

## A NOTE ON PRESERVATION OF WET BREWERS GRAINS

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It has often been observed in this Institute that, due to putrefaction, intake of wet brewers grains (WBG) by lactating cows is reduced with storage of the WBG in uncovered piles in the open. For example, intake of a concentrate comprising 60% WBG (initially 6.23 kg DM/d) was reduced by 0.13 kg DM/d for each day of storage ( $P < 0.01$ ,  $n = 32$ ). However, due to transportation problems, the WBG must be stored for up to 2 weeks. The following experiments were undertaken to examine various additives to avoid spoilage.

In Experiment 1, salt was either mixed with or sprinkled over three 20 kg batches of WBG, while in Experiment 2 NaOH was dissolved in 700 ml water and this solution mixed with 15 kg batches of WBG. The treated WBG samples were stored in the open in compartments 20 cm deep made from concrete blocks. Results for pH for various storage times are given in Table 1, and show that although pH was initially low (pH 4.3), presumably due to fermentation, acidic conditions and therefore good preservation were not maintained by the addition of salt. Ammonia concentration also increased from 0.2 g N/kg DM to a range from 6.4 - 9.5 g N/kg DM, indicating protein degradation during fermentation. Preservation was also unsatisfactory with NaOH addition.

In Experiments 3 and 4, duplicate 200 g samples of WBG were mixed with 50 ml solutions water with salt, NaOH,  $H_2SO_4$  or organic acids (a 1:1 mixture of propionic and formic acids) and compacted into 300 ml glass jars. The results obtained from the samples treated with salt and NaOH when the jars were not sealed (Experiment 3) were similar to those results from Experiments 1 and 2. Salt treatment was ineffective in preventing an increase in pH. The 4% and 6% NaOH treatments resulted in a high pH initially but this was not maintained. The absence of effective preservation was also seen in spoilage of WBG after 7 or 14 d, with an unpleasant odour and the frequent presence of fly maggots. Treatment with either inorganic acid ( $H_2SO_4$ ) or organic acid was effective for 14 days, although a 2% level of organic acid was required suggesting that organic acid was less effective than  $H_2SO_4$ .

In temperate climates salt is an effective preservative, but in our experience it is not satisfactory in a humid tropical climate. The results of Experiment 4 indicate that if anaerobic conditions can be maintained, no preservatives are necessary, but this is difficult in commercial practice without specialized storage facilities. The effective preservation when low pH was maintained with acid treatment is in agreement with other studies (Allen et al 1975) where 1.2% of DM of organic acid (propionic and formic acids) was effective.

Table 1:

Effect of preservation treatment on the pH of wet brewers grains for different storage times

Concentration of preservative (DM basis)		Storage time			
		0 days	4 days	7 days	
Expt 1	Control		4.3	5.3	7.3
	Salt (sprinkled) 1.5%		4.3	5.2	7.3
	Salt (sprinkled) 3.0%		4.3	4.8	6.4
	Salt (sprinkled) 4.5%		4.3	4.7	6.6
	Salt (mixed) 1.5%		4.3	4.8	6.8
	Salt (mixed) 3.0%		4.3	4.6	6.5
	Salt (mixed) 4.5%		4.3	4.9	6.6
Expt 2	Control		-	-	8.0
	NaOH 2.5%		-	-	8.7
	NaOH 5.0%		-	-	8.6
	NaOH 7.5%		-	-	8.7
			0 days	7 days	14 days
Expt 3	Control		4.1	4.0	6.8
	Salt 2.0%		3.9	5.4	6.9
	Salt 4.0%		3.9	5.4	6.5
	Salt 6.0%		4.1	6.0	7.0
	NaOH 2.0%		7.3	6.2	8.4
	NaOH 4.0%		11.2	7.3	7.5
	NaOH 6.0%		11.5	9.6	8.2
	H <sub>2</sub> SO <sub>4</sub> 2.0%		2.3	2.4	3.3
	H <sub>2</sub> SO <sub>4</sub> 4.0%		1.9	1.9	1.9
	H <sub>2</sub> SO <sub>4</sub> 6.0%		1.6	1.7	1.8
Expt 4	Control with cap		5.2	4.4	4.0
	without cap		5.2	4.6	6.3
	Organic acid (1%) with cap		4.4	3.7	3.6
	without cap		4.4	5.1	6.9
	Organic acid (2%) with cap		4.4	3.7	3.4
	without cap		4.4	3.6	5.0

## References

- Allen W R, Stevenson K R & Buchan-Smith J 1975 Influence of additives on short-term preservation of wet brewers grain stored in uncovered piles Canadian Journal of Animal Science 55: 609-618

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