



# Karnataka State Council for Science and Technology

## Indian Institute of Science Campus, Bengaluru - 560 012

Telephone: 080-23341652, 23348848, 23348849 ♦ Telefax: 080-23348840

Email: office@kscst.iisc.ernet.in, office@kscst.org.in ♦ Website: www.kscst.iisc.ernet.in, www.kscst.org.in

**Mr. H. Hemanth Kumar**  
Executive Secretary

29  
27th March 2019

Ref: 7.1.01/SPP/1333

The Principal,  
Sapthagiri College of Engineering,  
#14/5, Chickasandra,  
Hesaraghatta Main Road,  
Bengaluru - 560 057.

Dear Sir/Madam,

Sub : Sanction of Student Project (Biofuel) - 42nd Series: Year 2018-2019

Your Project Proposal Reference No. : **42S\_B\_BE\_003**

Ref : Your Project Proposal entitled " **BIOPLASTIC EXTRACTION FROM WASTE GREASE PRODUCED IN INDUSTRIES USING AS GLYCEROL AS A SUBSTRATE**

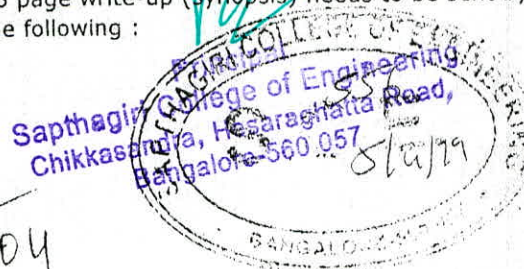
I am happy to inform that your student project proposal referred above, has been approved by the Council for "Student Project Programme (Biofuel)- 42nd Series" and has been sanctioned with a budgetary break-up as detailed below:

| Student / s                            | Ms. Debika Chakrabarty<br>and others    | Budget                | Amount (Rs) |
|--|---|-----------------------|-------------|
|  |   | Materials/Consumables | 3,500.00    |
| Guide/s                                | Mr. Prashanth Kumar H P<br>Ms. Shobha G | Labor                 | -           |
|  |   | Travel                | 500.00      |
| Department                             | Biotechnology                           | Analysis              | 500.00      |
|  |   | Miscellaneous         | 500.00      |
|  |   | Report                | 500.00      |
|  |   | TOTAL                 | 5,500.00    |
| RUPEES FIVE THOUSAND FIVE HUNDRED ONLY |   |                       |             |

The following are the guidelines to carryout the project work :

- The project should be performed based on the objectives of the proposal sent by you.
- The project should be completed in all respects and one copy of the hardbound report along with softcopy of the full report in a CD (.pdf format) should be submitted to KSCST.
- The project report shall mention the name of "**Karnataka State Bioenergy Development Board and Karnataka State Council for Science and Technology**" as sponsored organisations in the title page. Project Title or the objectives can be altered only with prior permission of KSCST. Any change in the project are strictly prohibited and liable for rejection and the amount sanctioned has to be returned back to KSCST. The fund is to be utilised only for the activities to which it has been released.
- Please quote your **project reference number printed above** in all your future correspondences.
- Important:** After completing the project, 2 to 3 page write-up (synopsis) needs to be sent by e-mail [biofuelcell.kscst@gmail.com] and should include following :

- Title of the project
- Name of the College & Department
- Name of the students & Guide(s)
- Keywords





SCE-2016-17

Payment Voucher

No. 1073

Dated 7-Sep-2019

| Particulars                       | Amount   |
|-----------------------------------|----------|
| Account :<br>KSCST( Project Work) | 5,500.00 |

Through :

SBI- 30263521464

On Account of :

Being funds released towards KSCST Project  
work on Bio Plastic Extractin of waste Grease  
using Glyceral as substrate


Bank Transaction Details:

Debika Chakraborty  
Cheque 499736 7-Sep-2019 5,500.00

Amount (in words) :

INR Five Thousand Five Hundred Only

₹ 5,500.00

  
R. S. ARASH (1591085023)  
Receiver's Signature

  
Authorised Signatory



  
Principal  
Sapthagiri College of Engineering  
Chikkasandra, Hesaraghatta Road,  
Bangalore-560 057



From,

14/08/19

Bangalore

Debika.C 7019226230

Department of Biotechnology

Sapthagiri College of Engineering

Bangalore - 560057

To,

The Principal

Sapthagiri College of Engineering

Bangalore - 560057

Respected Sir,

Subject: To release the fund  
sanctioned from KSCST

I, Debika C and one groupmates Dishu D B, Kceethna N, B Vaashini have successfully completed the project on "Bioplastic extraction from waste grease using glycerol as substrate". We have submitted the report and CD to SPP Coordinator Ravishankar M.N. I hereby request you to release the sanctioned amount for the project.

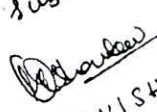
Thanking You,

Yours faithfully,

Debika.C

Principal  
Sapthagiri College of Engineering  
Chikkasandra, Hesaraghatta Road,  
Bangalore-560 057


The above project was funded by KSCST  
The students have completed the project  
and submitted the report.

  
RAVISHANKAR M.N.  
KSCST-SPP Coordinator  
SCE Block  
14/08/19

14/8/19

DETAILS ARE FURNISHED AS BELOW:

| Sl. No   | Items   | Cost<br>(in Rupees) |
|--|---|---------------------|
| 1  | Raw materials   | 300                 |
| 2  | Chemicals   | 1000                |
| 3  | Glass wares   | 250                 |
| 4  | Demand draft  | 2000                |
| 5  | Project Report  | 1200                |
| 6  | Miscellaneous<br>(Transportation, Xerox, writing materials etc.,) | 750                 |
|  | Total Sum   | 5500 ✓              |
| <u>Amount in words</u> : Five thousand five hundred only |   |                     |

  
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Sapthagiri College of Engineering  
Chikkasandra, Hesareghatta Road,  
Bangalore-560 057

  
Principal  
Sapthagiri College of Engineering  
Chikkasandra, Hesareghatta Road,  
Bangalore-560 057

  
14/08/19



Mob : 9945754390

## MAHESH CYBER WORLD

103/2, Rukmini Nagar, Nagasandra (P), Bangalore - 73

No.

Date 24/11/19

M/s

Deleka C

| No. | Particulars      | Qty. | Amount |
|-----|------------------|------|--------|
| 1   | INTERNET         | 1    | 100    |
| 2   | PRINT OUT        |      | 800    |
| 3   | XEROX            |      | 100    |
| 4   | DTP              |      | 500    |
| 5   | COMPUTER SERVICE |      |        |
| 6   | RENT AGREEMENT   |      |        |
|     | TOTAL            |      | 1500/- |

MAHESH CYBER WORLD  
Sapthagiri Engg. College  
Chikkasandra, Bangalore-560057

Kov  
Principal  
Sapthagiri College of Engineering  
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B  
Principal  
Sapthagiri College of Engineering  
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(ORIGINAL FOR RECIPIENT)



|                                      |   |
|--------------------------------------|---|
| Invoice No.<br><b>0535</b>           | Dated<br><b>17-Jul-2019</b>               |
| Delivery Note                        | Mode/Terms of Payment<br><b>Immediate</b> |
| Supplier's Ref.<br><b>0535</b>       | Other Reference(s)                        |
| Buyer's Order No.<br><b>Verble</b>   | Dated<br><b>17-Jul-2019</b>               |
| Despatch Document No.                | Delivery Note Date                        |
| Despatched through<br><b>By Hand</b> | Destination                               |
| Terms of Delivery                    |   |

Miss, Keerthana (Sapthagirl College of Engineering)  
No 14/5, Chikkasandra, Heasaragatta Main  
Road, Bangalorre-560057  
State Name : Karnataka, Code : 29

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Sapthagiri College of Engineering  
Bikkasandra, Hesaraghatta Road  
Bangalore-560 057



# **42S\_B\_BE\_003 Bioplastic Extraction from waste grease produced in industries using as glycerol as a substrate**

**COLLEGE:**Sapthagiri College Of Engineering, Bangalore

**DEPARTMENT:**Biotechnology

**GUIDE:**Mr Prashanth Kumar and Mrs Shobha G

**STUDENTS:**Debika Chakrabarty, Disha DB, Keerthana N, B Varshini

## **INTRODUCTION**

The used cooking oil and trap grease can contain much more than 15% FFAs. These feedstock need additional processing before they can undergo traditional alkali-catalysed transesterification to form glycerol and Biodiesel.

This process converts triacylglycerol and methanol into glycerol and fatty acid methyl esters (namely biodiesel) using alkali or acid catalysts. The amount of crude glycerol produced from this transesterification reaction accounts for approximately 10% of the final weight of biodiesel. Conversion of crude glycerol into higher-value products improves the economic viability of biofuel industry by coupling the production of value-added products to the production of biodiesel and eliminating the cost of treatment for crude glycerol disposal. Fermentation of glycerol has been reported to produce many value-added by-products, such as 1,3-propanediol, dihydroxyacetone, succinic acid, propionic acid, ethanol, butanol, hydrogen, citric acid, lactic acid, glyceric acid, bio surfactants, pigments, and PHAs. Among these by-products, 1,3-propanediol, 75 succinic acid, lactic acid, and glyceric acid, have been used as bio monomers for production of plastics, i.e. polyesters, polyethers, and polyurethanes, through chemical synthesis. In the present work glycerol obtained after transesterification will be used for bio plastic formation.

## **Materials and methodology:**

### **Production of Glycerol:**

Transesterification of waste grease using alkaline catalyst was carried out using a two-step process. The two-step reaction utilized 100% excess methanol, 6:1 molar ratio of alcohol to oil and 1% KOH as a catalyst. In each step, 3 mol of alcohol and 0.5% KOH were used and reaction was carried out at 25 °C

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Chikkabandra

for 30 min. After the first step the waste grease having a high free fatty acid formed a thick soap which interfered with the glycerol separation (Issariyakul *et al.*, 2006).

### **Test for Glycerol:**

#### **Acrolein test**

Acrolein test is used to detect the presence of glycerol or fat. When fat is treated strongly in the presence of a dehydrating agent like potassium bisulphate ( $\text{KHSO}_4$ ), the glycerol portion of the molecule is dehydrated to form an unsaturated aldehyde, acrolein that has a pungent irritating odour.

#### **Dichromate test:**

In a dry test tube 3 or 4 ml of glycerol solution, to it add a few drops of 5% potassium dichromate solution and 5 ml of conc.  $\text{HNO}_3$ , mix well and note that the brown colour is changed to blue.

#### **Dunstan's test :**

A drop of phenolphthalein is added to approximately 5 mL of borax solution . The pink color appears. On adding 2-3 drops of glycerol, the pink color disappears on heating and disappears on cooling again.

### **Bioplastic production from grease:**

Preparation of bioplastic was done by modifying the agar and the glycerol concentration.

1.5%, 3%, 4.5% of bioplastic was prepared. According to the concentration required amount of glycerol.

#### **Moisture Absorption Test:**

The moisture absorption test identified the ability of bioplastics to absorb water ( $\text{H}_2\text{O}$ ) as determined by standard ASTM D 570. Bioplastics, which had been previously dried for 24 hours in an oven at  $50^\circ\text{C}$ , cooled in a desiccator, and weighed, were cut into 2mm x 2mm. The moisture absorption data of bioplastics was obtained by soaking them in water for 24 hours. After that, the bioplastics were dried with a cloth and immediately weighed.

$$\text{Moisture Content (\%)} = \frac{(\text{Post-BrakeWeight}) - (\text{InitialWeight})}{\text{InitialWeight}} \times 100$$

*InitialWeight*

#### **Biodegradability**

Biodegradable behaviour of bioplastics was determined using soil burial degradation test, i.e. bioplastics were buried in the soil, so that it would be degraded completely.[Degradation testing serves to determine the extent of damage of bioplastics. The damage can be seen from the mass reduction of respective specimens buried in the ground. Bioplastics were cut into 10 mm x 10 mm. Then, they were buried into the ground at 8-cm depth; the burial duration varied (3, 6, 9, and 12 days). Prior to burial, the initial mass (mass before degradation) was determined. The final mass (mass after degradation) of the bioplastics was measured afterwards. Any changes in mechanical properties due to degradation process were observed and when the bioplastics were completely degraded, the biodegradability was measured.

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$$\text{Microbial Resistance (\%)} = \frac{\text{Final Mass} - \text{Initial Mass}}{\text{Initial Mass}} \times 100$$

## Results

### Production of Glycerol:

Transesterification of waste grease was carried out and glycerol was obtained.

### Test for Glycerol:

#### Acrolein test

Acrolein test is used to detect the presence of glycerol or fat. When fat is treated strongly in the presence of a dehydrating agent like potassium bisulphate ( $\text{KHSO}_4$ ), the glycerol portion of the molecule is dehydrated to form an unsaturated aldehyde, acrolein that has a pungent irritating odour was observed.

#### Dichromate test:

In a dry test tube 3 or 4 ml of glycerol solution, to it a few drops of 5% potassium dichromate solution was added and 5 ml of conc.  $\text{HNO}_3$ , was mixed well and there was a colour change from brown colour is changed to blue.

#### Dunstan's test :

A drop of phenolphthalein was added to approximately 5 ml of borax solution . The pink colour appears. On adding 2-3 drops of glycerol, disappearance of pink colour on addition of glycerol.

### Bioplastic production from grease:

Preparation of bioplastic was done by modifying the agar and the glycerol concentration.

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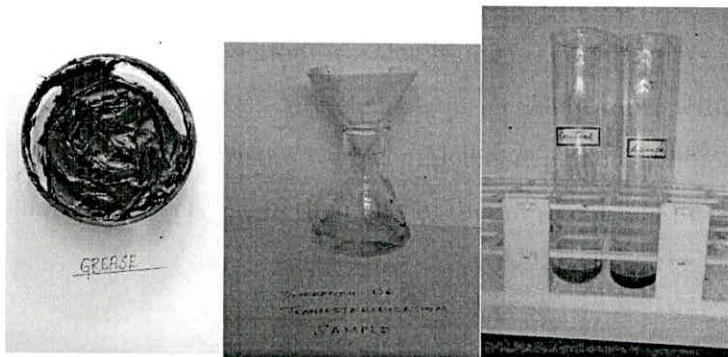
72.15% was moisture absorption was observed.

### Biodegradability

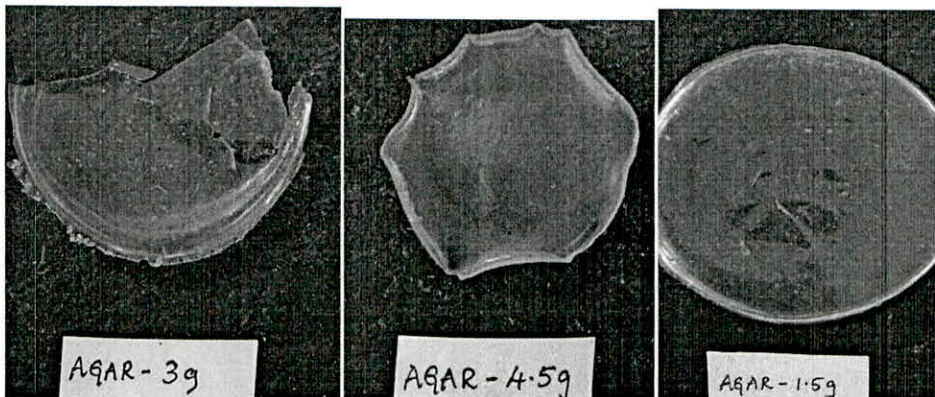
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Chikkasandra, Hesaraghatta Road,  
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the extent of damage of bioplastics. The damage can be seen from the mass reduction of respective specimens buried in the ground. Bioplastics were cut into 10 mm x 10 mm. Then, they were buried into the ground at 8-cm depth; the burial duration varied (3, 6, 9, and 12 days). Prior to burial, the initial mass (mass before degradation) was determined. The final mass (mass after degradation) of the bioplastics was measured afterwards. Any changes in mechanical properties due to degradation process were observed and when the bioplastics were completely degraded, the biodegradability was measured. There was decrease in the mass of the bioplastic as the time was increased.

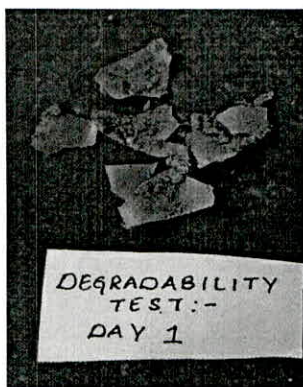


Dunstans test

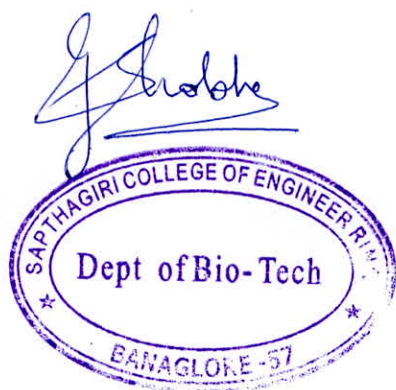
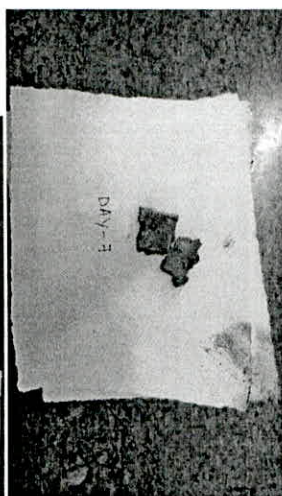


  
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DEGRADABILITY  
TEST:-  
DAY 1



  
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Bangalore-560 057



**KSCST PROJECTS**

**UTILIZATION CERTIFICATE**

**KSCST Student project program 42<sup>nd</sup> series- 2018-19**

| Sl No | Title of the project  | Amount | <p>Certified that KSCST has provided partial financial support of RS42500/- towards Biofuel and SPP student project program 42<sup>nd</sup> series</p> <p>Sum of Rs42500/- only has been utilize for the purpose Biofuel and SPP student project program for which it was sanction</p> |
|-------|---|--------|--|
| 1     | AGROBOT   | 7500/- |  |
| 2     | Development of Energy Management System (EMS) for Solar Photovoltaic Power Plants to Supply Power for Cottage Industries without using Battery Bank | 8000/- |  |
| 3     | Design and Fabrication of Articulated 3D Printer  | 8000/- |  |
| 4     | Power generation by engine exhaust gas for air brake  | 7000/- |  |
| 5     | Anti-Krait venom activity of folk medical plants.   | 6500/- |  |
| 6     | Bio plastic Extraction from waste grease produce in industries using as Glycerol as a substrate.  | 5500/- |  |

Certified that I have satisfied myself that condition on which the grant in aid sanctioned has been duly/are be fulfilled and that I have excise the following check to see that the money was actually utilized for the purpose for which it was sanctioned.

Kinds of check exercised

1. Cash book
2. Vouchers

*[Signature]*  
Principal  
Sapthagiri College of Engineering  
14/5, Chikkasandra, Hesaraghatta Main Road  
Bangalore - 560 057

*[Signature]*  
Principal  
Sapthagiri College of Engineering  
14/5, Chikkasandra, Hesaraghatta Main Road  
Bangalore - 560 057

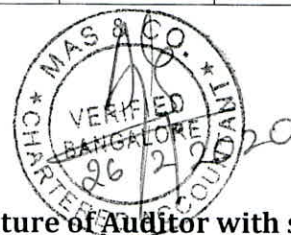


| Sl. No | Project proposal ref no | Title of the project  | Dept./Guide                                   | Amount Sanction by KSCST | Amount utilized by the college | Balance if any to be refunded to KSCST |
|--------|-------------------------|---|---|--------------------------|--------------------------------|--|
| 1      | 42S_BE_0279             | AGROBOT   | EEE/<br>Mr.Dhamodaran                         | 7500/-                   | 7500/-                         | 0                                      |
| 2      | 42S_BE_1473             | Development of Energy Management System (EMS) for Solar Photovoltaic Power Plants to Supply Power for Cottage Industries without using Battery Bank | EEE/<br>Mrs. Rekha S N                        | 8000/-                   | 8000/-                         | 0                                      |
| 3      | 42S_BE_1589             | Design and Fabrication of Articulated 3D Printer  | ME/<br>Mr. Ullas CS                           | 8000/-                   | 8000/-                         | 0                                      |
| 4      | 42S_BE_2339             | Power generation by engine exhaust gas for air brake  | ME/<br>Mr. Padmanabha                         | 7000/-                   | 7000/-                         | 0                                      |
| 5      | 42S_BE_3333             | Anti-Krait venom activity of flok medical plants.   | BT/<br>Dr. Veena S More                       | 6500/-                   | 6500/-                         | 0                                      |
| 6      | 42S_B_BE_003            | Bio plastic Extraction from waste grease produce in industries using as Glycerol as a substrate.  | BT<br>/Mr.prashanth kumar HP/<br>Ms. Shobha G | 5500/-                   | 5500/-                         | 0                                      |

Signature of the Principal with seal

Signature of Auditor with seal

Sapthagiri College of Engineering  
Chikkasandra, Hesaraghatta Road  
Bangalore-560 057



Date:

Principal  
Sapthagiri College of Engineering  
Chikkasandra, Hesaraghatta Road  
Bangalore-560 057