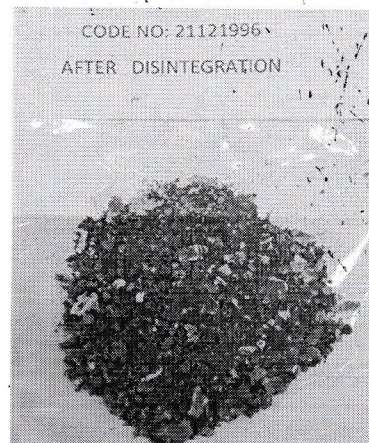
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9 Disintegration After 12 Weeks



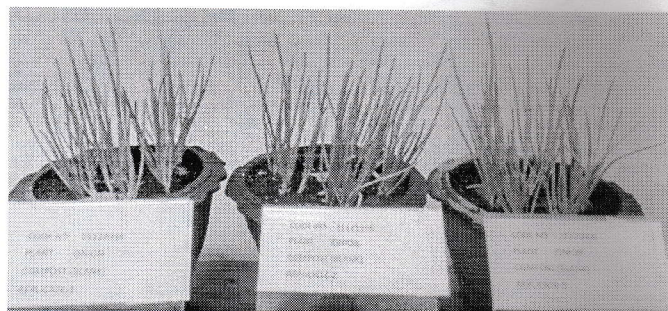
Before Disintegration



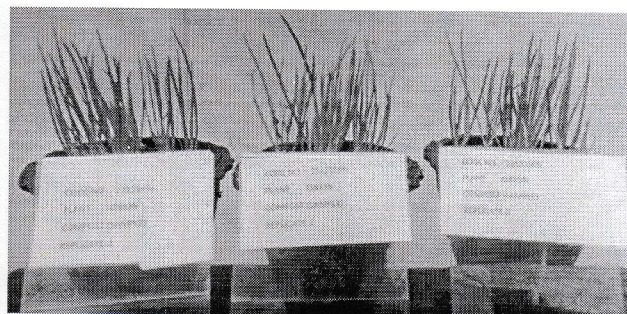
After Disintegration

The disintegration of the supplied sample by passing through 2 mm sieve after 12 week in composting condition as per ISO 17088-2021 was found not more than 10% of original dry mass remain.

10 Seed Germination & Plant growth study



Onion Compost (Blank)



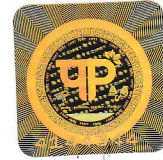
Onion Compost (Sample)

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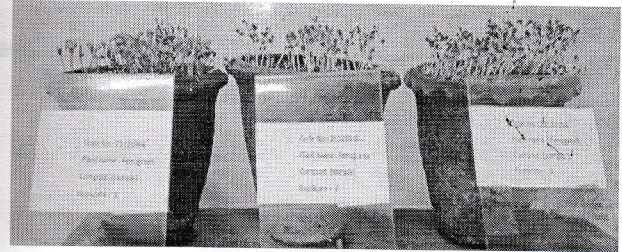
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Fenugreek Compost (Blank)



Fenugreek Compost (Sample)

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

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