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ASSESSMENT OF POWER POTENTIAL FROM CAJAN PEA AND PEANUT BIOMASS AND MIXED OF COAL & BIOMASS

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ABSTRACT

Due to high energy potential and less pollutants, power generation from biomass is becoming an attractive way for energy generation. In the present work briquette of coal and biomass is prepared for power generation. The biomass component is separately mixed with coal sample in the ratio of (coal : biomass=96:04, 90:10, 86:14, 81:19) .The objective of this work is to assess the energy contents of mixture and their power generation potential. The experimental work included with the determination of proximate analysis of coal and biomass & there mixture. The results have been shown that approximately 192.07 ha (in case of use of coal-cajan pea briquette) and 890.73 ha (in case of use of coal-peanut shell briquette) of land are required to generate power of 73×10^5 KWh/year.

KEYWORDS: Proximate analysis ,Biomass energy ,Briquette, Biomass potential ,Agricultural waste.

INTRODUCTION

In India, biomass fuels dominate the rural energy consumption patterns, accounting for over 80% of total energy consumed [1]. Fuelwood, crop residues (including plantation crops) and livestock dung are the biomass fuels used in rural areas. Fuelwood is the preferred and most dominant biomass source accounting for 54% of biofuel used in India [1]. Scarcity and increasing prices of fuelwood have been altering the biofuel consumption pattern. Due to scarcity of fuelwood, people are shifting to dung and various crop residues. The use of biofuels in domestic devices is associated with drudgery and adverse health impacts on women [2]. In most rural houses, the fuel use efficiency in domestic devices, particularly cook stoves, is low, in the range of 10–14% [1]. Thus, improving the conversion efficiency would be a significant step towards improving the quality of life and environment. Efforts are already under way to promote efficient devices and alternate energy sources for improving the quality of life and conserving biomass resources.

EXPERIMENTAl SETUP

Calorific Value and Proximate analysis of different components of coal and non-woody bio-mass species.
All the data that is related to work is summarized in the tables this data is obtained from the calorific value of non-woody biomass species, coal biomass mixed briquettes and proximate

Table 2.1: Proximate analysis and calorific values of different component of Cajan pea.

Component	Proximate analysis wt. %, air dried basis				Calorific value (kcal/kg, dry basis)
	Moisture	VM	Ash	FC	
Branch	11.00	70.00	8.50	14.50	4082
Leaf	10.00	66.00	11.50	16.50	5631
Bark	6.00	75.00	9.50	13.50	3847
Seed cover	11.00	66.00	11.00	16.00	4082

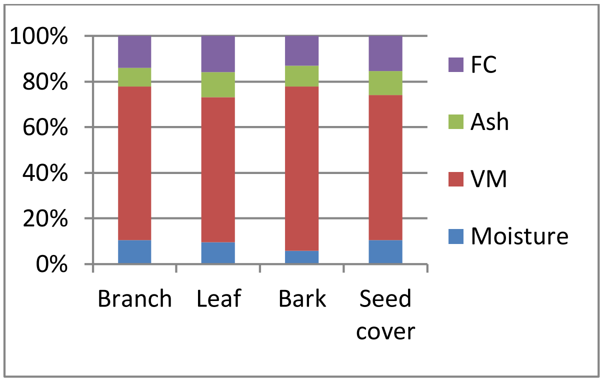


Table 2.2: Proximate analysis and calorific values of Peanut shell.

Com-ponent	Proximate analysis wt. %, air dried basis				Calorific value(cal/kg,dry basis)
	Moisture	VM	Ash	FC	
Peanut shell	7.00	66.00	11.00	20.00	3655.60

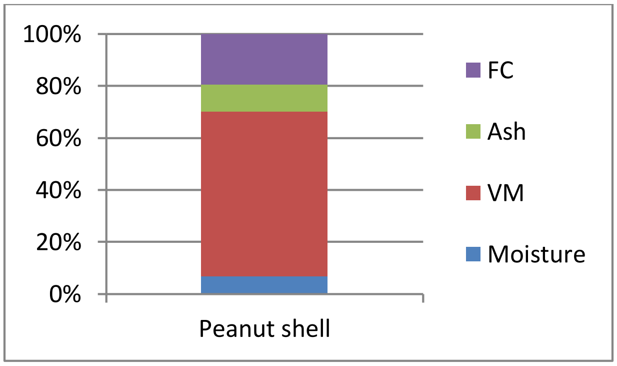


Table 2.3: Proximate analysis and calorific values of Coal

Com-ponent	Proximate analysis wt. %, air dried basis				Calorific value (kcal/kg, dry basis)
	Moisture	VM	Ash	FC	
Lingaraj Mines	9.00	22.60	42.30	30	4238

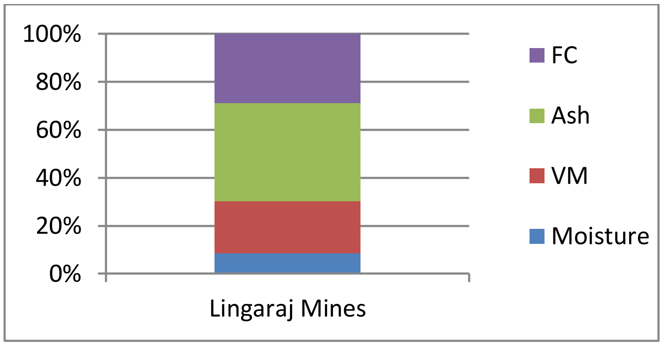


Table2.4-Coal:Cajan Pea Biomass different Components

Ratio (Coal:Biomass)	**Proximate analysis wt. %, air dried basis**				**Calorific Value(Kcal/kg,dry basis)**
	Moisture	**Volatile Matter**	**Ash**	**Fixed Carbon**	
Cajan Pea Branch					
96:04	9.95	25.06	40.52	28.50	4230.20
90:10	9.04	27.43	38.83	28.73	4222.40
86:14	9.08	29.79	37.14	27.00	4214.60
81:19	9.15	32.16	35.46	26.26	4206.08
Cajan Pea Leaf					
96:04	9.90	24.86	40.66	28.58	4307.65
90:10	9.91	27.03	39.13	27.93	4377.30
86:14	9.92	29.19	37.59	27.30	4446.95
81:19	9.93	31.36	36.06	26.65	4516.06
Cajan Pea Bark					
96:04	9.70	25.31	40.56	28.43	4218.45
90:10	9.51	27.93	38.93	27.63	4198.90
86:14	9.31	30.54	37.29	26.86	4179.37
81:19	9.12	33.16	35.66	26.06	4159.08
Cajan Pea seed cover					
96:04	9.95	24.86	40.64	28.55	4230.2
90:10	10.01	27.03	39.08	27.88	4222.4
86:14	10.06	29.19	37.52	27.23	4214.6
81:19	10.12	31.36	35.96	26.56	4206.1

Table 2.5-Variation of Cajan Pea Branch mixed briquette in different ratios.

(Coal: Biomass)	**Moisture**	**VM**	**Ash**	**FC**
96:04	9.95	25.06	40.52	28.50
90:10	9.04	27.43	38.83	28.73
86:14	9.08	29.79	37.14	27.00
81:19	9.15	32.16	35.46	26.26

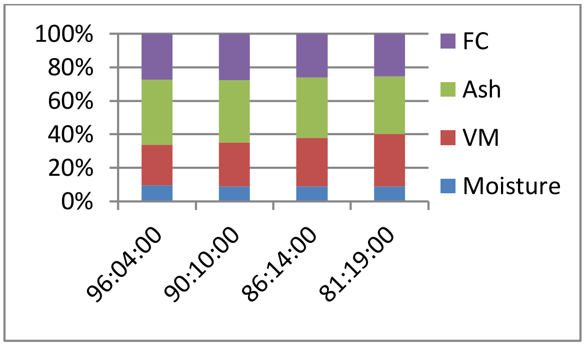


Table 2.6-Variation of Cajan Pea Leaf mixed briquette in different ratios.

(Coal: Biomass)	Moisture	VM	Ash	FC
96:04	9.90	24.86	40.66	28.58
90:10	9.91	27.03	39.13	27.93
86:14	9.92	29.19	37.59	27.30
81:19	9.93	31.36	36.06	26.65

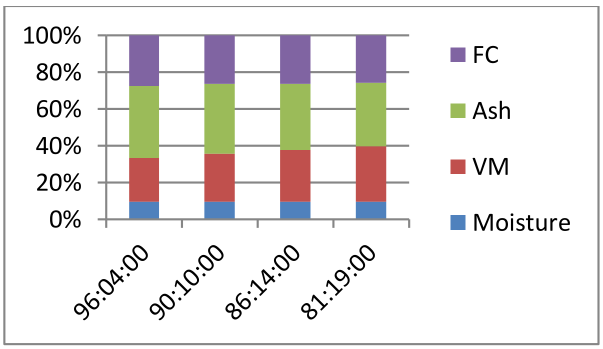


Table 2.7-Variation of Cajan Pea Bark mixed briquette in different ratios.

(Coal: Biomass)	Moisture	VM	Ash	FC
96:04	9.70	25.31	40.56	28.43
90:10	9.51	27.93	38.93	27.63
86:14	9.31	30.54	37.29	26.86
81:19	9.12	33.16	35.66	26.06

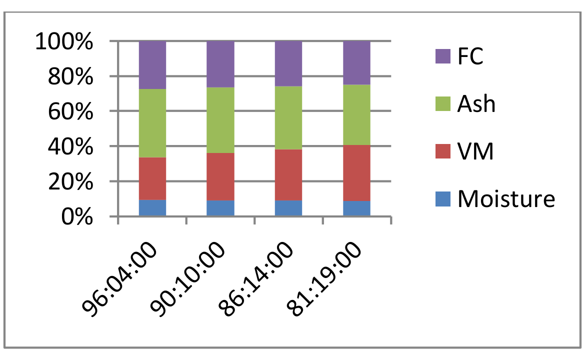


Table 2.8 -Variation of Cajan Pea Seed cover mixed briquette in different ratios.

(Coal: Biomass)	Moisture	VM	Ash	FC
96:04	9.95	24.86	40.64	28.55
90:10	10.01	27.03	39.08	27.88
86:14	10.06	29.19	37.52	27.23
81:19	10.12	31.36	35.96	26.56

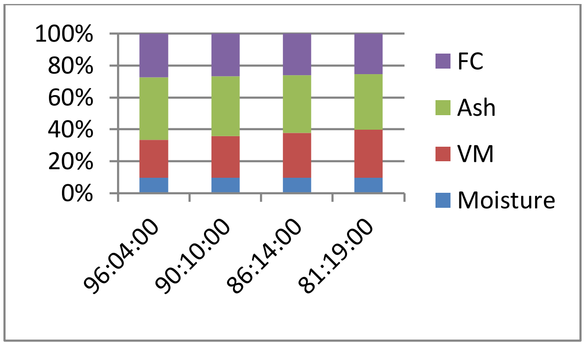
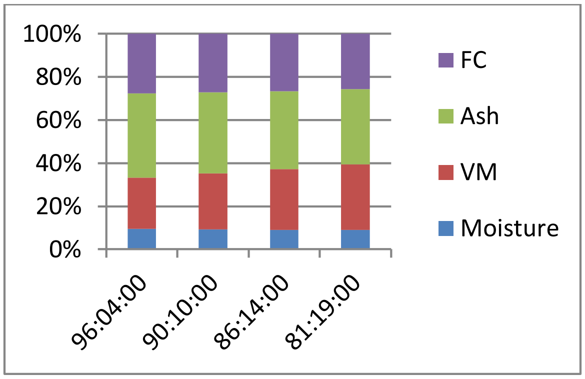


Table2.9:- Coal:Peanut Biomass different component

Ratio (Coal:Biomass)	Proximate analysis wt. %, air dried basis				Calorific value (kcal /kg, dry basis)
	Moisture	**VM**	**Ash**	**FC**	
Peanut Shell					
96:04	9.75	24.86	40.64	28.74	4208.87
90:10	9.61	27.03	39.08	28.28	4179.75
86:14	9.46	29.19	37.52	27.82	4150.63
81:19	9.32	31.36	35.96	27.36	4121.51

Table 2.10:-Variation of Peanut Shell mixed briquette in different ratios.

(Coal: Biomass)	Moisture	VM	Ash	FC
96:04	9.75	24.86	40.64	28.74
90:10	9.61	27.03	39.08	28.28
86:14	9.46	29.19	37.52	27.82
81:19	9.32	31.36	35.96	26.36



RESULTS AND DISCUSSION

The proximate analysis and calorific values of different components of Cajan pea and Peanut shell, coal and coal-biomass mixed briquette in different ratios are presented in tables 2.1 to 2.3 and variation of proximate analysis of mixed coal-biomass briquettes are shown in figure 2.4 to 2.10 Which shows that both the biomass species has less ash content and high volatile matter when mixes with coal in the ratio of 81:19.In conventional power plant bottom ash produced by the combustion of coal is a major problem, so it is always desires to use less ash content fuel.When coal-biomass mixed briquette is used as fuel for power generation in the ratio of 81:19 it is found that it requires 192.07 ha (in case of use of coal and Cajan pea residue) and 890.73 ha (in case of use of coal and Peanut shell) land which is more feasible because it reduces the dependency on agricultural residue and also land requirement for plantation.

CONCLUSION

In the present work two non-woody biomass species cajan pea and peanut were selected. Experiments to determine the proximate analysis, calorific values and ash fusion temperature was done on each of the components of the selected species such as stump, branch, leaf ,bark,seed cover were performed. Estimation has done to analyze how much power can be generated and land requirement for plantation for each of these species. The following are the different conclusions drawn from the present work:

1.Both plant species (cajan pea and peanut) showed almost the similar proximate analysis result for their components .Cajan pea has higher calorific value than peanut shell.

2.Peanut shell has lower calorific value, ash content and higher volatile matter than selected coal sample due to that when the percentage of peanut shell increases in the coal-biomass briquette calorific value and ash content decreases and volatile matter increases.

3.In case of cajan pea biomass calorific value and volatile matter is higher and ash content is lower than selected coal sample due to that when percentage of cajan pea increases in the coal-biomass briquette calorific value and volatile matter increases and ash content is decreases.

4.The cajan pea biomass species showed highest energy values for their branch, followed by wood, leaf and nascent branch.

5.Amongst the four different ratio81:19 gives the less ash content and higher volatile matter and energy value compared to 94:06, 90:10, 86:14.

6.Energy values of coal mixed cajan pea biomass component were found to be little bit higher than that of coal mixed peanut shell biomass.

7.In order to meet the yearly power requirement of the order of 73 x 10^5 kWh for a group of 10-15 villages, 4312.61 ha (in case of use of cajan pea residue) and 5021.32 ha (in case of use of peanut shell) land are required for plantation but when coal-biomass mixed briquette is used as fuel for power generation in the ratio of 81:19 it is found that it requires 192.07 ha (in case of use of coal-cajan pea briquette) and 890.73 ha land(in case of use of coal- peanut shell briquette).

8.This study could be positive in the exploitation of non-woody biomass species for power generation.

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