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PRODUCTION OF BIOFUEL USING WATER LETTUCES (PISTIA STRATIOTS)

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Abstract – *Biodiesel has turned into a key source as a substitution fuel and is making its place as a key future sustainable power source. As a concentrated fuel for diesel motors, it is ending up progressively significant because of decreasing oil holds and the ecological results of fume gases from oil fuelled motors. The high rate of spread and simple accessibility of water lettuce has made it a sustainable carbon hotspot for biofuel creation. The present examination was attempted to screen the attainability of utilizing water lettuce hemicelluloses as a substrate for alcohol creation by fermentation.*

As the scan for options in contrast to non-renewable energy source heightens in this time of modernization and industrialization, fuelled by expanding vitality costs, water hyacinth holds a solid guarantee in the 21st century biofuel industry. Along these lines, an endeavour was made to produce biodiesel from water lettuce and to talk about specialized, financial, and ecological advantages of little scale biofuels, for example, improving vitality get to, making extra sources and means for money age and alleviating ecological contamination at both nearby and worldwide dimensions.

***Key Words*: Biofuel, Fermentation, Sugar evaluation, Water lettuce.**

1. INTRODUCTION

The ignition of non-renewable energy sources has made a worldwide nervousness for nature and world economy. Abuse of petroleum derivative is expanding the carbon dioxide level in the air and altogether adds to an unnatural weather change. Nations over the world have coordinated state strategies toward the usage of biomass for gathering their future vitality requests to meet carbon dioxide decrease focuses as determined in the Kyoto Protocol just as to diminish reliance on the supply of petroleum products. Consequently, there is a squeezing need to adjust to the utilization of bioethanol as a sustainable and clean vitality source. As of late, inquire about has concentrated on utilizing non-eatable biomass as crude materials including lignocelluloses, celluloses, and marine green growth as opposed to the original biomass, for example, starch and sugar biomass.

Agro build-ups when utilized for ethanol generation may deliver this issue to a degree, yet the task of enormous scale plants for cellulosic ethanol creation still have a few confinements, including high capital speculation, specialized information, and the high transportation expenses of feedstock.

In India, Water Lettuce (Pistia Stratiots), an oceanic weed, was first seen in West Bengal towards the beginning of 1890 and is currently present all through the nation with the exception of in the more parched western piece of Rajasthan, in the tough areas of the north, and in Kashmir. This tropical plant overruns huge territories of water assets and therefore prompts decrease of biodiversity, blockage of waterways, and waste framework, consumption of broke up oxygen, change of water science, and inclusion in ecological contamination. The plant endures boundaries in water level vacillations, occasional varieties in stream speed, supplement accessibility, pH, temperature, and poisonous substances. The usage of water hyacinth as the feedstock for bioethanol generation has various focal points. Water lettuce is low in lignin content with high measures of cellulose and hemicellulose. This lignocellulose can all the more effectively be bio-changed over by enzymatic intends to fermentable sugar, hence bringing about a gigantic measure of utilizable biomass for bioethanol creation. Furthermore, being an amphibian plant, it doesn't contend with sustenance crops for arable terrains. Its high development rate, 60–100 ton/ha/year, is additionally good for its business development. In any case, as cellulose parts are commonly secured with lignin and hemicellulose in the cellulosic biomass, it is important to debase and evacuate lignin just as hemicellulose from the cellulosic biomass. In this manner, the appropriate pre-treatment strategy is required to quicken the saccharification of cellulosic biomass and their bioconversion to ethanol.

In a perfect world, these pre-treatments endeavour to (1) limit the loss of sugars, (2) devour least measures of vitality, (3) improve the enzymatic edibility, (4) decrease the number of side-effects and maturation inhibitors, and (5) lessen costs. In such manner generation of lignocellulosic bioethanol from the generally accessible waste biomass like water lettuce can fill a double need. Other than decrease of non-renewable energy source shortage, it can control natural contamination and quicken rustic improvement. As in most creating nations, most of India's work power works in the rural area; in this way, in India there is especially high potential for bioethanol to raise salaries, give business, and add to rustic improvement.

1.1 Biodiesel quality Assessment-

For fuel to be sold as biodiesel it must meet the American Society for Testing and Materials (ASTM) standard D6751. This assurance covers biodiesel fuel blend stock, B100 for use as a blend portion with diesel fuel. The rule extent of diesel quality relies upon its cetane number; higher cetane number fuel ignites immediately, when they are showered inside hot compacted air. The high cetane number improves start and cold start. The fuss and release is in like manner decreased by high cetane fuel.

1. Pounding is the impact of fuel inside engine.

2. Threatening to pounding administrators are substances that lessens pounding of fuel, used in unrivalled engines.

3. Octane number generally called octane rating, it is a standard extent of threatening to pound properties and execution of motor and fly fuel. The high-octane rate forces can withstand high weight. Higher octane forces have tip top.

4. Pour reason for diesel is minimal temperature at which it outlines a semi solid fluid and its stream properties are adjusted. The high pour point demonstrates higher paraffin substance of the fuel.

5. Kinematic thickness is an extent of the dynamic consistency and thickness of a fluidm2/s.

6. Cloud point is the temperature at which separated solids in diesel starts empowering A

7. Destructive estimation of diesel is the proportion of potassium hydroxide used in murdering one gram of diesel.

2. PROCEDURE-

It consists of four steps-

1. Primary treatment
2. Acid disintegration
3. Fermentation
4. Purification

1. Primary Treatment-

Water lettuce accumulated from new water, disconnecting leaves and radicles and washed them two with clean water. At that point it is cut in little pieces and make the juice.

2. Acid integrates-

Then 300 ml juice was mixed with concentration of 0.1, 0.5, 1.0, 1.5% hydrochloric acid (HCL), as using strong acids for the process as sulphuric acid and hydrochloric acid. Stirred them properly as acid dissolves completely. After that the sample is heated at 120^0c for 10 to 15 min, and then it was cooled down to atmospheric temperature. After cooling, it was filtered through what man filter paper no.42 and collected.

3. Fermentation-

Fermentation process begins. rather than utilizing any kind of culture as they debase more .by adding 1 to 2 % dry yeast going about as a sponsor Dry yeast is helpful as in light of yeast there was no tainting occurs in a procedure of aging. A lot of molasses juice is blended. furthermore, ideal temperature for fermentation kept up between 32 ^{0}C to 36 ^{0}C.

4. Purification-

After fermentation process, Distillation was accomplished for determining the liquor by isolating parts or substances from fluid blend by utilizing steaming and liquefaction. And after that with the assistance of liquor, stupors esterification process was begun by utilizing impetus for separating biodiesel

3. Parametric Examination-

A. Calculation of pH-

Essential chemicals: Buffer tablet of pH values 4 and 9.2

Reagents composition: Buffer tablet of pH value 4 is dissolved in 100 ml of distilled water. This solution should preferably be stored in a plastic bottle in cool place. Buffer tablet of pH value 9.2 is dissolved in 100 ml of distilled water

Method-

a) Clean the integrate electrode of pH meter with distilled water.

b) Immerse the integrate electrode in the buffer solution of pH value 4 and 9.2.

c) Regulate the temperature by the adjustment knob to an atmospheric (room) temperature.

d) If the instrument manifest the reading as 4 and 9.2 respectively then it is in order if not, calibrate the reading to 4.0 and 9.2 by calibration adjustment knob.

e) Replicate the above procedure until the meter manifest reading as 4 and 9.2 respectively when electrode is immersing in buffer solution.

B. Turbidity

Chemicals required: Dissolve 1.0 g Hydrazine sulphate and dilute to 100 ml, Dissolve 10 g Hexamethylene Tetraamine and dilute in 100 ml, take 5 ml of each of the above solution (1 and 2) in a 100 ml volumetric flask and allow standing for 24 h at 25 ± 3°C and diluting to 1000 ml. This solution has a turbidity of 40 NTU.

Method-

a) Calibration of Nephelometer is done by using above reagent.

b) The sample is thoroughly tremble and kept it for sometimes so the air bubbles are removed.

c) The sample is taken in Nephelometer tube and the sample is put in chamber and the reading is noted directly.

C. Determination of dissolved oxygen

Chemical required: Sodium hydroxide, Manganous sulphate, Potassium iodide, Sodium thiosulphate, Conc. H_2SO_4 and starch.

Method

a) Take 50 ml of clear pipette solution in a conical flask

b) Add to it one or two drops of starch indicator until the colour becomes blue.

c) Titrate against Standard Sodium Thiosulphate solution until the disappearance of colour.

D. Determination of COD

Chemical required: Potassium decoronate, Conc. Sulphuric acid, Ferroin indicator solution, Std. Ferrous ammonium sulphate solution and Mercuric Sulphate.

Method

a) Take 50 ml of sample in a flask and 1 g of $HgSO_4$ and 5 ml of H_2SO_4 add slowly to dissolve $HgSO_4$ and cool the mixture.

b) Add 25 ml of 0.25 N $K_2Cr_2O_7$ solutions. Attach the condensate and start the cooling water. Apply the heat and reflux for 2 h.

c) Dilute the mixture to about 300 ml and titrate excess dichromate with std. FAS using Ferroin indicator.

d) The color will change from yellow to green to blue and finally red.

e) Reflux on the same manner to a flask consisting of distilled water, equal to the volume of the sample and the reagents titrate as the samples and ml of titrant was deduced.

E. Total reducing sugar

Chemical required: Leading solution, De-leading solution, HCL, Phenophelin indicator, NaOH, Fehling A and Fehling B.

Method

a) Take 12.5 g raw material taken + 25 ml leading solution + 250 ml distilled water.

b) All solution Swills filtered and 50 ml solution will take + 10 ml de leading solution added = 250 ml distil water.

c) After that take 50 ml filtered +5 ml HCL added, then heat at 680 in water bath cool down room temperature then added 2 to 3 drop phenophelin indicated and neutral with 6 normal NaOH and make up 100 ml with distil water [pink colour form] fill in burette.

d) In conical flask -5 ml Fehling A + 5ml Fehling B + 10 ml distilled water.

e) End point brick red colour. Percentage of sugar = 5.128 (standard value of Fehling of sugar)/ burette reading x dil. factor (0.05) x Fehling factor (0.9323).

F. Alcohol

Method

a) Take 50 ml sample + 50 ml water = 100 ml.

b) collect them in distilled and take 50 ml sample collected.

c) Take pycnometer.

d) Take empty weight of pycnometer then take weight of Pycnometer + sample A.

e) Again, take a weight of Pycnometer + sample B.

f) Ratio will check in chart alcoholic.

4. RESULTS AND ANALYSIS

Table1. Results of Water sample.

Source	pH	Turbidity	DO	BOD (mg/L)	COD (mg/L)	Total solids	Suspended solids	Dissolved solids	Hardness
Source1 (Right)	3.675	256.1	NIL	64.52	147.65	3802	2934.5	867.5	239
Source2 (Middle)	4.35	131.7	NIL	68.76	152.8	4745	3680	1065	242.15
Source3 (Left)	6.65	90	NIL	51.29	114	2515	2206	570	207.5

Table 2. Results of water lettuce sample without addition of molasses (Only Leaf)

Sample	Total Reducing Sugar (TRS)	Alcohol content	Biodiesel
Sample with 0.1%of HCL	0.12	0.15	
Sample with 0.5% of	0.15	0.16	

HCL			
Sample with 1.0 % of HCL	0.2	0.19	0.16
Sample with 1.5 % of HCL	0.29	0.32	

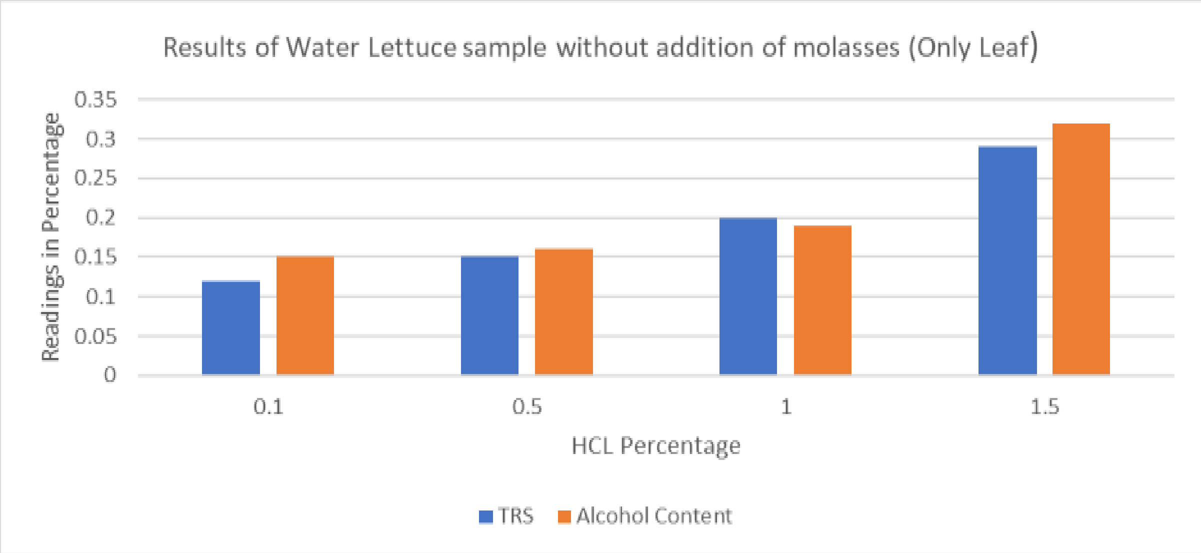


Table 3. Results of water lettuce sample without addition of molasses (Only Radicles)

Sample	Total Reducing Sugar (TRS)	Alcohol content	Biodiesel
Sample with 0.1% of HCL	0.2	0.24	
Sample with 0.5% OF HCL	0.3	0.31	
Sample with 1.0 % of HCL	0.5	0.55	
Sample with 1.5 %of HCL	0.6	0.64	0.60

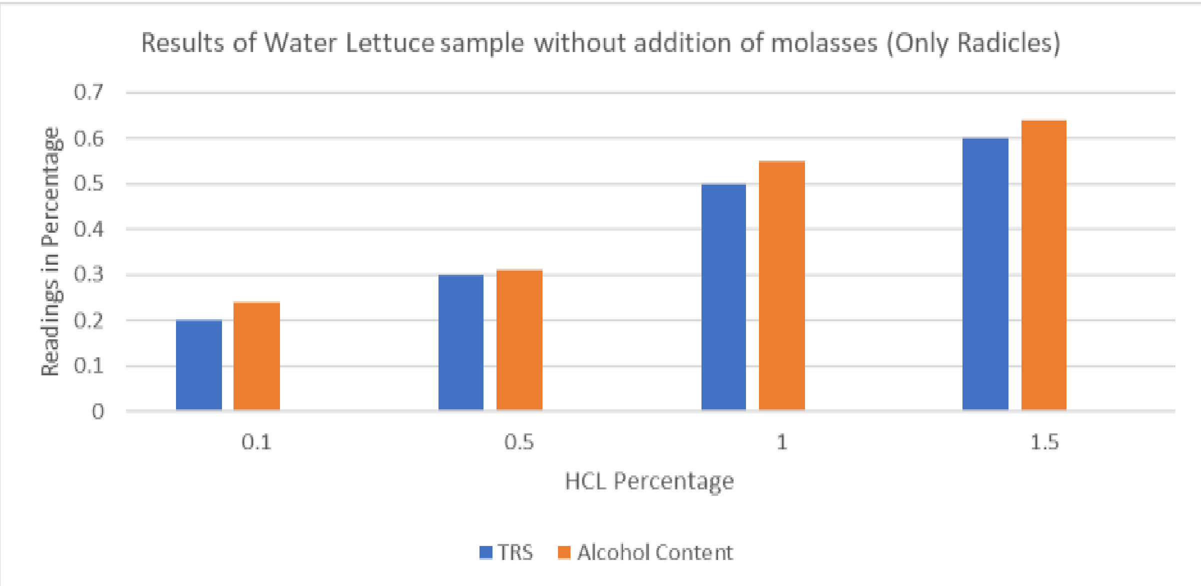


Table 4. Results of water lettuce sample with addition of molasses (Only Leaf)

Sample	Total Reducing Sugar (TRS)	Alcohol content	Biodiesel
Sample with 0.1 % of HCL	0.29	0.3	
Sample with 0.5 % of HCL	0.32	0.31	
Sample with 1.0 % of HCL	0.35	0.4	
Sample with 1.5 % of HCL	0.4	0.45	0.44

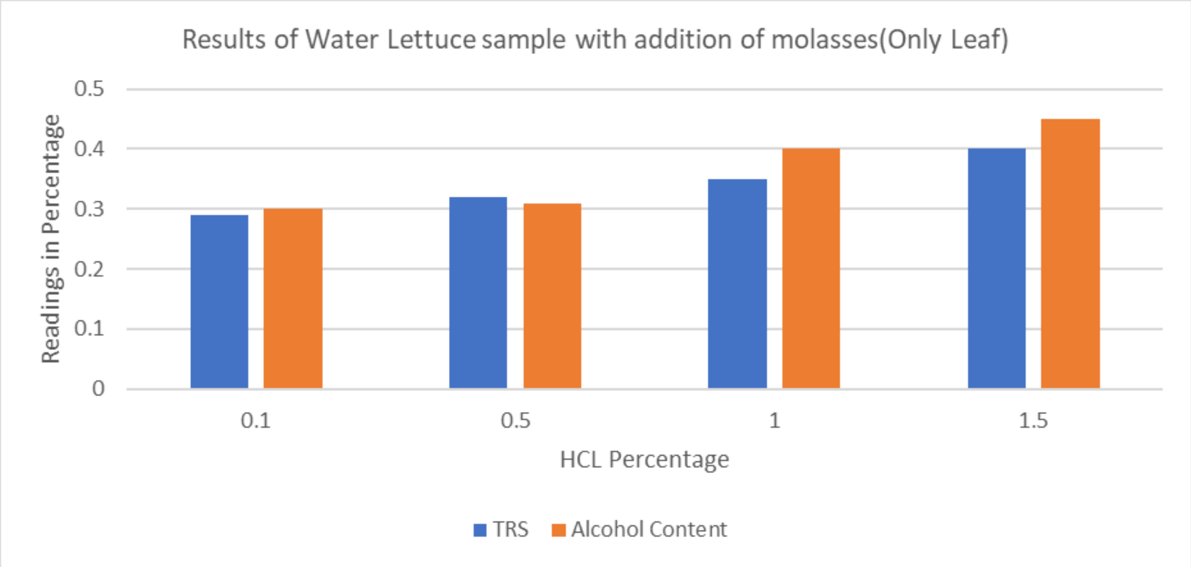
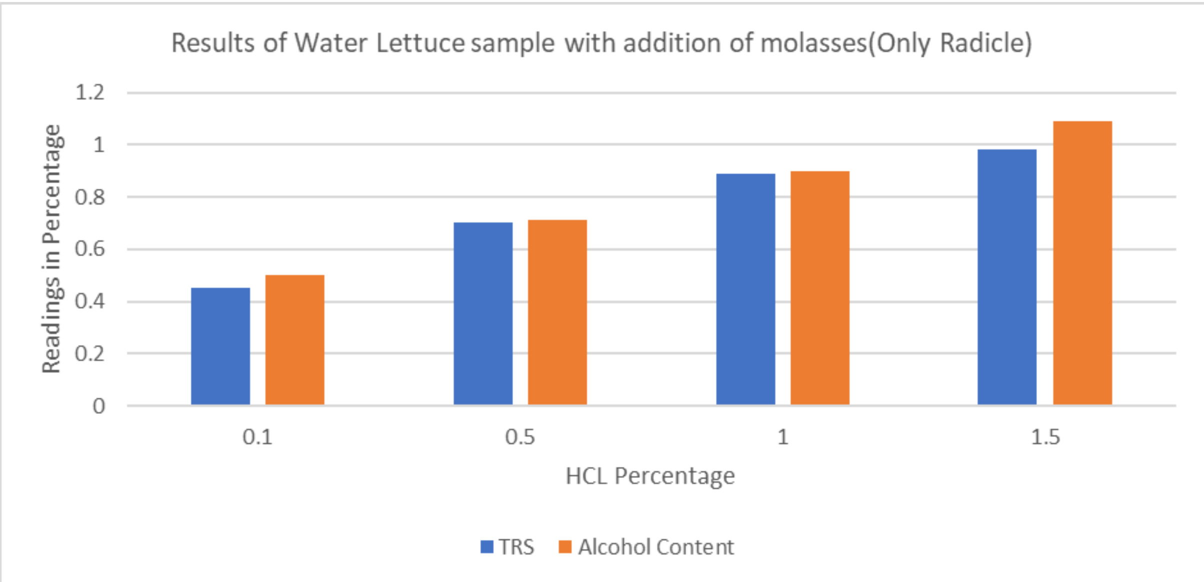


Table 5. Results of water lettuce sample without addition of molasses (Only Radicle)

Sample	Total Reducing Sugar (TRS)	Alcohol content	Biodiesel
Sample with 0.1 % of HCL	0.45	0.5	
Sample with 0.5 % of HCL	0.7	0.71	
Sample with 1.0 % of HCL	0.89	0.9	
Sample with 1.5 % of HCL	0.98	1.09	1.02



5. CONCLUSIONS

1. Water lettuce are one of the contradicting oceanic plant making the fundamental issue to the sea biosphere. In like way, obstruction is additionally related by checking utilization of herbicides and mechanical clearing.
2. As changing over this biomass to biofuel cuts down the risk of halting up conductors, flying mosquitos, as social affair of these plants is hard task with the objective that it's the best decision to be used in future as non-sustainable power sources are available in abundance.
3. Molasses juice is mixed with test for appearing of progress result in TRS and alcohol calculation, as results are settled for the two leaves and radicles, from that radicles give logically pleasant results in examination with leaves on the grounds that the radicles have more sugar content and if Total Reducing Sugar is more than liquor substance is likewise more

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7. REFERENCES

1. Ch.Vidya Sagar,(2013) Sustainable Biofuel Production From Water Hyacinth (Eicchornia Crassipes).
2. U.S. Aswathy,(2010) Bio-ethanol from Water Hyacinth Biomass: An evaluation of enzymatic saccharification strategy.
3. Arpan Das, (2016) Production of bioethanol as useful biofuel through the bioconversion of water hyacinth (Eichhornia crassipes)
4. Bhattacharya, "A Electronic Journal of Environmental''.
5. K. Simhadri, (2015) Experimental Analysis on Performance Improvement of Diesel Engine Utilizing Alternate Fuels.
6. Pacific biofuel, www.biodisel.com, April 2003.
7. "Biofuel Policies, standards and technologies", from World energy council 2010.
8. Dr. R. Suganeshwari, (2010) Production of Bio-Fuel and Furniture Products using Water Hyacinth.
9. Bently RW, in Global oil and gas depletion: "An overview. Energy Policy" 2002; 30:189-205.
10. Malik, A. 2007. Environmental challenge vis a vis opportunity: the case of water hyacinth. Environ. Internat. 33, 122-138.
11. Mathews, John, A Biofuels Manifesto: Why biofuels industry creation n should be "Priority Number One" for the World Bank and for developing countries. Macquarie Graduate School of Management Macquarie University, Sydney, Australia, September 2006.
12. Emad A. Shalaby, "Biofuel: Sources, Extraction and Determination", at http://dx.doi.org/10.5772/51943.
13. Ahmed F .Abdel-Fattah, Mohammad A. Abdel-Naby,Pretreatment and enzymic saccharification of water hyacinth cellulose.
14. Journal-Biofuels- Production, Application and Development Alan Scragg.
15. https://www.biofueljournal.com/volume_542.html