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COMPARISON OF DIFFERENT VARIETIES OF DRY SUGARCANE LEAVES FOR MAKING BRIQUETTES.

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Abstract

India is one of developing country & produces million tons of sugarcane. During treatment of sugar production tremendous amount of waste created like bagasse, dry sugarcane leaves. These wastes are burn openly which creates more pollution. In our project we use agro waste like dry sugarcane leaves which is frequently burn openly. Hence aim of our project is comparison of different varieties of dry sugarcane leaves for making briquettes. These briquettes are substitute coal & charcoal & reduce carbon emission.

Key words: briquettes, dry sugarcane leaves, open field burning, carbon emission, and pollution.

Introduction

Now India is developing country, cause of industrialization demand for energy increased but the availability of oil and natural gas is declining day by day due to population & rapid use of fuels. Hence some renewable energy sources replace those traditional fuels for example ethanol, bio diesel etc. Our project is also related to biomass. Biomass is defined as (renewable) biological material that come from animal, vegetables, agricultural waste and plant matter whether grown on land or water, food processing and forestry by products and municipal wastes. Hence as per our project briquettes are compressed blocks which is made by organic waste or biomass. It is a household and institutional fuel resources

highly used in boilers & widely used in heating purpose & any thermal operation like gasification. Also used in domestic level for cooking etc.

According to history people have been use briquettes before recorded history in Nepal. First commercial production is started in 1982 & 900 metric tons of production they had done. In 1984, factories were constructed that incorporated vast improvements on efficiency and the quality of

briquettes. They used a combination of history rice husks and molasses.

According to sugarcane production surveys 2014-2015 Uttar Pradesh producing 138481 th. Tons of sugarcane, Maharashtra producing 81870 th. Tones, Karnataka producing 41895 th. Tons of sugarcane & throughout India 352 million tons of sugarcane production take place.60 million tons of bagasse created through it & only 47% to 50% of utilization take place. Mostly waste which is generated by sugarcane is burn openly which is called as open field burning. Cause of open field burning, disposal problem is the loss of energy which creates more environmental problem.

Briquettes have some environmental & social benefits like using biomass briquettes can contribute to sustainable forest management. Neutral co2 & co emissions balance & low sulfur emissions is the best achievement of it. If it has a forest origin under a proper management scheme, it contributes to forest regeneration and prevention of forest fires. If source of raw material is agricultural or industrial waste, it enables a residue with a second life. Ash from briquettes burning can be used as fertilizer. Biomass briquettes has high calorific fraction & low ash contain.

Outline of market of briquettes says that, since from the mid-nineteenth century, industrial briquetting methods have been reported. Briquette use has been linked to periods of fuel shortages and times of crisis. During World War II, briquette production from waste wood and other residues like biomass like saw dust, dry sugarcane leaves & so on greatly expanded in Europe and America. After the war, briquettes lost ground in the market due to cheaper hydrocarbon alternatives. During periods of high energy prices, such as the 1970s and early 1980s, the use of briquettes was revitalized, mainly in Scandinavian countries, the USA and Canada. Finally, due to movements combating climate change, market change and global promotion of renewable and clean energies, the use of briquettes is spreading worldwide, steadily growing from 2000 until today.

Literature review

Briquette production could prove not only particularly more costly but the overall cost of the briquette could compete with fuel similar scale or perhaps in other big sugarcane producing Indian states, making some leeway into tackling deforestation, reported by chest tiwari.

Rahul a. Patil & umesh b. Deshannavar reported that, the calorific value of dry sugarcane leaves is equal to other biomass. The calorific value of dry sugarcane leaves and biomass is listed in table 1 and table 2

Table 1. Calorific value of dry sugarcane leaves

Raw Material	Calorific value (Kcal/Kg)
Dry Sugarcane Leaves	3500 - 4196

Table 2. Calorific values some biomass

Sr. No.	Raw Material	Calorific values (Kcal/Kg)
1	Sugar Cane	3996
2	Corn cob	4060.38
3	Rice Husk	3742.71
4	Bagasse	4139.19
5	Saw dust	4769.75
6	Sun flower Stalk	4300
7	Wheat Straw	4060.38
8	Wood	4418.64
9	Cotton stalk	4788.86
10	Cattle Dung	3700
11	Groundnut Shell	4626

From our study it may be revealed that the dry sugarcane leaves has 11.95 % lignin which liberates energy on burning and calorific value between 3500 – 4196 kcal/kg. These values are good enough when compared with other biomass. Therefore dry sugarcane leaves can also be used for making briquettes to overcome problems related to pollution and energy.

Problem definition

India produces 60 million metric ton sugarcane per year. So huge amount of waste like cane tops, bagasse, filter muds and molasses is also generated during the treatment of sugarcane. Approximately tat of dry leaves are generated. The dry sugarcane leaves is burned in the open field, emitting the greenhouse gases and creating the environmental issue. Solution of these problems is converting the dry sugarcane leaves into briquettes.

Objectives

1) Making of briquettes from different dry sugarcane leaves.
2) To check feasibility optimum pressure of briquette produce from different species of dry sugarcane.

Expected outcome

1) Formation of briquettes from different verities of dry sugarcane leaves.
2) Expected feasibility of briquette produce from different species of dry sugarcane.
3) Optimized pressure.

Methodology:

Raw material:

We require different verities of sugarcane leaves. Hence we find some common verities of sugarcane as shown in table 3. Also we require cow dung as a binder.

Table 3. Varieties of sugarcane

Sr.no	Varieties of sugarcane
1.	Vsi 434 co 86032 sugarcane
2.	Vsi 08005 sugarcane
3.	Com 0265 sugarcane

Study of dry sugarcane leaves

We do study for dry leaves of sugarcane. First we identify content of sugarcane leaves according to it, dry leaves are present at the mid & bottom of cane. Shown in figure 1 green tops present at top. Dry leaves are brown & yellow color. It contains 27.64 % of cellulose, hemicellulose 19.15 & lignin 11.95. It has calorific value between 3500–4196 kcal/kg.

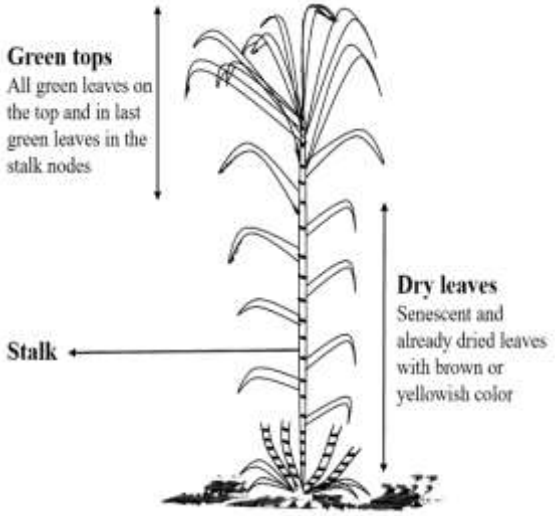


Fig no.1 sugarcane crop

Fig no.2 verities of sugarcane leaves.

Experimental work

First upon size reduction of sugarcane leaves is done by chaff cutter up to 1-2 cm as shown in fig 3.

Fig no. 3 cutting machine / chaff cutter

First upon we take 700 gram cow dung as binder as shown in fig.4 & 200 gram dry sugarcane leaves of each verities as shown in fig 5 .then dry sugarcane leaves mix with 700 gm. Cow dung as a binder (other binders like cow dung, buffalo dung and press mud binders separately). The mixture was placed in the die and block was adjusted over the sample. The load was gradually applied on the sample. It was observed that at high load original moisture content of sample comes out along with some amount of binder. 22 KN load require for cow dung & 11 KN load require for buffalo dung. After removal of sample from die the briquette gets disintegrated. As per our experiment to all verities of briquettes are formed at optimum pressure that is 18 KN. Our experiment carried out by using UTM machine as shown in fig 6. Therefore further experiments were carried out at lower load. Briquettes making method shown in fig 10

Fig no 4. 700 gm. Cow dung (binder)

Fig no 5. 200 gm. Dry sugarcane leaves.

Fig no. 6 universal testing machine (UTM)

Experimental readings

As per our project we are take various reading of size reduction of dry sugarcane leaves, pressure optimization & moisture content.

1) Size reduction

Size reduction of dry sugarcane leaves is very important part of this project. First upon we cut all leaves up to 5-6 cm. as shown in fig no. 12 & fig no.13 then we observe that briquettes are fall in pieces cause of its size.

Fig no.7 size reduction up to 5-6 cm

Fig no. 8 size reduction up to 5-6 cm

Fig no. 9 briquette fall in pieces

Size reduction of raw dry sugarcane leaves is must be very less, mostly 1- 2 cm. If size of raw leaves is large then briquettes formation is not take place. As shown in fig no. 9.

2) Pressure analysis

As per our project we form 3 verities of briquettes from different verities of dry sugarcane leaves. Basically we make briquettes from dry sugarcane leaves & cow dung. When we applied pressure moisture inside the material comes out from sample. Genially 22 KN load require for cow dung & 11 KN load require for buffalo dung. After removal of sample from die the briquette gets disintegrated.

As per our experiment we get following readings**,**

For VSI 434 CO 86032 sugarcane

Table no.4 pressure analysis for VSI 434 CO 86032 sugarcane

Sr no,	Pressure	Briquette formation
1	10	Not formation
2	12	Not formation
3	14	Not formation
4	16	Not formation
5	18	Formation take place

For VSI 08005 sugarcane

Table no.5 pressure analysis for VSI 08005 sugarcane

Sr no,	Pressure	Briquette formation
1	10	Not formation
2	12	Not formation
3	14	Not formation
4	16	Not formation
5	18	Formation take place

For COM 0265 sugarcane

Table no.6 pressure analysis for COM 0265 sugarcane

Sr no,	Pressure	Briquette formation
1	10	Not formation
2	12	Not formation
3	14	Not formation
4	16	Not formation
5	18	Formation take place

When the pressing temperature is lower than briquettes are unstable & it has less strength also it has shorter burning time and producing less heat eventually. When the temperature is higher, the volatile compounds in briquettes may be burned out and cause burning during pressing.

3) Moisture content

Proximate analysis, which is a standardized procedure that gives an idea of the bulk components that make up a fuel, was done to determine the average of the percentage moisture content and percentage content of fixed carbon. We are performing here test of moisture content.

50 grams of briquette sample was oven dried at around 40^0 to 50^0C until a constant mass was obtained. The change in weight (d) after 16–24 h was then used to determine the sample's PMC using:

PMC =d\e*100

Where PMC is the percentage moisture content, d is change in weight, and e is the initial weight before drying

1) Moisture content test for VSI CO 86032 briquette

We take 500 gm. sample of VSI CO 86032 briquette & dry it at 40^0C. Dried sample weight is 90.11 gm.

PMC =d\e*100

According to above formula,

PMC= 90.11\500*100=18.022

2) Moisture content test for VSI 08005 briquette

We take 500 gm. sample of VSI 08005 briquette & dry it at 40^0C. Dried sample weight is 84.89 gm.

PMC =d\e*100

According to above formula,

PMC= 84.89\500*100=16.978

3) Moisture content test for COM 0265 briquette

We take 500 gm. sample of COM 0265 briquette & dry it at 40^0C. Dried sample weight is 78.56 gm.

PMC =d\e*100

According to above formula,

PMC= 78.56\500*100=15.712

Table no.7 moisture content of Verities of briquettes

Sr. No	Verities of briquettes	Moisture content
1.	VSI 434 CO 86032 sugarcane	18.022
2.	VSI 08005 sugarcane	16.975
3.	COM 0265 sugarcane	15.712

Briquette of VSI 434 CO 86032 has highest moisture content & COM 0265 has low moisture content

Result & discussion:

1) Size reduction

Size reduction of raw dry sugarcane leaves is must be very less, mostly 1- 2 cm. If size of raw leaves is large then briquettes formation is not take place. If size reduction of leaves is not uniform & large then brutes fall in pieces. Pressing temperature impact the soften and excretion of lignin which will function as natural binders to join the fibers of the feed stocks to form solid high density briquettes. The optimal pressing temperature is at the curve peak where maximum strength is achieved by briquettes. When the temperature is lower, briquettes are unstable, have less strength and are likely to crumble during burning, having shorter burning time and producing less heat eventually. When the temperature is higher, the volatile compounds may be burned out and cause burning during pressing.

Fig no. 10 briquettes of large size leaves

2) Pressure optimization

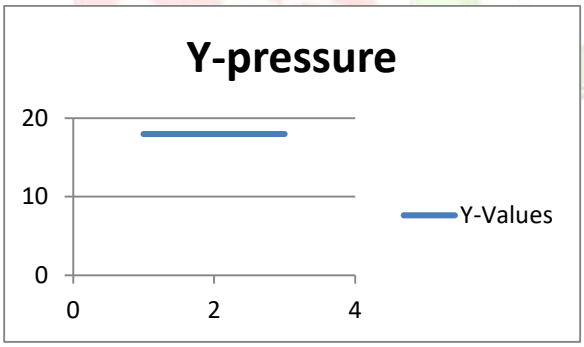
1) All verities of briquettes are form at pressure 18 KN.

Table no. 8 Pressure optimization

Sr. No	Verities of sugarcane leaves	Optimized pressure
1.	Vsi 434 co 86032 sugarcane	18 KN
2.	Vsi 08005 sugarcane	18 KN
3.	Com 0265 sugarcane	18 KN

2) During experiment we observe that, when the pressing temperature is lower than briquettes are unstable & it have less strength also it has shorter burning time and producing less heat eventually. When the temperature is higher, the volatile compounds in briquettes may be burned out and cause burning during pressing.

3) Strength of briquettes is increased with the increasing compacting pressure within the compacting limit of the feed stock. As pressure is increase the atmospheric humidity in the feed stock is decreased and briquettes durability is increased.



Graphical representation of pressure analysis

On X- axis= verities of briquettes given at below

1. VSI 434 co 86032 sugarcane

2. VSI 08005 sugarcane

3. COM 0265 sugarcane

On Y- axis= pressure

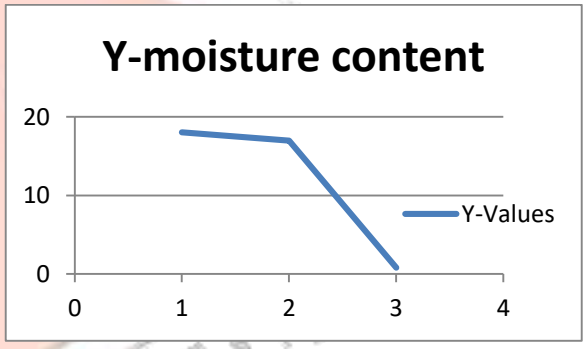
3) Moisture content

1) Briquette of VSI 434 CO 86032 has highest moisture content & COM 0265 has low moisture content.

Table no. 9 moisture content of Verities of briquettes

Sr. No	Verities of briquettes	Moisture content
1.	VSI 434 CO 86032 sugarcane	18.022
2.	VSI 08005 sugarcane	16.975
3.	COM 0265 sugarcane	15.712

2) Moisture content is required in 10 % to 18%. If it more than 18% or it less than 10% then briquette is tended to fall into pieces.



Graphical representation of moisture content

On X- axis= verities of briquettes given at below

1. VSI 434 co 86032 sugarcane

2. VSI 08005 sugarcane

3. COM 0265 sugarcane

On Y- axis= moisture content

Conclusion:

1) Pressure optimization

As per our project we form 3 verities of briquettes from different verities of dry sugarcane leaves. Basically we make briquettes from dry sugarcane leaves & cow dung. When we applied pressure moisture inside the material comes out from sample. Genially 22 KN load require for cow dung &

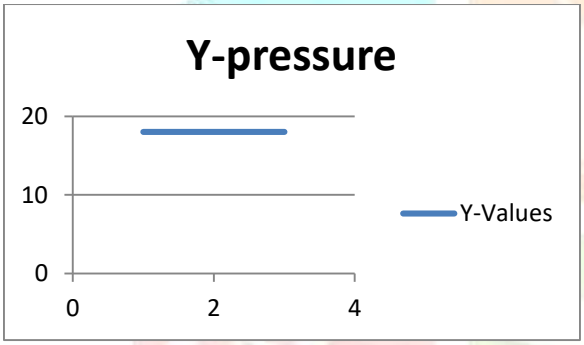
11 KN load require for buffalo dung. After removal of sample from die the briquette gets disintegrated.

As per our experiment we get following readings**,**

Table no. 10 Pressure optimization

Sr. No	Verities of sugarcane leaves	Optimized pressure
1.	VSI 434 co 86032 sugarcane	18 KN
2.	VSI 08005 sugarcane	18 KN
3.	COM 0265 sugarcane	18 KN

All briquettes are formed at 18 KN hence 18 KN is optimum pressure of our briquettes.



Graphical representation of pressure optimization

On X- axis= verities of briquettes given at below

1. VSI 434 co 86032 sugarcane

2. VSI 08005 sugarcane

3. COM 0265 sugarcane

On Y- axis= pressure

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