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Studies on Extraction and Physico-chemical analysis of novel algae *Scenedesmus* sp YACCYB70 oil

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ABSTRACT

Microalgae are fast growing aquatic photosynthetic organism, microalgae have many economic value in human life. As with any biological lipid, algal lipid is a potential feed stock for making the renewable fuel biodiesel. The present investigation was carried by isolation of novel *Scenedesmus* sp YACCYB70 algae from Godavari River of Maharashtra and fatty acid were extracted with soxhlet apparatus using hexane solvent. Physical properties of fatty acid such as density, viscosity, moisture, flash point, acid value, calorific value were recorded as 0.85gm/cc,4.2mm^2,1.8 % 210^{0}C, 54, 0.5 mg of KoH/gm, 9110 kal/kg. GCMS investigation revealed that ***Scenedesmus* sp YACCYB70** yielded high content of oleic acid 65.83%, Linoleic acid 20.10% palmitic acid, 5.81% stearic acid 1.86%, , ,Linolenic acid 0.52%,Ecosenoic acid 1.22%. In a view of its chemical and physical profile fatty acid of Scenedesmus sp YACCYB70 can be relevance for its prospective application in food and biodiesel feed stock. Algal biodiesel is a eco- friendly and about 50% of algal oil Trans esterifies in to biodiesel, algal biodiesel can be used to run the vehicle like truck, public transport

Keywords: Microalgae, *Scenedesmus* sp YACCYB70 Microalgae oil, solvent extraction, fatty acid

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INTRODUCTION

Microalgae are fast growing acquit microorganism. Their multiplication rate is 10 to 50 times greater than that of terrestrial plants. Microalgae produce large amount of biomass as compare to energy crops [2]. Microalgae can be prokaryotic or eukaryotic in nature. In evolutionary term, they can be better ancient species or recent one. Algae using by human in many ways, for example as a fertilizer, soil conditioner and live feed stock.[4]

Escalating fuel prices, the emerging concern about global warming that is associated with burning fossil fuel, quest of economic growth, fighting poverty and the growing demand for petroleum product have spurred new interest in the search for alternate source of natural oil for fuel [6]

In the united state biodiesel is produced from soybeans, canola oil, animal fat, palm oil, and corn oil, cooking oil, jatropha oil [8.15,16]. In the recent year microalgae have gained attention as a possible solution to chemical petro-diesel. Basic concept behind algal bio fuel and store lipid similar is to those found in the most vegetables oil [2]. Microalgae naturally stored lipid up to 40% in their cell. The key challenge is the selecting most suitable strain, if scientist create recombinant oil producer strain, then it would be more efficient artificial strain for biodiesel production.[1]

Present research work were undertaken to isolate the potential oil producer strain from local river Godavari and to extract oil from it and investigate the different physico chemical parameter of fatty acid.

MATERIALS AND METHOD

Isolation and identification of algal culture

Algae sample were collected from the Godavari River at Gangakhed during winter season in the year 2013. 1 ml water sample was added to BG11 growth medium for enrichment at 25^{o} C(+-1) under 1.2 to 0.2 klux- light irradiated for 16:8 hr light and dark cycle for 15 days. From this enriched culture pure culture isolated by pour plate method [19].Microalgae culture was identified with zeal biological research laboratory (Hydrabad,India) using 18S r RNA sequencing and identified as *scenedesmus spp,* as described [1]

Detection of lipid

Algae biomass was subjected to FTIR analysis at North Maharashtra University Jalgoan research laboratory and peak of lipid detected and it conform lipids. As described by Gulabchand shaha et.al [2]

Oil extraction

100 gm of algae powder were transfer in to soxhlet apparatus, and then 100ml of hexane was added to rupture cell wall of algae, after some time algae oil will be collected from the collecting flask and it is considered as crude algal oil, this was carried as described by Suseela et.al[2]

Physico-chemical analysis of crude algae oil

The physico chemical parameter such as density, moisture, flash point, acid value, calorific value determined by standard method of analysis (AoAC, 1995) and GCMS(FAME) of oil done at envirocare laboratory (Mumbai India) and this study conform fatty acid profile of algae oil.

RESULT AND DISCUSSION

Isolation and identification of microalgae

Colony characteristic and morphological features of the Indian isolate have demonstrated its close similarity with the genus *scendemus sp*. The individual cell are in the range 5-15µm in diameter shown in photo plate 1,further investigation of 18srRNA sequence analysis revealed the taxonomical relation to order

chlorococcales and further the sequence has shown more than95% similarity with the reported 18s RNS sequence *scenedesmus sp.* The Indian isolate was designated as *Scenedesmus* sp YACCYB70 [15]

Physical properties of fatty acid

The physical properties of s of *Scenedesmus sp YACCYB70* oil shown in table 1, The density, viscosity, moisture, flash point, acid value, calorific value were recorded as 0.85gm/cc,4.2mm^2,1.8 % 210^{0}C, 54,0.5 mg of KoH/gm,9110 kal/kg, These finding are approximate similarity to the oil extracted from algae *chaetoceros sp.* reported by shaleesha [2].

GCMS analysis of algae oil

The fatty acid profile of novel *Scenedesmus* sp YACCYB70 microalgae is shown in photo plate 2, and table 2, from the result it was clear that the main component of oil of novel algae recorded by GCMS(FAME) as palmitic acid,(5.81).stearic acid (1.86%) oleic acid (65.83%) Linoleic acid (20.10%) Linolenic(4.66%) Arachidic (0.52%)Ecosenoic (1.22%),similar finding reported by many researchers but we are reporting first time that our novel strain found to contain large amount of oleic acid(65.83%). All fatty acid are potential source of biodiesel production.[1]

Table 1: Physiochemical characteristic of microalgal oil,

Sr.no	Physical parameter	values
1	Density	0.85gm/cc
2	viscosity	4.2mm^2
3	moisture	1.8%
4	Flash point	210
5	Acid value	54
6	Calorific value	9110

Table 2: Scendemis species fatty acid percentage profile

Sr.no	Name of fatty acid	percentage
1	Palmitic acid	5.83
2	Stearic acid	1.86
3	Oleic acid	65.83
4	Linoleic	20.10
5	Linolenic acid	4.66
6	Arachidic acid	0.52
7	Ecosenoic acid	1.22

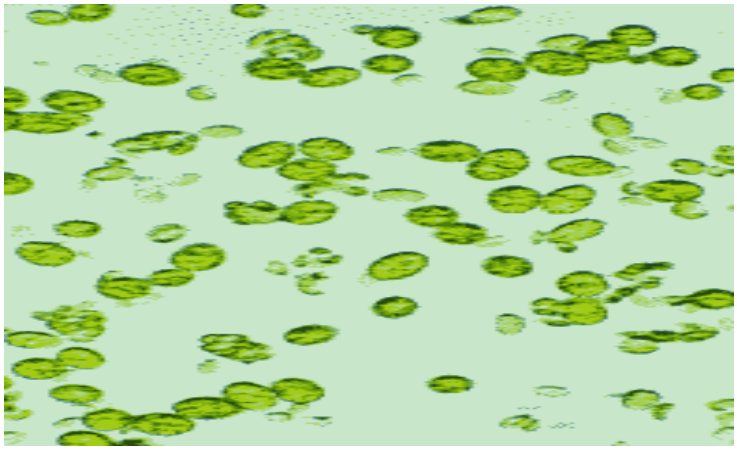

Fig 1: Microscopic picture of isolated microalgae

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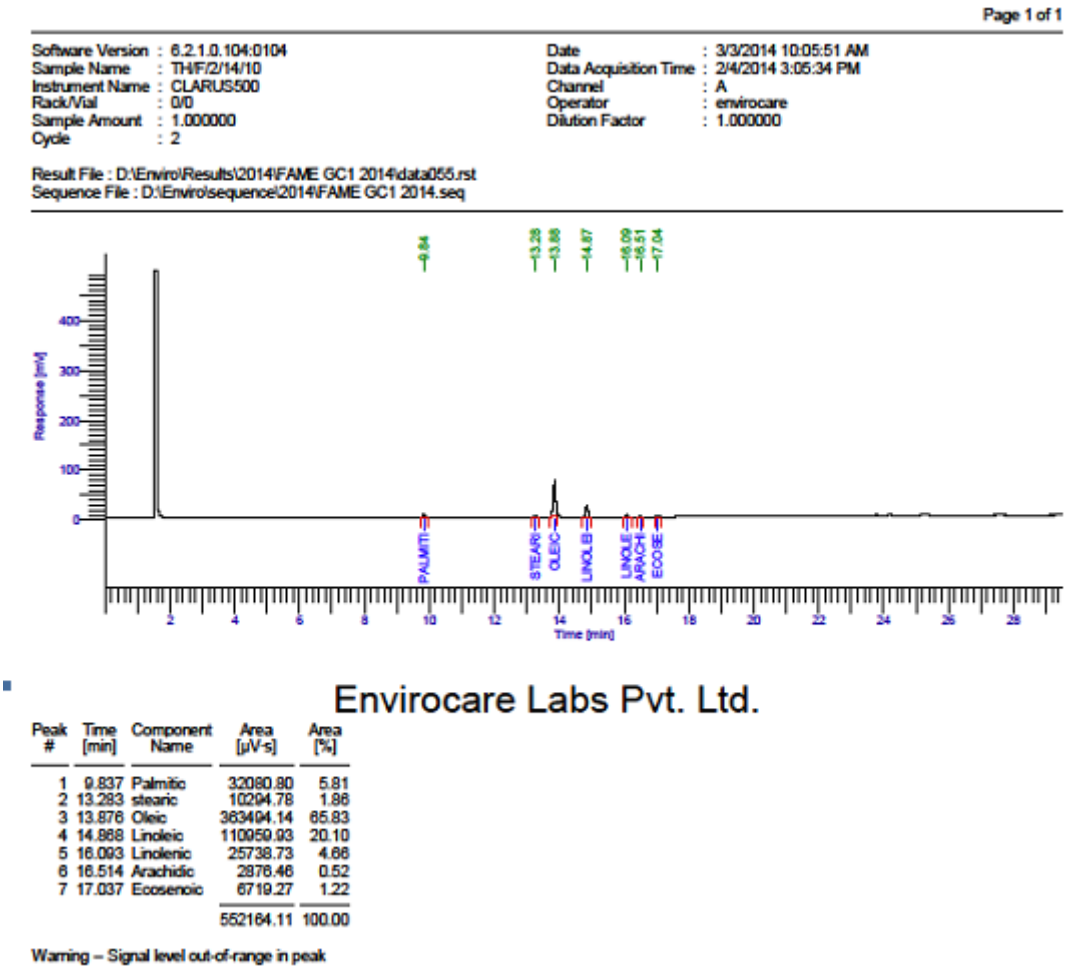

Fig 2: GCMS chromatogram of algae oil

CONCLUSION

Present study was focused mainly on isolation, extraction and evaluation of total lipid and fatty acid profile from novel algal strain from Godawari river of Maharashtra. isolated novel *Scenedesmus* sp YACCYB70 oil were studied for various physiochemical parameters such as FAME, AOAC standards. This Result shows that algae oil was mixture of saturated and unsaturated fatty acid and as well as a source of olic acid 65.83%,linoleic acid 20.10%,palmitic acid 5.81%,steric acid 1.86%,linoleic acid 0.52%,Ecosenoic acid 1.22%. Algae oil can be used for production of biodiesel using transesterification reaction. This oil also has the nutrition value. In the light of above research, novel *Scenedesmus* sp YACCYB70 could be efficiently used for the production of bioethanol, biodiesel and edible oil.

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