IJISET - International Journal of Innovative Science, Engineering & Technology, Vol. 3 Issue 6, June 2016
ISSN (Online) 2348 – 7968 | Impact Factor (2015) - 4.332
www.ijiset.com

Production of Bioethanol from deoiled Jatropha cake.

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Abstract:

The deoiled Jatropha cake obtained from biodiesel plant gives the sufficient quantity of bioethanol required for trans esterification reaction (1). The chemical and enzyme pre-treatments followed by fermentation with saccromycess cervesse on optimized parameters gives the maximum yield. Bioethanol from fermented substrate was separated by vacuum distillation on 30^0c and 1 atmosphere . The sugar content increased by chemical treatment is 30g/lit results 14g/lit of ethanol. The sugar content obtained by saccrification 60g/lit results 25g/lit of ethanol. The concentration of obtained bioethanol was analysed by UV spectrophotometer.

Keyword: Saccrification, deoiled karanja cake, vacuum distillation, ethanol.

Introduction

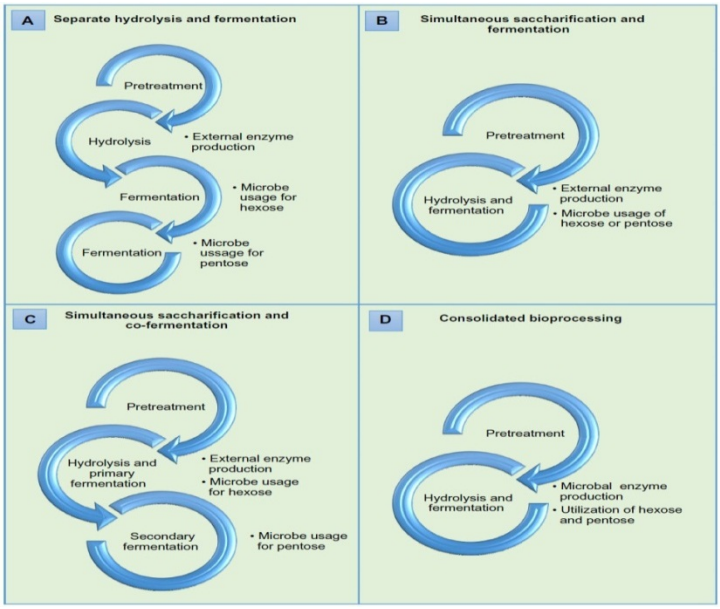
One hectare of j*atropha curcas* plantation on an average will produce 3.75 metric tones of seed yielding 1.2 metric tones of oil. At the end of two years j*atropha curcas* plant will give seed to its full potential. Hence four lakh hectares will produce 0.48 million metric tones of oil and 1.02 million metric tones of oil cakes [5].

Considering the future scenario of non-edible oil seeds utilization for biodiesel production in the country from j*atropha curcas* there is need for efficient utilization of their cakes. The current production of jatropha seed is around 0.056 million tones per annum against potential of 0.20 million tones per year. Similarly, the production of j*atropha curcas* seed would be very large in comparison to jatropha seed by the introduction of National biodiesel mission started in year 2003in the country. These two crops in India have been selected as major source of non-edible oil for production of biodiesel. One of the major problems arising in the coming years is disposal of cake after expelling oil from seed. The cake neither can be used for animal feeding nor directly can be used in agricultural farming due to its toxic nature. The generation of biofuel from these cakes would be a best solution for its efficient utilization. Biogas from cake provides energy for heating, cooking, lighting and engine operation and digested cake slurry can be directly put for agricultural farming.[7]

Table 1 : Proximate composition of dry jatropha seed cake (5)

Analysis	Averages (% *w/w*)
Moisture	2.18 ± 0.17
Ash	6.24 ± 0.13
Lipids	1.15 ± 0.08
Protein	31.82 ± 0.78
Cellulose	16.88 ± 0.26
Hemicellulose	10.41 ± 0.33
Lignin	33.29 ± 1.86
Starch	4.8 ± 0.33
TSS	5.11 ± 0.15
NDF	60.58 ± 3.13
ADF	50.17 ± 2.1

TSS : total soluble sugars; NDF : neutral detergent fibre; ADF : acid detergent fibre



The present and forthcoming use of non-edible oil seeds in India is production of biodiesel due to massive plantation of jatropha on waste lands in the Biodiesel Mission Project.

METHODOLOGY

Initial reducing sugar content in jatropha cakes was analyzed by DNSA method and found to be 9.5gm.This sugar content was increased up to 65.5g by the saccrification of starch with combined chemical and enzyme treatment with dilution 1:2 Fermentation was done by using Saccromucess Cervese at 30^0c and P^H maintained was 6, reaction time given is 48 hr. Ethanol was extracted by vacuum distillation which gives 28ml of ethanol from 100 gm. of deoiled jatropha cake. Hence on large scale calculation, 290 L 0f Ethanol can be obtained per ton of Karanja cake. The sample analyzed on UV spectrophotometer has shown 78% purity.

The waste residue of hydrolysis and fermentation process was analyzed. It indicates the absence of starch in the solid residue and has the composition as lipids, fiber, phosphorous, magnesium ,and sodium.

Considering the increasing generation of waste associated with production of oil from castor bean seeds, the utilization of jatropha deoiled cake for co-generation of ethanol could be integrated to the trans esterification process, reducing cost, and giving solution to destination to jatropha cake residue.

Results and Discussion

Table 2 Reducing sugar conversion and Alcohol Estimation from Jatropha cake

Time Interval (Hr)	P^H	Sugar Percentage(%S)	Alcohol Production
0	**6.5**	**60g**	**0**
12	**6.5**	**50.8g**	**4.5ml**

24	**6**	**44.5g**	**9.7ml**
36	**5.5**	**32.5g**	**16.5ml**
48	**6**	**21.5g**	**23.5ml**
60	**5.5**	**12.5g**	**25ml**
72	**5.5**	**12.5**	**25ml**

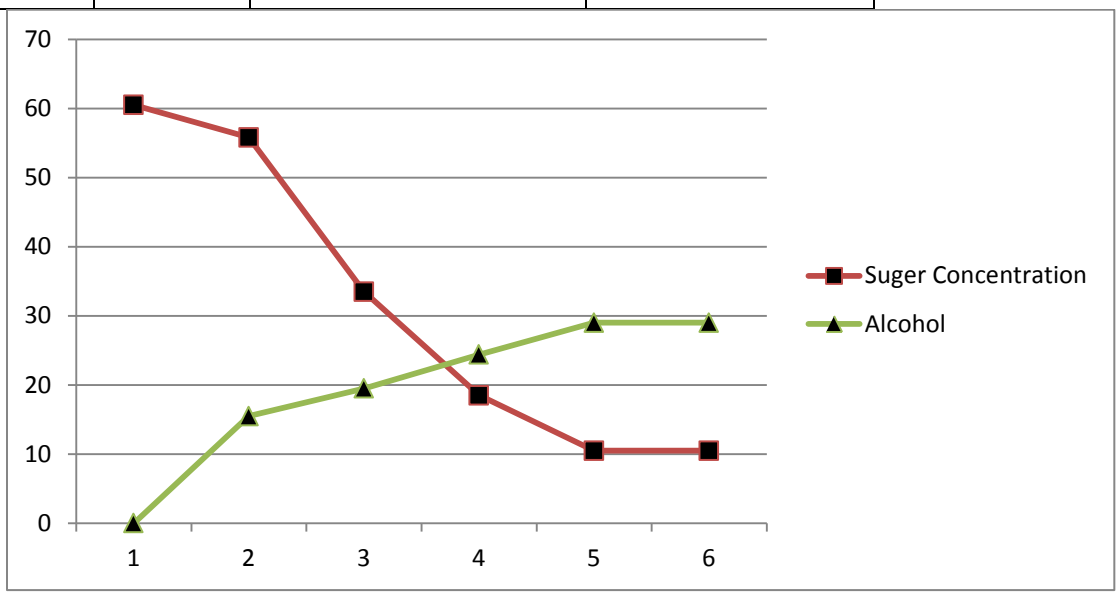


Figure 1 Fermentation Kinetics

Table 3 Result Analysis

Sr.no.	Fermented karanja DOC(gm)	Ethanol Distillate(ml)	Concentration	Residue(gm)
1	**100**	25	78%	64
2	**500**	100	77.5%	367
3	**1000**	200	78%	725

Table 4 Analysis of Ethanol separated by Vacuum Distillation [UV Spectrophotometer LT-2900, Wavelength range-190-1100NM]

Standard Ethanol samples (%)	Wavelength	Absorbance
100	292	0.901
75	276	0.828

50	271	0.596
25	209	0.170
0	270	0.436
Sample (1:1)	265	0.855

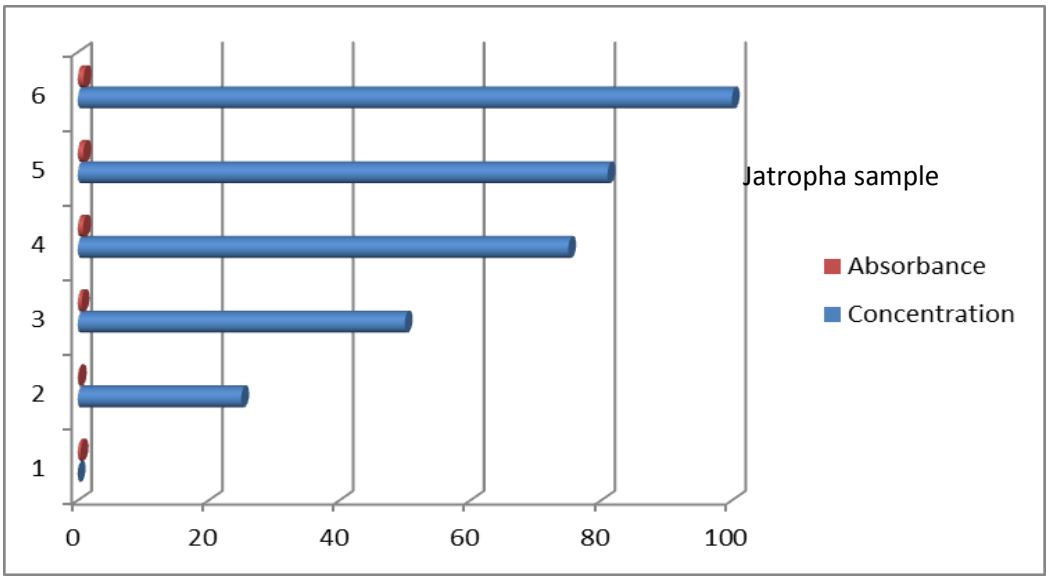


Figure 2 Ethanol concentration is taken for jatropha sample

CONCLUSION

Nonedible deoiled jatropha been cake can be used as best resource for the production of bioethanol by fermentation .The saccrification by combined chemical and enzyme treatment is found to give a better yield .The ethanol produced was analyzed by gas chromatography equipped with ionic exchange column, distilled water is used as mobile phase .The optimum operating conditions are found to be 30^0c and optimum P^H 6.The kinetics of the fermentation is found to be first order with respect to substrate.

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