Research Journal of Chemical and Environmental Sciences
Res J. Chem. Environ. Sci. Vol 6 [2] April 2018: 40-43
Online ISSN 2321-1040
CODEN: RJCEA2 [USA]

Website: www.aelsindia.com/rjces.htm

RJCES

ORIGINAL ARTICLE

Effect of Drying under Shed on Change in Dry matter, Physical traits and labour requirement of an alternate feed: Sugarcane Press Mud

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ABSTRACT
The storage of fresh sugarcane press mud (SPM) is a great challenge due to high moisture content that causes deterioration in a short span. However, dried SPM could reduce this deterioration challenge and would extend storage life. In this study, the effect of drying under roof (shed) was carried out for SPM to prolong its storability as a future feed in the livestock ration. Drying experiment was done by spreading 1″ (T1) and 2″ (T2) thickness under shed and 2 times (M2) and 4 times (M4) mulching were performed under each thickness. Significantly lower value ($p<0.05$) for the days to achieve desirable quality was observed for T1 than T2 group for all the parameters, except odour which showed a non-significant result. Various labour cost (man min.) parameters were significant lower ($P<0.05$) in M2 than M4 for both the thickness and T1 took significantly lower overall mean labour (man min.) than T2 for all the parameters under observation. From the experiment it was clear that the thickness had profound effect drying under shed drying. While different mulching under each thickness were not differed greatly except few parameters. It can be concluded that lower thickness (1″) with less time mulching (2 times/day) can effectively dry the SPM in a short time with less labour requirement.
Key words: Drying, under shed, sugar cane Press mud, Traits, Alternate feed.

Received 01.04.2018 Accepted 09.04.2018

INTRODUCTION

Sugarcane pressmud, a byproduct of sugarcane industry is rich in organic matter [1] and recently is used in the diets of sheep [2], goat [3], pig [4], broiler [5,6] and layer [7] in different percentage in the concentrate mixture. Further, the fresh SPM obtained from sugarcane industry contains high moisture [1,7,8] and it is difficult to store. With an annual production of 30 million tonnes of SPM produced across the globe and around 3.6 million tons in India [9], its storage is a major challenge for livestock keepers.
Dehydration is the oldest and economic way to reduce the moisture level in the feed and keeps it in storage form for a very long period [10]. Water is usually removed by evaporation trough various drying methods *viz.* air drying, sun drying, smoking or wind drying. Drying under sun is the best way to reduce moisture, but in tropical country like India, occurrence of rain is unpredictable. To avoid unnecessary labour cost and other associated problem during rain in sun drying [11], drying under roof (shed) might be a better option. Besides, removal of water from food products depends on not only drying temperature but also thickness [12] and too the number of mulching i.e periodic turning from time to time [13].
Several researches on drying of vegetables and fruits have been reported in literature. However, little or/no information is available on the effect of drying under shed for sugarcane press mud. Therefore, the purpose of this work is to experimentally study the effect of shed drying on change in dry matter, physical traits and labour requirement of sugarcane press mud.

MATERIALS AND METHODS

Fresh sample of SPM was procured from sugarcane factory (JK Sugar meal), Bareilly to Swine Production Farm, IVRI, Izzatnagar. For drying, fresh SPM was spreaded on the dry floor making a unit (bed) measuring 1×1 m^2. In order to study time taken for drying based on the physical properties [(colour,

odour, consistency and fungal growth), dry matter (%) change and labour (man min.)], drying under shed (roof) was carried out. Approximately 9 quintals of fresh SPM was allowed to dry under roof. Further, two thickness, 2″ (T1) and 1″ (T2) beds of 6 units each were maintained under shed drying and the approximate quantity of fresh SPM under T1 remained was 6 quintals and under T2 was 3 quintals. So the fresh SPM for each bed (1×1 m^2) under 2″ thickness was nearly 1 quintal and under 1″ thickness was nearly 0.5 quintal. For quick drying under each thickness 2 times mulching (M2) (8 AM and 5 PM) and 4 times mulching (M4) (8 AM, 11 AM, 2 PM and 5 PM) were done. In each time mulching for a unit bed, the labour in man min. required was recorded by the same person with the help of a stop watch all throughout the experimental period till the DM % achieved 90±2 %. Temperature and relative humidity under shed were also recorded daily as a source of indication of microclimate. Maximum, minimum and mean temperature as well as relative humidity during each day of experiment was recorded. Microclimatic indicators were recorded four times daily i.e. morning (10 am), afternoon (2 pm), evening (5 pm) and night (10 pm) to provide better picture of diurnal conditions. The average maximum & minimum temperature in the experimental period recorded under shed was 30.5°C, 25.1°C, respectively and average Relative humidity (RH%) was 57%. On each day physical parameters *viz.* colour (On visualization with naked eye), odour (smelling by standing close to the bed), consistency (Handful of sample taken & light squeezing and subsequently slow releasing), fungal (presence or absence of white/orange growth on the surface) growth were observed with naked eyes. Each day a ranking was made for various units by taking a 1 to 5 point scale (Table 1) for each parameter under study. Further, daily dry matter percentage (DM%) of each unit (bed) was estimated by taking a representative sample and kept inside the hot air oven maintained at 100±1^{O}C for 12 h. The same parameters were recorded for each unit daily till it achieved a Dry matter (DM) percentage of 90±2 %.

Data generated was analysed using statistical package for the social sciences (SPSS, Chicago, USA) using independent T-test. Treatment means are presented along with standard errors of the mean (SEM) where 't' value was computed and for others only mean value are given in the table 2.

Table 1: Physical Score (1-5 pt. scale) to parameters/traits under sun drying experiment

Score	colour	odour	Consistency	fungal growth
1	Dark brown	Sweetish	Retains Shape with finger imprints	Fresh sample with no growth
2	Medium brown	Light sweetish	Retains Shape without finger imprints	Growth covering more than 60%
3	brown	fermenting	Does not retain shapes but breakes in to larger flakes	Growth covering more than 30-60%
4	Light brown	Light fermenting	Does not retain shapes but breakes in to smaller flakes	Growth covering less than 10-30%
5	Very light brown	No smell	Not at all flakes formatin	Dry sample with no growth (<10%)

Table 2. Mean Days taken to achieve desirable drying traits and labour cost (man minute) involved under shed drying condition.

Under shed drying									
Thickness	Mulching/day	Physical Parameters and DM change					Labour cost in man min.		
		colour	odour	consistency	Fungal growth	90% DM	Total man min.	Man min./day	Man min./qt. drying
1″ (T1)	2 times (M2)	9.33± 0.000	8.00± 0.000	9.33± 0.000	6.00± 0.000	7.67± 0.000	86.66^{b}±1.33	11.33^{b} ±0.33	173.33^{b} ±2.67
	4 times (M4)	8.00± 0.000	8.00± 0.000	8.00± 0.000	5.00± 0.000	7.67± 0.000	179.00^{a} ±9.29	23.33^{a} ±0.33	358.00^{a} ±18.58
	Overall	8.67^{B} ± 0.422	8.00± 0.000	8.67^{B} ± 0.422	5.50^{B} ± 0.342	7.67^{B} ± 0.211	132.83^{B}±21.06	17.33^{B} ±2.69	265.66^{B}±42.14
2″ (T2)	2 times (M2)	9.67± 0.000	9.00± 0.000	10.00± 0.000	8.67± 0.000	10.67± 0.000	355.00^{b} ±4.04	33.33^{b} ±0.88	355.00^{b} ±4.04
	4 times (M4)	10.00± 0.000	8.00± 0.000	10.00± 0.000	8.00± 0.000	10.67± 0.000	658.33^{a} ±30.68	61.66^{a} ±1.20	658.33^{a} ±30.68
	Overall	9.83^{A} ± 0.167	8.50± 0.342	10.00^{A} ± 0.000	8.33^{A} ± 0.333	10.67^{A} ± 0.211	506.66^{A} ±69.22	47.50^{A} ±6.37	506.67^{A} ±69.22

^{ab}Means bearing different superscripts in a column differ significantly ($p<0.05$) within the thickness

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RESULTS AND DISCUSSION

Different parameters viz. physical attributes, DM % change and labour cost (man minute) involved for drying under shed are presented in Table 2. Under shed drying, mean days of 8.00 were required to achieve desirable odour and 7.67 mean days took to achieve 90%DM for both the groups T1M2 and T1M4. For colour and consistency, T1M2 and T1M4 group took 9.33 mean days and 8.00 days, respectively to achieve the desirable trait said above. T2M2 and T2M4 group took mean days 9.67 and 10.00 for colour, 9.00 and 8.00 for odour and 8.67 and 8.00 for fungal growth, respectively, but took the same mean days for consistency (10.00) and 90%DM (10.67). There was no visible fungal/mould growth observed by [14] when CJS feed blocks were kept under covered area for two months. Under shed drying, significantly lower value ($p<0.05$) for the days to achieve the desirable traits was observed for T1 than T2 group for all the parameters viz. colour (8.67±.422 for T1 and 9.83±0.167 for T2), consistency (8.67±.422 for T1 and 10.00±0.00 for T2), fungal growth (5.5±0.342for T1 and 8.33±0.333for T2) and 90%DM (7.67±0.211 for T1 and 10.67±0.211 for T2), except odour which showed a non significant result. The present findings were not in agreement with [15] who reported that colour, odour and consistency were not changed upto a week during the month of March when jaggery filter cake was kept inside the drum. Various labour cost (man min.) parameters were significant ($P<0.05$) between M2 and M4 for both the thickness. T1M4 took significantly ($P<0.05$) higher value for total man min., man min./day and man min./q to dry than T1M2 and the corresponding value were 179.00±9.29, 23.33±0.33, 358.00±18.58 for T1M4 and 86.66±1.33, 11.33±0.33,173.33±2.67 for T1M2, respectively. Likewise under T2, M4 took significantly ($P<0.05$) higher labour cost for different labour cost than M2 group. Total man min. required to dry T2M4 was 658.33±30.68 and for T2M2 was 355.00±4.04, while the value for man min./day, man min./q to dry for T2M4 were 61.66±1.20, 658.33±30.68 and the same corresponding value for T2M2 were 33.33±0.88 and 355.00±4.04, respectively. Under shed drying, T1 took significantly lower ($P<0.05$) labour (man min.) than T2. Overall mean of total man min. required for T1was 132.83±21.06 and for T2 was 506.66±69.22. Significantly ($P<0.05$) higher labour (47.50±6.37 man min./day and 506.67±69.22 man min./q dry) was required in T2 than T1 (17.33±2.69 man min./day and 265.66±42.14 man min./q dry) group. Our findings as thickness affects the rate of drying, also corroborated with the findings of [16] who showed that the drying time decreased with increasing slice thickness of the pumpkin.

CONCLUSION

From the experiment it was clear that the thickness had profound effect on under shed drying. While different mulching under each thickness were not differed greatly except few parameters. It can be concluded that lower thickness (1") with less time mulching (2 times/day) can effectively dry the SPM in a short time with less labour requirement.

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CITE THIS ARTICLE

Subhasish Sahu, B.H.M. Patel, Archana Sarangi and Amit. Effect of Drying under Shed on Change in Dry matter, Physical traits and labour requirement of an alternate feed: Sugarcane Press Mud Res. J. Chem. Env. Sci. Vol 6 [2] April 2018. 40-43