

Beehive Briquette for maintaining desired microclimate in Goat Shelters during winter

Arvind Kumar^{1*}, U B Chaudhary², Ravindra Kumar³, N Ramachandran⁴
and Mohd. Arif⁵

ICAR-Central Institute for Research on Goats, Makhdoom, Mathura, Uttar Pradesh 281 122

In the absence of proper protection measures goat kids are likely to suffer from pneumonia and other respiratory problems during winter when temperature falls below 10°C. This retards the growth of young goats and mortality rate is increased. Use of gunny bags and thatch panels for covering the goat sheds during winter has not resulted in full protection, especially in newborn kids. Use of artificial heat, using electricity or heavy concrete structure may protect the animals from extreme cold but increases the cost of rearing. Direct burning of biomass emits substantial amount of pollutants including respirable particles and harmful gases, which may cause health hazards to the animals. Beehive briquettes are low cost solution to these problems. Experiments on shed heating with beehive briquettes were conducted at the goat shelters of ICAR-CIRG, Makhdoom during winter months of 2018.

Key words: Beehive briquette, Goat shelter, Microclimate, Winter protection

EXTRÊMELY cold weather condition adversely affects the growth performance of goats especially the young ones. Normally recommended minimum temperature inside shed for 3 months old kids is above 10°C. Accordingly, the climatic zones where the minimum temperature falls below 10°C needs extra care by means of side wall protection of shelters using gunny bags and thatch panels. The gunny bags are stitched and hanged on long side of the shed during mild winters (Fig. 1a). Thatch panels of about 10 cm thick (Fig. 1b) are also used to maintain microclimate above 10°C. During day time, the gunny bags and thatch panels are removed to have

proper ventilation inside shed with proper drying of floors before sunset (Fig. 1c).

Even after the gunny bags and thatch panels, the occurrence of pneumonia and other respiratory problems are being observed in newborn kids and kids of lower birth weight particularly in highly prolific and small sized goat breeds like Black Bengal where the birth weight of kids is even less than 1kg in few multiple birth cases. For such conditions, use of artificial heat using electricity is needed to have warmer microclimate inside kid's enclosure which increases the cost of kid rearing. In rural areas, goat keepers are burning grasses, wood materials etc. which causes

animals to suffocate, if provisions are not present in shelters for escape of smoke. Heavy concrete structures may protect the animals from extreme cold but high cost involvement makes it economically unsuitable for goat shelters. Direct burning of biomass emits harmful gases such as carbon monoxide, nitrogen and sulphur oxide, which may cause health hazards to the animals.

Beehive charcoal briquette has been found to be a solution to above mentioned environmental problems. Briquetting has been practiced for many years in several countries. These briquettes can provide an alternative source of solid fuel, especially in rural areas for warming



Fig. 1. Winter protection measures in goat shelters (a) Gunny bags, (b) Thatch panels, (c) Opening of protection in day time.

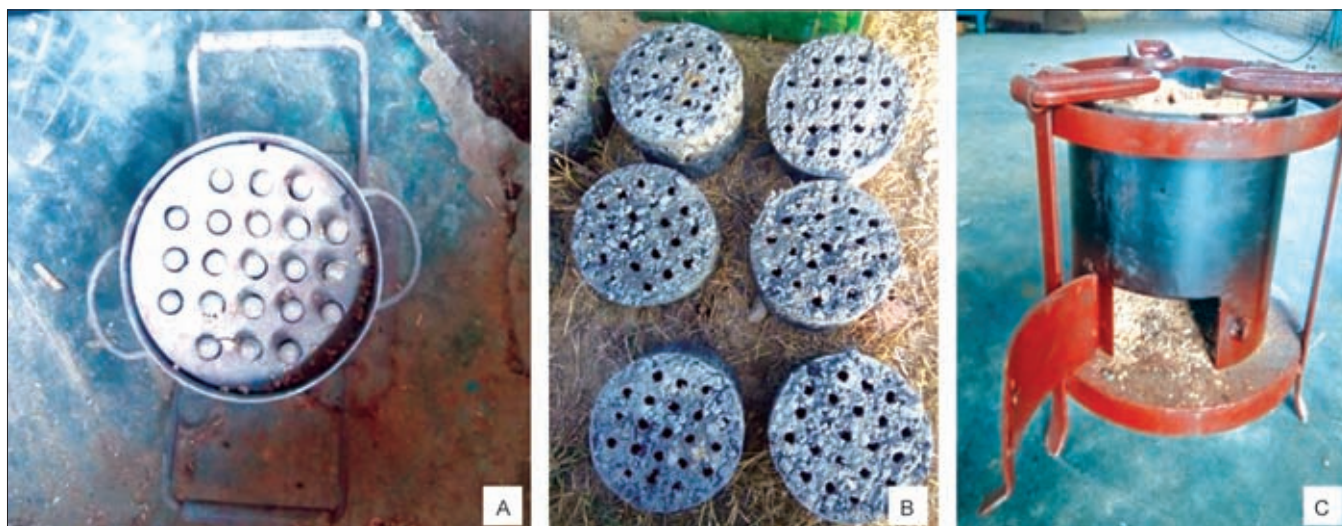


Fig. 2 (a) Briquette mould, (b) Beehive briquettes, (c) Briquette stove.

up houses and animal shelters. These can be burnt clean and therefore are eco-friendly and possess the advantages associated with the direct use of biomass burning. These briquettes are made cylindrical in shape with number of parallel holes which make it look like beehive. Beehive briquettes are made by mixing charcoal powder and mud in a certain proportion. Charcoal can be obtained by controlled burning of locally available biomass. Mud (clay) is used as binding agent for giving the required shape and also used to elongate the burning period. Beehive briquettes are produced by densifying loose charcoal mixed with clay mud in briquetting equipment known as briquette mould (Fig 2a). In general, the ratio of charcoal and mud used for making briquettes is 70:30 by volume. For making the briquette charcoal powder and mud (clay) are mixed together and a little water is added to make the paste soft enough to hold the structure. A standardized beehive briquette mould with overall dimension of 400 mm × 100 mm is used to make the briquettes. It consists of three parts i) cylinder, ii) base plate with 21 rods and iii) cover plate. Cylinder dimension is 145 mm diameter × 85 mm height. Base plate has total 21 rods of 12 mm diameter and 95 mm height welded on it. Cover plate has same number of holes of slightly larger diameter so that it can move through the rods on base plate freely. After putting cover plate and cylinder on base plate, the

charcoal mixture is put into the cylinder and the whole unit is beaten on ground to increase the compaction of the material. Then the cylinder along with cover plate is pulled out of the base plate along with the formed briquette. It is placed upside down on ground and pressed to release the briquette. Thus the dimension of each briquette formed is 145 mm in diameter and 85 mm in height which perfectly fits in the briquette stove (Fig 2c) available in the market. Raw briquettes are allowed to dry in open air as well as in sunlight. These briquettes are easy to store because they are of uniform shape and size. Dried beehive briquettes produce smokeless blue flame with an average burning time of 2 to 2.5 hours.

The fuel density, moisture content,

size and geometry as well as the material properties, all these factors have significant effect on burning rates of biomass. The exact ratio of the raw materials, number of holes and shape and size of the briquette has been standardized by ICAR Research Complex for NEH Region, Meghalaya. These briquettes are commonly used for space heating in NEH region during winter season. The technology has been recognised by NRDC, Ministry of Science and Technology, Government of India and awarded with NRDC National Societal Innovation Award of the Year 2018.

Trials on heating of goat shed by combustion of beehive briquettes were conducted at ICAR-Central Institute for Research on Goats,



Fig. 3. Heating of goat shelter by combustion of beehive briquette.

Table 1. Rise in temperature of the goat shed due to briquette combustion

Time duration	Temperature inside the shed (without briquette combustion) (°C)	Temperature inside the shed (with briquette combustion) (°C)	
		Temp at middle of the shed	Temp at boundary of the shed
11.00 AM	12	12	12
12.00 Noon	12	16	13.6
1.00 PM	13	15.5	14.5
2.00 PM	16	18	17.7

Makhdoom, Mathura (UP) during winter months of 2018. Three briquettes were burnt at equal spacing in the central gallery of goat shed having 10 m length and 7 m width (Fig 3). The rise in temperature at the middle of the shed and at the boundary with burning time is shown in Table 1. The data revealed that the maximum rise of temperature was observed to be 4°C at the middle of the shed 1 hour after burning the briquette. The burning of briquette

lasted for maximum of 2.5 hours.

SUMMARY

Extremely cold weather condition adversely affects the growth performance of goats especially the young ones. The climatic zones where the minimum temperature falls below 10°C needs additional protection by use of gunny bags, thatch panels etc. Even after the gunny bags and thatch panels, the occurrence of pneumonia and other

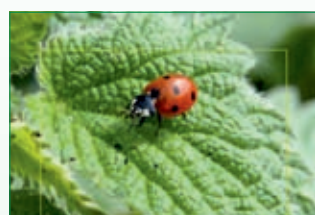
respiratory problems are being observed in newborn kids and kids having lower birth weight particularly in highly prolific and small sized goats. For such conditions, beehive briquette can easily be used for maintaining goat sheds with required microclimate in rural areas at low cost as the biomass is available locally and does not require any costly equipment. Therefore, the goat keepers in rural areas shall use these briquettes to have warmer microclimate for rearing young kids during inclement cold weather conditions.

¹Sr. Scientist, ^{2,3}Principal Scientist, ⁵Scientist, Division of Animal Nutrition, Management and Products Technology, ⁴Sr. Scientist, Division of Animal Physiology and Reproduction. *Corresponding author's e mail: arvindr30@yahoo.com

HANDBOOK OF



To reverse the loss of environmental resources and also to reduce biodiversity loss, the Government of India has Integrated Pest Management (IPM) as part of the National Agricultural Policy. Integrated Pest Management emphasizes the growth of a health crop with the least possible disruption to agro-ecosystems and encourages natural pest control mechanisms. IPM is not new – mechanical, cultural and biological tactics were used by farmers for hundreds of years before chemical pesticides became available. Besides, there are IPM techniques that have been developed more recently and are effective in suppressing pests without adversely affecting the environment.



The task of spreading the message of IPM across is tough due to poor awareness about the subject among people in line-departments as also among the farmers. The information on integrated pest management as a whole is scattered. This *Handbook* comprehensively deals with all the aspects of integrated pest management in field crops, horticultural crops under traditional, protected systems. Information on basic strategies and tactics of different methods of management including mass production of biocontrol agents, IPM policy and pesticide registration is provided in comprehensive form.

The *Handbook of Integrated Pest Management* comprises 82 chapters which are well written in lucid language with crispy sentences by the renowned scientists. The role of IPM is elucidated with different pests like *Trichogramma*, *Bacillus thuringiensis*, *Nomuraea rileyi* etc. and agricultural crops like rice, wheat, maize, sorghum, pearl millet, pulses, soybean, rapeseed mustard, groundnut, minor-oilseed crops, sugarcane, cotton, jute and mesta, potato, vegetable crops, fruits, grapes, citrus, banana, pomegranate, coconut etc. This *Handbook* will provide information of available useful technologies to educate on how to reduce or judiciously use chemical pesticides, safeguard ourselves from chronic poisoning, save the National environment while also reducing input costs and raise farmers' income. This compilation will be useful to teachers, students, trainers, line-department personnel and policy makers.

TECHNICAL SPECIFICATIONS

No. of pages : i-x + 768 • Price : ₹ 1500 • Postage : Rs 100 • ISBN No. : 978-81-7164-179-6

For obtaining copies, please contact:

Business Manager

Directorate of Knowledge Management in Agriculture

Indian Council of Agricultural Research

Krishi Anusandhan Bhavan-I, Pusa, New Delhi 110 012

Tel : 011-25843657, Fax 91-11-25841282; e-mail : bmicar@gmail.com