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Sun Drying of Sugarcane Press Mud as a Future Feed for Livestock

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A B S T R A C T

Fresh sugarcane press mud (SPM), an agricultural waste was collected from the sugar mill near Bareilly city for drying for its long term storage as a future feed in the livestock ration. Drying experiment was done by spreading 1″ (T1) and 2″ (T2) thickness under the sun and 2 times (M2) and 4 times (M4) mulching were performed under each thickness. Under sun drying, significant ($P<0.05$) difference was recorded between two times and four times mulching under a particular thickness group for various labour cost (man min.) parameters. Overall mean of labour attributes were significantly higher in T2 than T1 under sun drying. From the experiment it was clear that the thickness had profound effect drying under sun 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.

Introduction

Sugarcane Press Mud (SPM) is one of the byproduct obtained from commercial sugarcane factory. Out of 30 million tonnes of SPM produced per annum across the globe, India produces around 3.6 million tons (FAO, 2011). Generally SPM is used as organic manure for enrichment of soil (Bhosale *et al.*, 2012; Jamil *et al.*, 2008 and Rangaraj *et al.*, 2007). Besides, wax extracted from SPM has several applications in various industries (Bhosale *et al.*, 2012). Further, recent studies have made its inclusion in the diets of sheep (Suresh *et al.*, 2006), goat (Ankita *et al.*, 2015), pig (Sahu *et al.*, 2014), broiler (Budeppa *et al.*, 2009 and Suresh *et al.*, 2012) and layer (Suma *et al.*, 2007) in different percentage in the concentrate mixture which proves it as an alternative feed ingredient in the livestock ration. Further, the fresh SPM obtained from sugarcane industry contains high moisture (Sahu *et al.*, 2016; Bhosale *et al.*, 2012; Suma *et al.*, 2007) and it is difficult to store. Therefore its drying is utmost important for its long term storage for incorporation in the ration of livestock. Since there is no work has been done on drying of SPM earlier, an attempt has been made to dry the SPM in field condition for its future use.

Materials and Methods

Fresh sample of SPM was procured from sugarcane factory (JK Sugar meal), Bareilly to IVRI, Izzatnagar. For drying experiment, fresh SPM was spread 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.)], sun drying was carried out. Approximately 9 quintals of fresh SPM was allowed to dry under sun. Further, two thickness, 2″ (T1) and 1″ (T2) beds of 6 units each were maintained under sun 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 sun 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 sunlight was 38.71°C and 16.07°C and average Relative humidity (RH%) was 55%. 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 and 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) under two treatments was estimated by taking a representative sample and kept inside the hot air oven maintained at 100±1oC 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.

Results and Discussion

Drying experiment for SPM revealed that there was no variation among the units under each mulching and between mulching (M2 and M4) for both the thickness (T1 and T2) for various parameters except the mean days taken to achieve the 90% DM, in sun drying case. It was observed that under sun drying (Table 2), M2 group under 1" thickness (T1M2) achieved the same mean days as like M4 group (T1M4) for parameters viz. odour (5.00) and fungal growth (3.00), but took an extra mean day for colour and consistency (5.00 mean days for 2 times and 4.00 mean days for 4 times mulching) to achieve the desirable traits. To achieve 90% DM, 4.00 mean days were taken by the T1M2 group while T1M4 took mean days of 3.33. Significant difference ($p<0.05$) of mean days to achieve 90% DM was observed between T1 (3.67±0.211) and T2 (5.17±0.167), besides colour and consistency (Table 2) parameters.

The 't' values could not be computed for rest parameters, viz. odour and fungal growth because of uniformity in the data, but clearly indicated that T1 took less mean days (5.00 for odour and 3.00 for fungal growth) than T2 (7.00 for odour and 4.00 for fungal growth). Significant (P<0.05) difference was recorded between two times and four times mulching under a particular thickness group for various labour cost (man min.) parameters. Total man min. required to dry T1M2 was 44.00±2.31 which was significantly lower than T1M4 which took 75.33±12.45 man min. Similarly man min./day and man min./q to dry were 11.00±0.57, 88.00±4.61 for T1M2 and 22.33±1.45, 150.67±18.02 for T1M4 group, respectively and the corresponding value were significantly lower (P<0.05) in T1M2 as compared to T1M4. When overall mean between two thickness were compared, significantly higher (P<0.05) labour cost (man min.) was involved in 2" thickness as compared to 1" thickness group for all the labour parameters. Total man min. for T1 and T2 were 59.67±9.01 and 245.33±32.32 respectively, while the other parameters viz. Man min./day and man min./q dry were 16.66±2.63, 119.44±44.14 for T1 and 48.00±6.89, 245.33±32.32 for T2 respectively. All values were significantly higher in T2 than T1 under sun drying. Patoo *et al.*, (2011) reported that for drying concentrate jaggery scum (CJS) feed blocks of various shapes under sun shine required 5 to 8 days. Similarly, both T2M2 and T2M4 group revealed no difference in the mean days to achieve desirable parameters (Table 2) except for the time to achieve 90% DM, where 5.33 and 5.00 mean days were taken by 2 times mulching and 4 times mulching group, respectively. The present findings corroborated with the results of Salem and Nefzaoui (2003) who reported that feed blocks must be turned time to time to accelerate drying process. The present findings were not in agreement with Patel *et al.*, (2009) 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.

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 breaks in to larger flakes	Growth covering more than 30-60%
4	Light brown	Light fermenting	Does not retain shapes but breaks in to smaller flakes	Growth covering less than 10-30%
5	Very light brown	No smell	Not at all flakes formation	Dry sample with no growth (<10%)

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

Sun 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)	5.00± 0.000	5.00± 0.000	5.00± 0.000	3.00± 0.000	4.00± 0.000	44.00 ^{b}± 2.31	11.00 ^{b}± 0.57	88.00 ^{b}± 4.61
	4 times (M4)	4.00± 0.000	5.00± 0.000	4.00± 0.000	3.00± 0.000	3.33± 0.000	75.33 ^{a}± 12.45	22.33^{a}± 1.45	150.67 ^{a}± 18.02
	Overall	4.50 ^{B} ± 0.224	5.0± 0.000	4.5 ^{B} ±0.224	3.00± 0.000	3.67 ^{B} ± 0.211	59.67 ^{B} ± 9.01	16.66 ^{B} ±2.63	119.33 ^{B} ± 44.14
2″ (T2)	2 times (M2)	5.00± 0.000	7.00± 0.000	5.00± 0.000	4.00± 0.000	5.33± 0.000	174.00 ^{b}±10.63	32.66 ^{b} ±1.20	174.00 ^{b}± 10.69
	4 times (M4)	5.00± 0.000	7.00± 0.000	5.00± 0.000	4.00± 0.000	5.00± 0.000	316.66 ^{a}±4.41	63.33 ^{a} ±0.88	316.66^{a}± 4.41
	Overall	5.00 ^{A} ± 0.000	7.0± 0.000	5.0 ^{A} ±0.000	4.00± 0.000	5.17 ^{A} ± 0.167	245.33 ^{A} ±32.32	48.00 ^{A} ±6.89	245.33 ^{A} ± 32.32

^{ab} Means bearing different superscripts in a column differ significantly ($p<0.05$) within the thickness
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From the experiment it was clear that the thickness had profound effect under sun 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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