

को जारी /

Issued to : **M/s. VISION INDUSTRIES,**
No.11, Navkar Estate, B/h. G.E.B., Before Rcon
Company, Santaj-Khatraj Road, Santaj,
Ta. Kalol, Dist. Gandhinagar 382 721.

परीक्षण रिपोर्ट / TEST REPORT

क्र.सं / Sl. No.

26071

रिपोर्ट सं / REPORT NO. : **62613**

दिनांक / Date : **19-01-2021**

Pages.....Nos. Part A,B,C & D

संदर्भ / Customer Let. Ref : **Ltr. Dated 31-01-2020**

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 sample -as stated by the party
आ) सैपिल प्राप्त होने की तारीख / b) Date of Receipt of sample	: 31-01-2020
इ) ग्रेड/प्रकार/आकार/वर्ग / c) Grade / variety / type / size / class	: Not applicable
ई) घोषित मूल्य / d) Declared value, If any	: Not applicable
उ) कोड सं. / e) Code No.	: Noi applicable
ऊ) बैच सं. एवं निर्माण तारीख / f) Batch No. and Date of Manufacture:	: Not applicable
ऋ) मात्रा / g) Quantity	: 1.5 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

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

परीक्षण रिपोर्ट / TEST REPORT

रिपोर्ट सं / REPORT NO. : 62613

क्र.सं / Sl. No. 26071

दिनांक / Date : 19-01-2021

भाग - ग / PART - C

परीक्षण परिणाम / TEST RESULTS

Test Duration: to 03.02.2020 to 19.01.2021

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)	-
2	Disintegration (Dry mass remains in 2 mm sieve after 84 days)	ISO 17088:2012 / IS 17088:2008	%	7.6	No more than 10%
3	Ultimate aerobic Biodegradation (with reference to 100% degradation of positive reference)	ISO 17088:2012 / IS 17088:2008	%	90.06% (at the end of 109 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	ISO 17088:2012 / IS 17088:2008	%	91	> 90

The detailed observation on biodegradability test is enclosed as Annexure

Contd.



Report No: **62613**

TEST RESULTS

Date: **19-01-2021**

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)			0.004	20
b.	Copper (Cu)			0.201	500
c.	Nickel (Ni)			BDL(DL-0.005)	100
d.	Zinc (Zn)	ISO 17088:2012 /		0.122	2500
e.	Cobalt (Co)	IS 17088:2008	mg/L	0.09	-
f.	Chromium (Cr)			0.045	300
g.	Molybdenum (Mo)			BDL(DL-0.006)	-
h.	Mercury (Hg)			0.0004	10
i.	Cadmium (Cd)			BDL(DL-0.0008)	20
j.	Lead (Pb)			0.779	500
k.	Selenium (Se)			0.005	-

* 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

Contd.,


AUTHORISED SIGNATORY


AUTHORISED SIGNATORY



CIPET
Chennai-32.

Continuation Sheet

Report No: **62613****TEST RESULTS**Date: **19-01-2021****OBSERVATION FOR BIODEGRADABILITY TEST AS PER ISO 17088:2012/IS 17088:2008**

Name of the Party : M/s.Vision Industries
No.11,Navkar Estate, B/h. G.E.B.,Before Rcon Company,
Santaj-Khatraj Road,Santaj,Ta.Kalol,
Dist Gandhinagar 382 721

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

BIODEGRADABILITY TEST AS PER ISO:14855-13 **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 (%) : 13.9
CO₂ evolved during first 10days in blank vessels (mg/g of volatile content of compost) : 76.9 mg/g
Test duration (days) : 109 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	7.2
2	Blank 2	7.2	7.2
3	Blank 3	7.3	7.3
4	Cellulose 1	7.6	7.1
5	Cellulose 2	7.6	7.2
6	Cellulose 3	7.6	7.1
7	Negative 1	7.7	7.2
8	Negative 2	7.7	7.2
9	Negative 3	7.6	7.1
10	Sample 1	7.8	7.3
11	Sample 2	7.8	7.3
12	Sample 3	7.7	7.2

Contd.,


 AUTOHRISED SIGNATORY


 AUTHORISED SIGNATORY

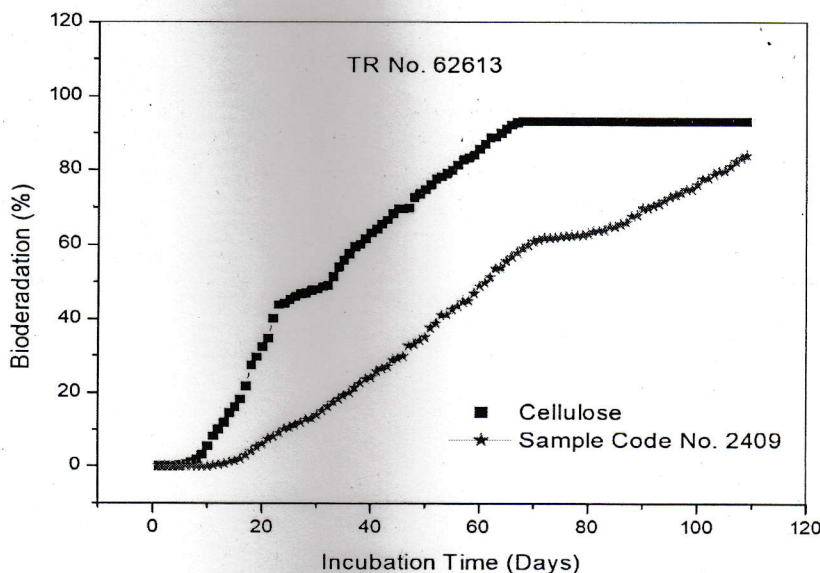


TEST RESULTS

Report No: **62613**

Date: **19-01-2021**

- 4 **Result:** Percentage biodegradation relative to positive reference
 Sample (Mean) : 90.06% at the end of 109 days
 The reference Material - cellulose : ~ 100%



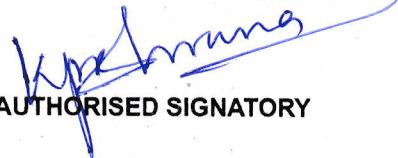
5 **Visual Observation of Sample**

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	Dark brown	Dark brown	Dark brown
Fungal Development	None	None	None
Smell	Organic/dirt like	Organic/dirt like	Organic/dirt like

Description	Week 12	Week 15	Week 16
Structure	Fragmented pieces	Fragmented pieces	Fragmented pieces
Moisture	Adequate moisture Level	Adequate moisture Level	Adequate moisture Level
Colour	Dark brown	Dark brown	Dark brown
Fungal Development	None	None	None
Smell	Organic/dirt like	Organic/dirt like	Organic/dirt like

Contd.,


AUTHORISED SIGNATORY


AUTHORISED SIGNATORY



TEST RESULTS

Report No: **62613**

Date: **19-01-2021**

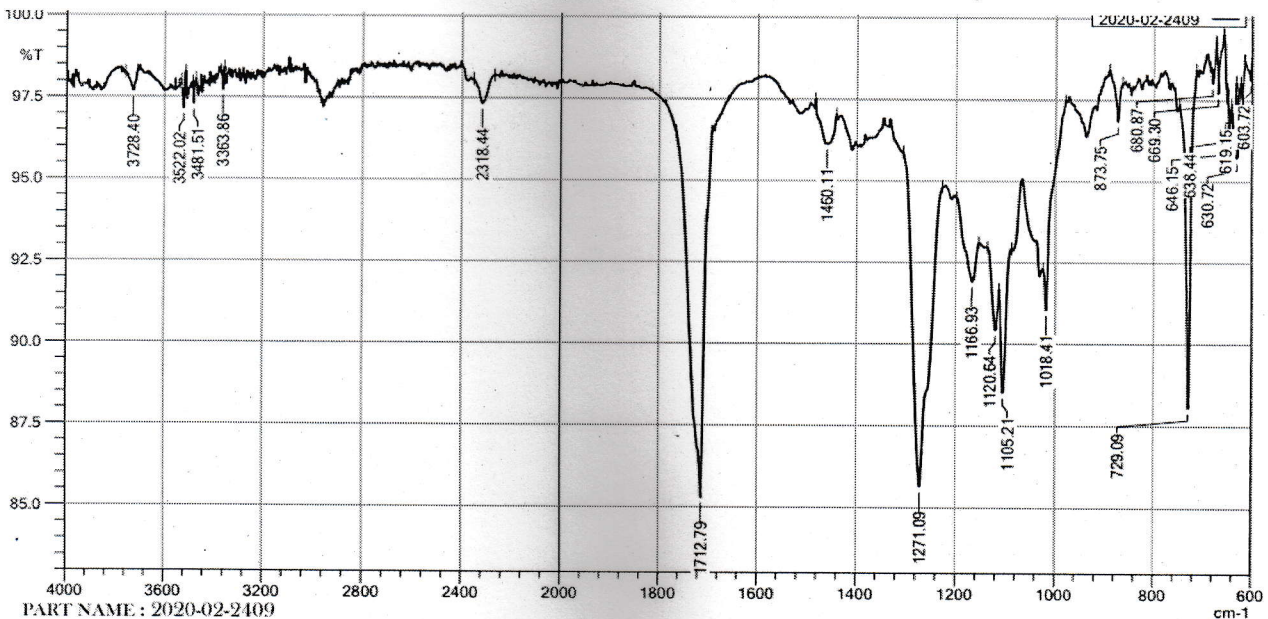
6 Visual Observation of Compost

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 16
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

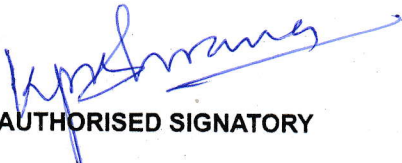
7 FTIR Analysis

Sample Details (As stated by Party): **Compostable Film Sample**



Contd.,


AUTHORISED SIGNATORY


AUTHORISED SIGNATORY



Report No: **62613**

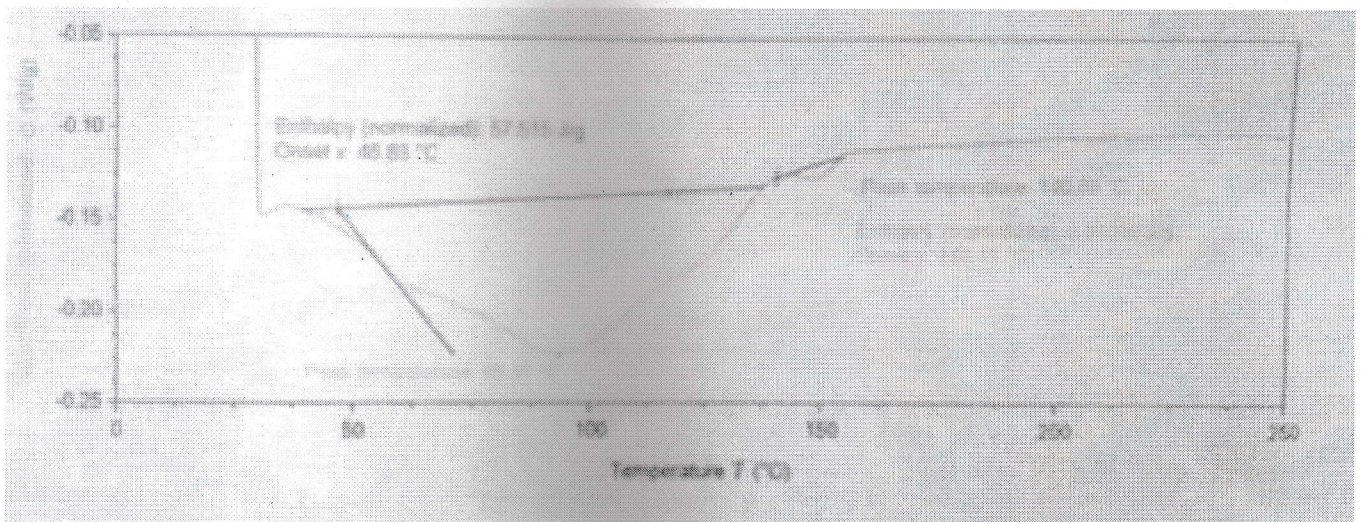
TEST RESULTS

Date: **19-01-2021**

FTIR Interpretation

Wave number (cm ⁻¹)	Nature of Bond
2318	CH ₂ asymmetric stretching
1712	C=O in PLA and PBAT
1460	-CH ₂ Plane Bending
1271	C-O bonds of PBAT
1105	C-O bonds of PBAT
1018	C-O bonds of PBAT
873	O-CH-CH ₃ of ester
729	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)

Contd.,


AUTHORISED SIGNATORY


AUTHORISED SIGNATORY



Report No: **62613**

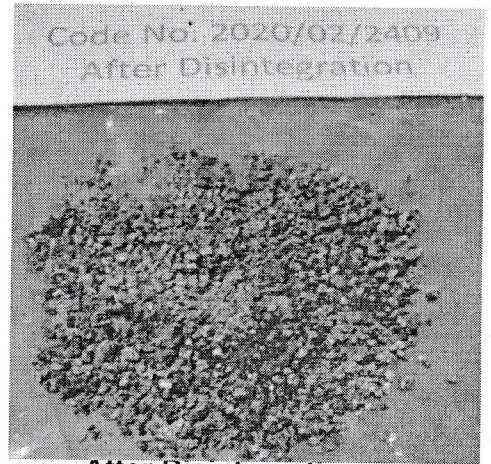
TEST RESULTS

Date: **19-01-2021**

9 Disintegration After 12 Weeks



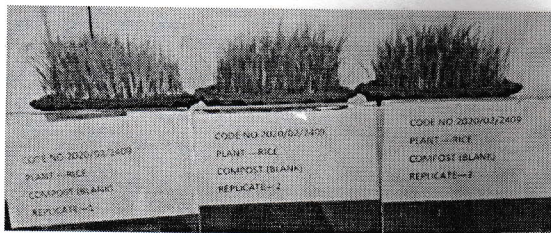
Before Disintegration



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.,


AUTHORISED SIGNATORY

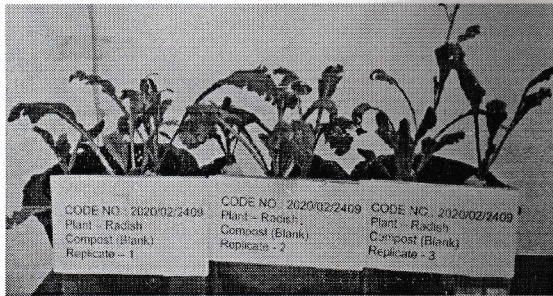

AUTHORISED SIGNATORY



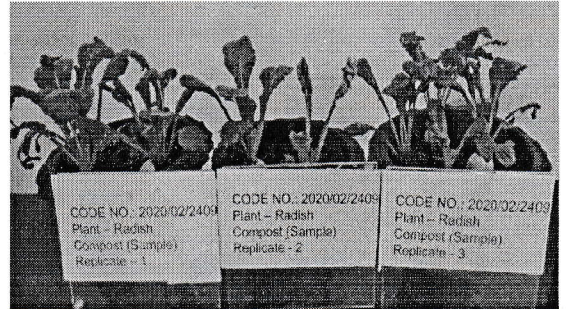
Report No: **62613**

TEST RESULTS

Date: **19-01-2021**



Radish Compost (Control)



Radish Compost (Sample)

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

AUTHORIZED SIGNATORY

AUTHORIZED SIGNATORY