We claim

1. An integrated process for the production of oil bearing *Chlorella variabilis* for lipid extraction utilizing by-products of Jatropha methyl ester (JME) production from whole seeds of Jatropha and the process comprising the steps of:

i. providing deoiled cake as by-product of Jatropha methyl ester (JME) production having 4-6 % (w/w) nitrogen of Jatropha seeds by known method;

ii. hydrolysating the deoiled cake as provided in step (i) with hot acidic aqueous solution followed by adjusting pH in the range of 5.5 to 8.5 with alkaline materials to obtain a nitrogen-rich Jatropha oil cake hydrolysate(JOCH);

iii. providing crude glycerol containing methanol-depleted glycerol layer (GL7 and GL8) by known method;

iv. adding 1-5% (w/v) of the crude glycerol containing methanol-depleted glycerol layer (GL7 and GL8) as provided in step (iii) to 1-10% (v/v) of Jatropha oil cake hydrolysate as obtained in step (ii) to prepare growth-cum production medium for *Chlorella variabilis* ;

v. inoculating 1-10% (v/v) of the *Chlorella variabilis* seed culture into growth-cum-production medium as obtained in step (iv) and incubating for a period in the range of 7 to 15days at a pH in the range of 7.0-8.0 at a temperature in the range of 25-40°C to obtain lipid containing biomass;

vi. or alternatively inoculating 1-10% (v/v) of the *Chlorella variabilis* seed culture on the 1st day of seed culture inoculation with tap water, for initial 4 to 10 days incubation with only seawater or 1:2 diluted seawater in tap water and after 4th to 10th day subsequently adding GL7 to obtain lipid containing biomass;

vii. or alternatively inoculating 1-10% (v/v) of the *Chlorella variabilis* seed culture on the 1st day of seed culture inoculation with tap water, for initial 4 to 10 days incubation with only seawater or 1:2 diluted seawater in tap water and after 4th to 10th day subsequently adding GL8 to obtain lipid containing biomass;

viii. optionally inoculating 1-10% (v/v) of the *Chlorella variabilis* seed culture into growth-cum-production medium as obtained in step (iii) and adding UV- specific dye during outdoor biomass production to protect from UV damage at the temperature in the range of 40°C -50° maintaining the viability of the culture, and incubating for a

period in the range of 7 to 15 days at a pH in the range of 7.0-8.0 at a temperature in the range of 25-40°C to obtain lipid containing biomass;

ix. drying the biomass as obtained in step (iv to vii) in sun or directly using the wet biomass for lipid extraction;

x. extracting the lipid from biomass as obtained in step (viii) by known method.

2. An integrated process as claimed in claim 1, wherein the acid used is selected from the group consisting of $H_3PO_4$and H_2SO_4.

3. An integrated process as claimed in claim 1, wherein the alkaline material is selected from the group consisting of crude glycerol layer, potassium hydroxide and magnesium hydroxide.

4. An integrated process as claimed in claim 1, wherein the UV dye used is 2,5-thiophenediylbis(5-tert-butyl-1,3-benzoxazole).

5. An integrated process as claimed in claim 1, wherein methanol-depleted glycerol layer is obtained by mopped up of the ethanol from the glycerol layer by known method.

6. An integrated process as claimed in claim 1, wherein yield of the lipid with respect to cell dry weight were in the range of 20 to 35%.

Listing of Claims

1. An integrated process for the production of oil bearing *Chlorella variabilis* for lipid extraction utilizing by-products of Jatropha methyl ester (JME) production from whole seeds of Jatropha and the process comprising the steps of:

(i) providing deoiled cake as by-product of Jatropha methyl ester (JME) production having 4-6% (w/w) nitrogen of Jatropha seeds;

(ii) hydrolyzing the deoiled cake as provided in step (i) with hot acidic aqueous solution followed by adjusting pH in the range of 5.5 to 8.5 with alkaline materials to obtain a nitrogen-rich Jatropha oil cake hydrolysate (JOCH);

(iii) providing crude glycerol containing methanol-depleted glycerol layer containing by product of JME production obtained by washing crude fatty acid methyl ester obtained by transesterification of oil obtained from Jatropha with methanol and then distilling off residual methanol;

(iv) adding 1-5% (w/v) of crude glycerol containing methanol-depleted glycerol as provided in step (iii) to 1-10% (v/v) of Jatropha oil cake hydrolysate as obtained in step (ii) to prepare growth and production medium for *Chlorella variabilis*;

(v) inoculating 1-10% (v/v) of *Chlorella variabilis* culture into growth and production medium as obtained in step (iv) and incubating for a period in the range of 7 to 15 days at a pH in the range of 7.0-8.0 at a temperature in the range of 25-40°C to obtain lipid containing biomass;

(vi) optionally inoculating 1-10% (v/v) of *Chlorella variabilis* culture into growth and production medium as obtained in step (iv) and adding UV-specific dye during outdoor biomass production to protect from UV damage at a temperature in the

range of 40 - 50°C to maintain the viability of the culture, and incubating for a period in the range of 7 to 15 days at a pH in the range of 7.0-8.0 at a temperature in the range of 25-40°C to obtain lipid containing biomass.

(vii) drying the biomass as obtained in step (v to vi) in sun or directly using the wet biomass for lipid extraction.

(viii) extracting the lipid from biomass as obtained in step (vii).

2. An integrated process as claimed in claim 1, wherein the acid used is selected from the group consisting of $H_3PO_4$and H_2SO_4.

3. An integrated process as claimed in claim 1, wherein the alkaline material is selected from the group consisting of crude glycerol layer containing by product of JME production obtained by washing crude fatty acid methyl ester obtained by transesterification of oil obtained from Jatropha with methanol and then distilling off residual methanol, potassium hydroxide and magnesium hydroxide.

4. An integrated process as claimed in claim 1, wherein the UV dye used is 2,5-thiophenediylbis(5-tert-butyl-1,3-benzoxazole).

5. An integrated process as claimed in claim 1, wherein yield of the lipid with respect to cell dry weight are in the range of 20 to 35%.

6. An integrated process for the production of oil bearing *Chlorella variabilis* for lipid extraction utilizing by-products of Jatropha methyl ester (JME) production from whole seeds of Jatropha and the process comprising the steps of:

(i) providing a crude glycerol-containing methanol-depleted glycerol layer-containing by product obtained by washing crude fatty acid methyl ester obtained by transesterification of oil obtained from Jatropha with methanol and then distilling off residual methanol;

(ii) inoculating 1-10% (v/v) of *Chlorella variabilis* culture on the 1st day of growth with tap water, for initial 4 to 10 days incubation with only seawater or 1:2 diluted seawater in tap water and after 4th to 10th day subsequently adding methanol-depleted glycerol-containing by product as specified in step (i) to obtain lipid containing biomass;

(iii) drying the biomass as obtained in step (ii) in sun or directly using the wet biomass for lipid extraction;

(iv) extracting the lipid from biomass as obtained in step (iii).