

A Comparison of Rice Husks and Peanut Shells as Bedding Materials on Dairy Cows' Preferences, Behaviour, and food nutrition Health.

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Abstract: The provision and quality of bedding materials affect the behaviour, welfare, and health of dairy cows. This paper present the experimental study of CDA and RHA as partial replacement of ordinary portland cement in M:15 mix proportional ratio 1:2:4 is used and tested for consistency limit ,setting time, workability of CDA and RHA with ordinary portland cement .cement was replace with CDA and RHA by weight of 5%,10%,15%,20%,25% respectively in concrete. Compressive strength test was carried out on 150x150x150mm³ concrete cube after 7, 14, and 28 days curing. It was observed that optimum content of CDA and RHA is 5% at that content maximum compressive strength is achieved. While workability decreases when increasing % of CDA and RHA in concrete and setting time also increases by increasing replacement in cement.. The total duration of lying down (PS: 699.1 min/d, PRC: 645.6 min/d, RH: 852.5 min/d), the frequency of bouts of lying down (PS: 8.7 bouts/d, PRC: 7.6 bouts/d, RH: 11.1 bouts/d), and the mean duration of lying bouts (PS: 83.5 min/bouts, PRC: 91.8 min/bouts, RH: 81.4 min/bouts) did not differ between treatments. Similarly, no differences in eating or drinking behaviour of dairy cows were observed. In terms of hygiene, cleanliness scores did not differ between the three bedding materials, but udder and flank cleanliness decreased and improved, respectively. In addition, treatments did not affect serum metabolites or productivity of the cows. In summary, daily behaviour, serum metabolites, and productivity of dairy cows were all within the normal range, and no statistical differences occurred between the three bedding materials, although cows showed a preference for rice husk when given access to all three bedding materials at the same time. Finally, the results suggest that bedding comprised of peanut shells and peanut–rice combinations are all suitable for maintaining the health and comfort of dairy cows.

KEYWORDS:- Cement concrete, Compaction factor, Compressive strength, Consistency Cow dung ash, Rice husk ash, Setting time.

1. Introduction

Lying down is essential in the daily activities of dairy cows. The duration of time that cows normally spend lying down is between 8 and 16 h each day [1]. Adequate rest is essential for the health and welfare of dairy cows [2]. When cows are deprived of rest, growth hormone and milk yield are reduced [3]. Duration is not the only factor involved in determining the adequacy of rest; the quality of rest is also important and is influenced by bedding characteristics such as the amount, type, and moisture [1,4,5]. Usually, deep, dry, and clean bedding materials are preferred by cows and can improve the welfare of dairy cows [1,5]. The provision of comfortable bedding can improve the health, welfare, and productivity of dairy cows [6–8]. The most common types of bedding used in free-stall barns are sand, sawdust, wheat straw, and wood shavings [9]. Nevertheless, it is generally accepted that organic bedding material, such as straw, is favoured by cows over nonorganic materials, such as sand, and that cows lie for longer when offered organic material [4,10,11]. The dry period is a crucial stage in the dairy cow lactation cycle that affects both health and performance after calving [12]. Good facilities for cows during their dry period can promote udder health and increase milk yield in the next lactation [13,14]. Cow lying time after parturition may be linked to health status; for example, ketosis is associated with increased lying time [15]. Consequently, it is very important that dairy cows are carefully monitored and that their environment provides sufficient opportunities for good health and welfare [16].

Rice husk has been used as a bedding material in commercial farms [17], although it has only been tested experimentally for lambs and pigs [18–20]. As far as we know, no studies of its suitability for dairy cows have been published, and information on cow preference, health, welfare, and cost would be valuable. In central China, only a small amount of rice is grown, and importation of husks from neighbouring rice-growing regions has a high transportation cost because of its bulk, resulting in a need for alternative bedding materials. Henan grows large quantities of peanuts, with about 1.7 million tons of peanut husks are produced yearly (Henan Academy of Agricultural Sciences Portal; <http://www.hnagri.org.cn/>, accessed on 5 April 2021). The broken peanut shells are dry and soft, characteristics usually favoured by cows for increased comfort [1,5,21]. Peanut shells also have low amounts of bacteria

and moisture, which make them suitable for deep bedding systems [22,23]. Hence, peanut shells provide a potential bedding material for dairy cows in this region.

Scientific studies of dairy cow bedding usually record cow behaviour (e.g., lying, standing, eating and drinking, etc.), body hygiene (particularly of the udder and legs), and health (which may be determined from serum metabolites) [5,15,24]. We explored the characteristics and effects of peanut shells and rice husk in two experiments. In the first, we compared the preference of nonlactating dairy cows for peanut shells, rice husks, or a combination of the two. We examined the physical characteristics of the bedding materials and the influence of ambient weather conditions. In the second experiment, we evaluated the behaviour, cleanliness, serum metabolites, and production of cows provided with the same three bedding treatments.

2. Materials and Methods

CEMENT:- Cement used in the experimental work is ordinary Portland cement (OPC), 43grade with a specific gravity of 3.15 and pass through a 90 µm sieve. **COURSE AGGREGATE:-** Granite after being crushed and passed through 20 mm sieve and retain on 4.75 mm sieve was used as course aggregate for testing purpose, this course aggregate satisfactorily match to the standard specified in IS 383:1970. A. Specific gravity = 2.14 B. Fineness modulus= 5.612 **FINE AGGREGATE:-** Fine aggregate which is used for testing satisfied the required properties of fine aggregate for experimental work the sand conform to zone I as per the IS 383:1970 A. Specific gravity= 2.38 B. Fine modulus= 3.92 **WATER:-** The water used for experimental purpose was obtained from underground source through pump, The water thus obtain was free from any impurities including visible and bacterial. **METHOD USED:-** For the preparation of concrete above material are first batched and then mixed in a proper proportion for M15. **BATCHING AND MIXING OF MATERIAL:-** Batching of material was done by weight the percentage of ordinary Portland cement (OPC) by cow dung ash and rice husk ash were 5%, 10%, 15%, 20%, 25%. We use machine mixer for making concrete. **CONCRETE MIX DESIGN:-** The concrete used in this research work was made using binder, sand, crushed stone (gravel). The concrete mix proportion was 1:2:4 by weight and water-cement ratio 0.55 **CASTING OF SAMPLE:-** Cement, sand, aggregate, and RHA, CDA was mix, placed and compacted in three layers in a mould for size 150mm. The sample were demolded after 24 hour and were kept in a curing tank for 7,14 and 28 days as required, casting was done under a standard temperature or pressure condition in a MITS concrete lab. **RESULT AND DISCUSSION: CONSISTENCY LIMIT:-** Consistency limit test is done to determine the standard water requirement for setting time, the test was done under standard condition as mention in IS: 4031-1988. the cow dung ash and rice husk ash are mixed with cement paste as a percentage of weight of cement. Table show the results for consistency test, test result show that the more water is required to achieve the desired consistency as the percentage of cow dung ash and rice husk ash increase. Fig 4.1 shows the curve of consistency limit.

2.1.2. Preference Test

Developing countries like India, are improving their infrastructure and there is lot of scope in it but there are lot of challenges on their way especially high cost of cement. Consumption of natural raw material by concrete industry is large compared to all other natural raw material like water, sand, gravel and crushed rocks are consumed largely by concrete industry. Out of the total green houses gases emission to the earth atmosphere 7% of it is contributed by global cement industry, due to emissions of poisonous gases like CO₂, NO etc by cement production company they have depleted the natural environment, they have caused environment pollution and global warming due to the depletion of ozone layer. Understanding the seriousness of these problem serious steps should be taken in this regard to replace the cement by waste material like cow dung ash and rice husk ash. Cow dung ash is the undigested residue of plant matter which comes from cows gut. In cow dung nitrogen, calcium, carbon, potassium, and phosphorus have a high content of about 10-15 kg cow dung is produce by a cow in a day, which contain about 28% water in fresh state, 34% of cow dung become ash when it is burned. According to a survey of 2012 there are about 51.2 crore cattle in India. Cow dung is mainly used for cooking food as heat source and also used in biogas plants for making electricity. India is one of the largest rice producing country and the husk generated during milling is mostly used as a fuel in the boiler. milling of husk from rice is generally done by local people of rural area, this husk can be utilized as a heat source for making food and in industries. When we do milling 76% of weight of paddy is received as rice and the rest 24% of the weight of paddy is received as husk. Asia produce about 770 million tons of husk annually, 200 million tonnes of paddy is produce by India, one ton paddy give 700 kg rice and 300 kg

5. Conclusions

According to the results of this experimental study, peanut shells and peanut-rice combinations appear to be suitable bedding materials for dairy cows. Daily behaviour, serum metabolites, and productivity measures of the cows were all within the normal range, and no statistical differences were found between bedding types, although cows showed a preference for rice husk when given access to all three bedding materials. Further research is needed to confirm the long-term effect of these deep bedding materials on dairy cow health, welfare, and production.

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