

सिपेट: पेट्रोकेमिकल्स तकनीकी
संस्थान (आईपीटी)

रसायन एवं पेट्रोसायन विभाग
रसायन एवं उर्वरक मंत्रालय, भारत सरकार
गिण्डी, चेन्नई - 600 032.
फोन : 91-44-2225 4701 (6 लाइन)
ई-मेल : chennai@cipet.gov.in
वेबसाइट : www.cipet.gov.in



CIPET: INSTITUTE OF PETROCHEMICALS
TECHNOLOGY (IPT)

Department of Chemicals & Petrochemicals
Ministry of Chemicals & Fertilizers, Govt. of India
Guindy, Chennai - 600 032.
Phone : 91-44-2225 4701 (6 Lines)
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Website : www.cipet.gov.in



75
Azadi Ka
Amrit Mahotsav

संदर्भ/Ref: परीक्षण/TR/ 24013375

दिनांक/Date: 27-09-2024

प्रति /To,

SRN INDUSTRIES

No.4, Bharathiyar Street, Kosapalayam, Arani, Tiruvannamalai -
632 301

विषय/Sub : Testing of samples-reg.

संदर्भ/Ref : Your letter no. MAIL

Dated: 24-01-2024

महोदय,

कृपया हमारी परीक्षण रिपोर्ट क्रमांक प्राप्त करें। Please find enclosed herewith our Test Report no.	78754	दिनांक dated	27-09-2024
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धन्यवाद,

भवदीय

अधिकृत हस्ताक्षरकर्ता

संलग्न : उपर्युक्तानुसार
Encl:1.a/a.

मुख्यालय : सिपेट, गिण्डी, चेन्नई - 600 032. Head Office : CIPET, Guindy, Chennai - 600 032.

केन्द्र : अहमदाबाद, अमृतसर, औरंगाबाद, अगरतला, बदी, बालासोर, बेंगलुरु, भोपाल, भुवनेश्वर, भावनगर, भागलपुर, चन्द्रपुर, चेन्नई, देहरादून, दिल्ली, गुवाहाटी, ग्वालियर, हैदराबाद, हाजीपुर, हल्दिया, इम्फाल, जयपुर, कोच्चि, कोरबा, लखनऊ, मदुरै, मुरथल, मैसूरु, नवसारी, पारादीप, पालक्काड, रायपुर, राँची, तामोटा, वाराणसी एवं विजयवाड़ा

Centres : Ahmedabad, Amritsar, Aurangabad, Agartala, Baddi, Balasore, Bengaluru, Bhopal, Bhubaneswar, Bhavnagar, Bhagalpur, Chandrapur, Chennai, Dehradun, Delhi, Guwahati, Gwalior, Hyderabad, Hajipur, Haldia, Imphal, Jaipur, Kochi, Korba, Lucknow, Madurai, Murthal, Mysuru, Navsari, Paradip, Palakkad, Raipur, Ranchi, Tamot, Varanasi & Vijayawada

केंद्रीय पेट्रोरसायन अभियांत्रिकी एवं
प्रौद्योगिकी संस्थान
पेट्रोकेमिकल्स तकनीकी संस्थान

रसायन एवं पेट्रोरसायन विभाग
रसायन एवं उर्वरक मंत्रालय, भारत सरकार
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CENTRAL INSTITUTE OF PETROCHEMICALS
ENGINEERING & TECHNOLOGY
INSTITUTE OF PETROCHEMICALS TECHNOLOGY

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को जारी /
Issued to :

परीक्षण रिपोर्ट / TEST REPORT

क्र.सं / Sl. No. 36177

SRN INDUSTRIES

No.4, Bharathiyar Street, Kosapalayam, Arani,
Tiruvannamalai - 632 301

रिपोर्ट सं / REPORT NO. 78754

दिनांक / Date : 27-09-2024

संदर्भ / Customer Let. Ref : MAIL

Pages.....Nos. 24-01-2024 Part A,B,C & D

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 : Bio Compostable Film
- आ) सैपिल प्राप्त होने की तारीख / b) Date of Receipt of sample : 24-01-2024
- 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) पैकिंग की रीति / h) Mode of Packing : No packing
- ऐ) मोहर बंद या नहीं / i) Sealed or not : Not Sealed
- ओ) कोई अन्य सूचना / j) Any other information :

24013375

भाग - ख / PART - B

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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Selvi

केंद्रीय पेट्रोसायन अभियांत्रिकी एवं
प्रौद्योगिकी संस्थान
पेट्रोकेमिकल्स तकनीकी संस्थान

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सिपेट CIPET



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परीक्षण रिपोर्ट / TEST REPORT

रिपोर्ट सं / REPORT NO. : 78754

27-09-2024

दिनांक / Date :

क्र.सं / Sl. No. 36177

Test Duration : 26-02-2024 to 26-09-2024

भाग - ग / PART - C

Sl. No.	Name of the test	Test Method / Standard	unit	TEST RESULTS Results Obtained	Specific Requirements
1	Material Identification	FTIR & DSC	-	Poly butylene adipate co-terephthalate (PBAT)	-
2	Disintegration (Dry mass remains in 2 mm sieve after 84 days)	ISO 17088:2021	%	9.3	No more than 10%
3	Ultimate aerobic Biodegradation (with reference to 100% degradation of positive reference)	ISO 17088:2021	%	90.9 (at the end of 143 days)	> 90 (at the end of the test period not more than 180 days.)
4	Plant Growth study Monocotyledon (Onion) % Seed emergence	ISO 17088:2021 Cl.no. 6.4.3	%	98	> 90
	Dicotyledon (Fenugreek) % Seed Emergence		%	95.7	> 90
5	Acute Ecotoxic effects to earthworm	ISO 17088:2021 Cl.no. 6.4.4	%		
a	Survial of adult earthworm at the end of 7 days			100	Shall be more than 90
b	Survial of adult earthworm at the end of 14 days			98	Shall be more than 90
c	Biomass end of the 14 days	99	Shall be more than 90		
6	Chronic ecotoxic effets to earthworm	ISO:17088:2021 Cl.no. 6.4.5	%		
a	Survial of adult earthworm at the end of 28 days			95	Shall be more than 90
b	Survial of adult earthworm at the end of 56 days			95	Shall be more than 90
c	Offspring at the end of 56 days			95	Shall be more than 90
d	Biomass end of the 56 days	96	Shall be more than 90		

The detailed observation on biodegradability test is enclosed as Annexure

Issued to: M/s. SRN INDUSTRIES
No.4, 4A, Bharathiyar Street, Kosapalayam, Arani,
Tiruvannamalai - 632 301

Customer Letter Ref. 24-01-2024

AUTHORISED SIGNATORY
Dr. Radhashvam Giri

AUTHORISED SIGNATORY
S. Udhayamalar,



रिपोर्ट सं / REPORT NO. : 78754

परीक्षण परिणाम / TEST RESULTS

दिनांक / Date 26-09-2024

Issued to: M/s. SRN INDUSTRIES
No.4, 4A, Bharathiyar Street, Kosapalayam, Arani,
Tiruvannamalai - 632 301

Customer Letter Ref. 24-01-2024

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)			0.045	10
b.	Copper (Cu)			6.1155	300
c.	Nickel (Ni)			3.7155	50
d.	Zinc (Zn)			8.256	1000
e.	Cobalt (Co)	ISO		0.003	-
f.	Chromium (Cr)	17088:2021	mg/kg	9.3593	50
g.	Molybdenum (Mo)			0.045	-
h.	Mercury (Hg)			0.0053	0.15
i.	Cadmium (Cd)			0.0225	5
j.	Lead (Pb)			0.0188	100
k.	Selenium (Se)			1.5653	-

* Based on Municipal solid waste (Management and Handling) Rules, 2016 notified on 8th April, 2016 by Ministry of Environment , Forests and climate change, Government of India. Note that concentration of metals like cobalt, molybdenum, and selenium is not mentioned in the notification.

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 from the date of issue.
 6. Subcontracted Tests (if any): Nil


AUTHORISED SIGNATORY
Dr. Radhashvam Giri


AUTHORISED SIGNATORY
S. Udhayamalai,

रिपोर्ट सं / REPORT NO. : 78754

परीक्षण परिणाम / TEST RESULTS

दिनांक /Date: 26-09-2024

Issued to: M/s. SRN INDUSTRIES
No.4, 4A+A96, Bharathiyar Street, Kosapalayam, Arani,
Tiruvannamalai - 632 301+A101

Customer Letter Ref. 24-01-2024

OBSERVATION FOR BIODEGRADABILITY TEST AS PER ISO 17088:2021

- 1 **Sample Details (As stated by Party):** Bio compostable film
2 **Material Identification by FTIR :** 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 ± 2
Dry Solid (%) : 54.8
Volatile content (%) : 16.9
CO₂ evolved during first 10days in blank vessels (mg/g of volatile content of compost) : 52.18
Test duration (days) : 143 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	7.3	7.2
3	Blank 3	7.4	7.4
4	Cellulose 1	7.3	7.2
5	Cellulose 2	7.2	7.1
6	Cellulose 3	7.4	7.3
7	Negative 1	7.4	7.4
8	Negative 2	7.3	7.2
9	Negative 3	7.2	7.1
10	Sample 1	7.2	7.1
11	Sample 2	7.2	7
12	Sample 3	7.3	7.2

Contd.,



रिपोर्ट सं / REPORT NO. : 78754

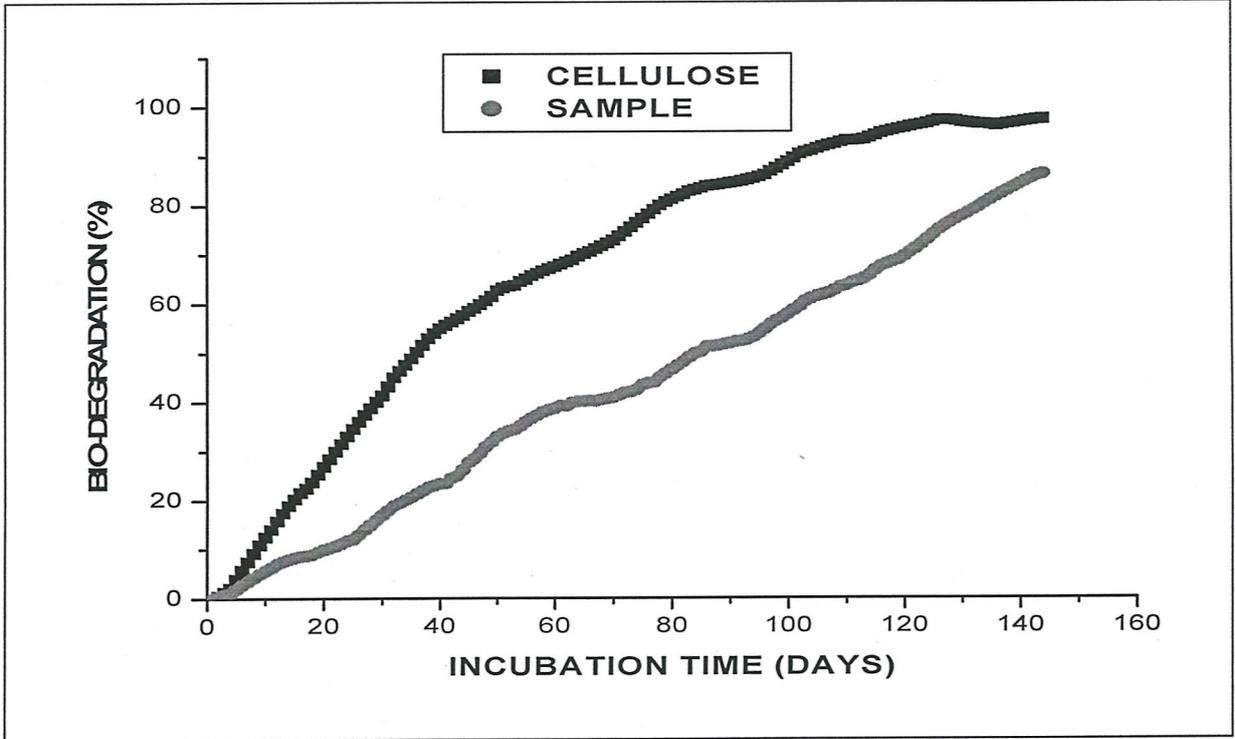
परीक्षण परिणाम / TEST RESULTS

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Tiruvannamalai - 632 301

Customer Letter Ref. 24-01-2024

- 4 **Result:** Percentage biodegradation relative to positive reference
Sample (Mean) : 90.9 % at the end of 143 days
The reference Material - cellulose : ~ 100%



5 **Visual Observation of Sample**

Description	Week 1-4	Week 5-8	Week 9-12
Structure	Cut pieces	Cut pieces	Fragmented pieces
Moisture	Adequate moisture Level	Adequate moisture Level	Adequate moisture Level
Colour	Transparent	Transparent	Dirty
Fungal Development	None	None	None
Smell	Organic/dirt like	Organic/dirt like	Organic/dirt like

Description	Week 13-15	Week 16-18	week 19-21
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

Contd.,


AUTHORISED SIGNATORY
Dr. Radhashyam Giri

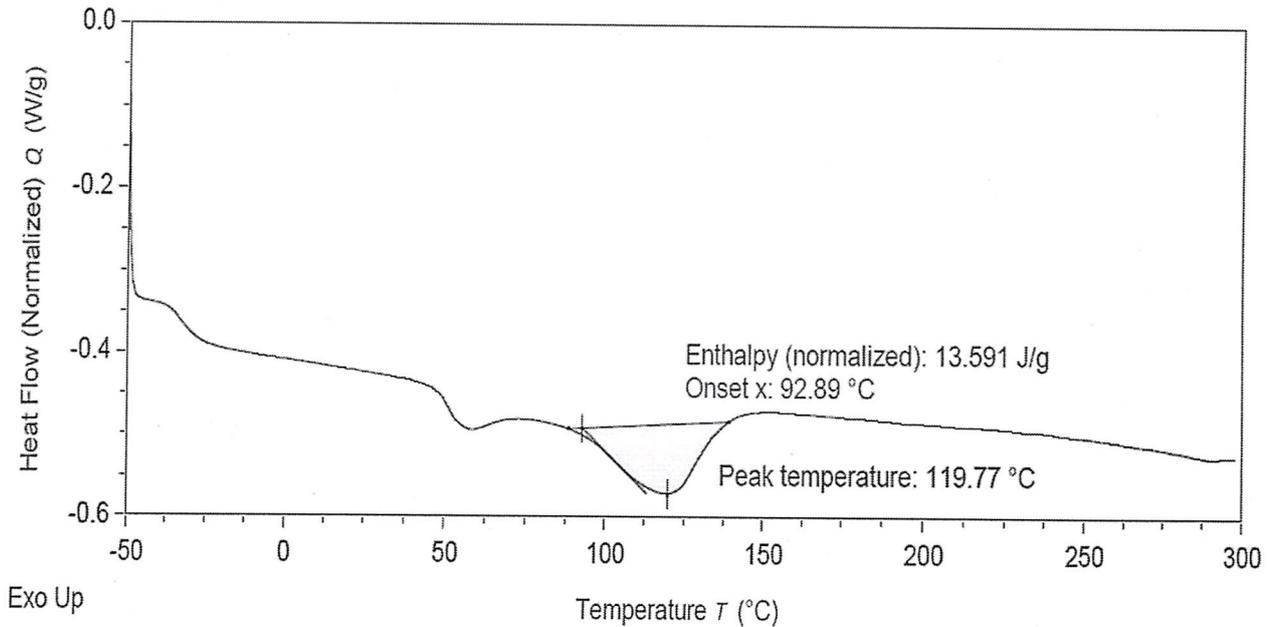

AUTHORISED SIGNATORY
S. Udhayamalar,
Sr. Technical Officer

6 Visual Observation of Compost

Description	Week 1-4	Week 5-8	Week 9-12
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 13-15	Week 16-18	week 19-21
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 DSC Analysis



Contd.,



AUTHORISED SIGNATORY

Dr. Radhashyam Giri



AUTHORISED SIGNATORY

S. Udhayamalar.

रिपोर्ट सं / REPORT NO. : 78754

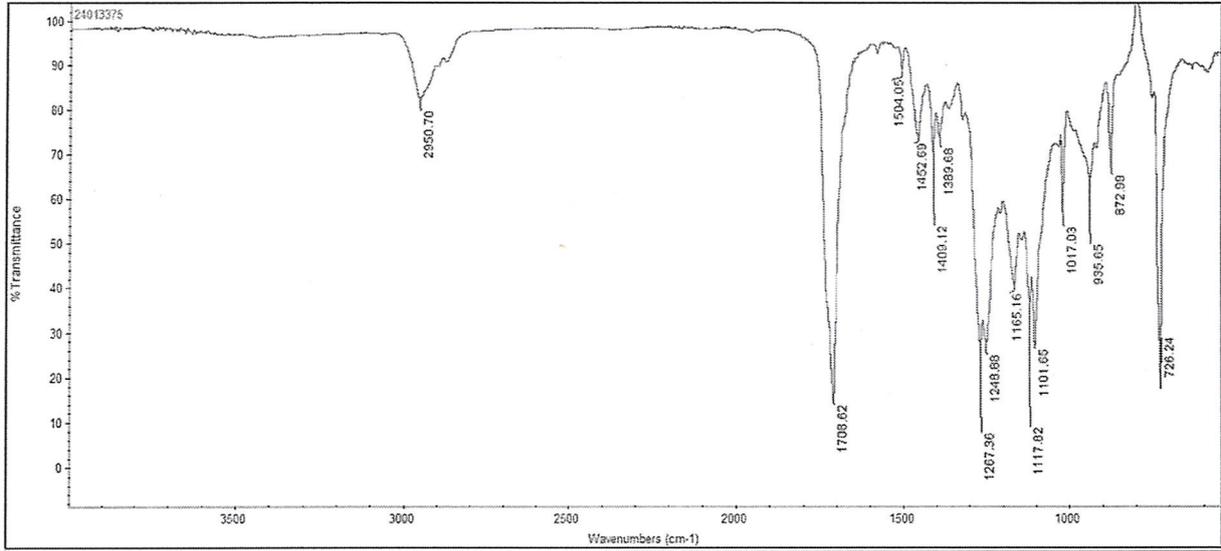
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दिनांक / Date 27-09-2024

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No.4, 4A, Bharathiyar Street, Kosapalayam, Arani,
Tiruvannamalai - 632 301

Customer Letter Ref. 24-01-2024

8 FTIR Analysis



FTIR Interpretation

Wave number (cm ⁻¹)	Nature of Bond
2950	C-H Stretching
1708	C=O Stretching in PBAT
1504	C=C Stretch in PBAT
1452	C-H Asymmetric Bending
1409	C=C Stretching
1389	C-H Asymmetric Bend
1267	C-O Stretching

Comment: The above DSC & FTIR analysis indicates the above sample is
Poly butylene adipate co- terephthalate (PBAT)

Contd.,

रिपोर्ट सं / REPORT NO. : 78754

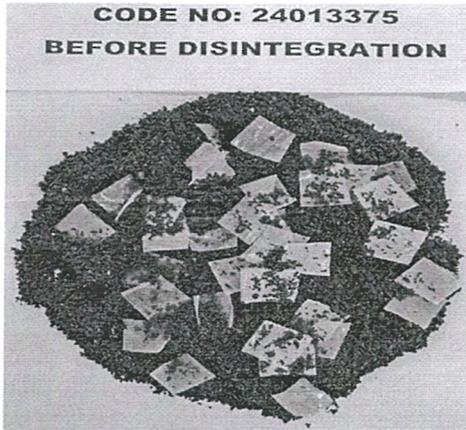
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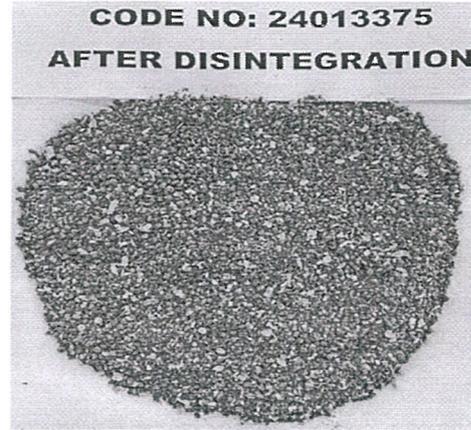
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9 Disintegration After 12 Weeks



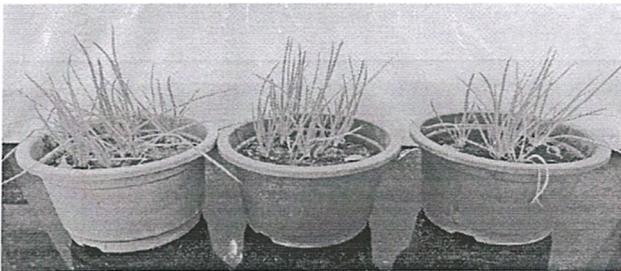
Before Disintegration



After Disintegration

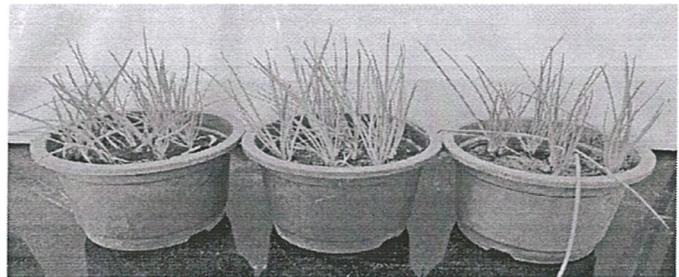
The disintegration of the supplied sample by passing through 2 mm sieve after 12 week in composting condition as per ISO 17088-2021 was found not more than 10% of original dry mass remain.

10 Plant growth study



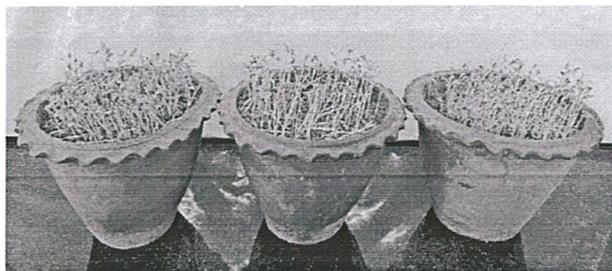
REP-1 REP-2 REP-3

Fresh compost with Onion seeds



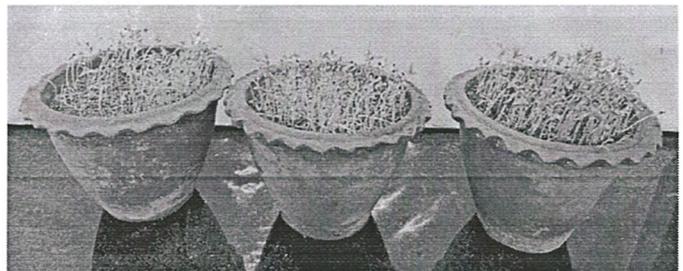
REP-1 REP-2 REP-3

Bio-degradation tested compost with Onion seeds



REP-1 REP-2 REP-3

Fresh compost with Fenugreek seeds



REP-1 REP-2 REP-3

Bio-degradation tested compost with Fenugreek seeds

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