COMPARING THE BUILT DETERGENT AND MOLD ENZYME IN REMOVING MILK SOIL FROM MINIATURE DAIRY EQUIPMENT

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ABSTRACT
A detergent built from sodium salts and an enzyme extracted from A. flavus TDM 4 were separately used to clean milk soil from miniature dairy equipment such as milk can and cheese vat. Both the built detergent and the mold enzyme were used at 0.5 to 2% concentration to remove soil from the equipment. More soil was removed at the higher concentration of built detergent or mold enzyme. Increasing the concentration of washing solution with simultaneous increase in its temperature resulted in more effective removal of soil and showed high significance at 1% level. However, a higher concentration of enzyme was required to get a comparable results with a lower detergent concentration.

INTRODUCTION
Cleaning is an important routine that is followed at the end of each processing operation in any dairy plant to maintain hygienic conditions for the transformation of milk into safe and wholesome milk products. The soils in the dairy industry generally consist of proteins, fats, minerals, carbohydrates and these need to be dislodged from the milk contact surfaces.

The synthetic detergents contain a mixture of caustic soda, chelating agents and surfactants, and these chemical cleaning agents are non-biodegradable, toxic to sewage microflora and increase the BOD levels (Margunova, 1983; Perlat et al., 1986; Grasshoff, 1988; Graz and McComb, 1999). The satisfactory removal of protein deposits from the heating section of the U.H.T sterilizer using acid followed by alkali.

Now there is a big demand for biodegradable or environment friendly detergents containing enzymes like proteinases, lipases etc. Enzymes are proteins mostly obtained from microorganisms eg. Bacillus licheniformis, Bacillus subtilis They are action specific and easily degradable by the normal flora of sewage once they are in the effluent (Coolbear et al., 1992; Phadatare et al., 1993).

Grouped as ‘Green chemicals’ these enzyme based detergents are becoming an ideal choice for the dairy processor. These enzyme based detergents have been found to be very effective as cleaning can take place not only in lukewarm condition but also at a slight higher temperature upto 60°C or so. These detergents are more energy efficient, active and stable in the presence of phosphates, silicates, perborates etc., highly soluble, have good shelf life and better affinity towards proteinaceous soil (Bhosle et al., 1995).

MATERIAL AND METHODS
Miniature SS cans of 2.5 litres capacity and cheese vats of 6 litres capacity were soiled with whole raw milk containing 3.5% fat and 8.5% SNF and then dried at 37°C for 24h. All the cleaning procedures involved first pre-rinsing with tap water, washing with wash solution, made up of different concentrations using 0.5, 1.0, 1.5 and 2.0% of built detergent and of enzyme solutions at 30, 40, 50 and 60°C and finally rinsing with tap water. The built detergent comprised of sodium carbonate-30%; sodium lauryl sulphate-5%; sodium tripolyphosphate-30%; and sodium metasilicate-35%; was used. Enzyme extracted from A. flavus TDM 4 was dissolved in water to get its different concentrations and cleaning was carried as for
built detergent. Percentage soil removal from the cans and cheese vats were calculated using the following formula.
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\text{% Soil removed} = \frac{\text{Soil removed} \times 100}{\text{Soil deposited}}
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**Statistical analysis:** Regression analysis was carried out to explain the efficiency of soil removal by built detergent and mold enzyme (Johnston, 1988).

**RESULTS AND DISCUSSION**
Removal of milk soil by using built detergent Wide variation in the quantum of cleaning was observed using 0.5% to 2% of built detergent at different temperatures levels. It may be is noted from Table 1 that the soil removal was 80% at 30°C and 85% at 60°C when 0.5% built detergent was used for the cleaning. The increase in the strength of built detergent upto 2% further improved the removal of soil during the cleaning process. As temperature of the built detergent was increased from 30°C to 60°C, noticeable improvement in the removal of soil was observed. According to regression analysis for every one degree increase in temperature of detergent solution, 0.14% increase in soil removal was noticed and for every 1% increase in the detergent used, the soil removal was increased by 10.04%. and the values obtained were highly significant at 1%. Grasshoff (1988) used weak solution of sodium hydroxide (0.25-0.5%) supplemented with commercial cleaning agents composed of water softening agents and surfactants to effectively remove the encrusted milk deposits from hot plates. An effective alkaline detergent comprising of Sodium hydroxide-7.5g; EDTA-1.5g and labolene-1ml (pH-10.5) for cleaning of the glass plates has been formulated by Sony (2002).

**Removal of soil by using mold enzyme:**
Cleaning of the SS cylinders was carried out using 0.5, 1, 1.5 and 2% mold enzyme maintained at different temperatures ranging from 30°- 60°C and The per cent soil removed from SS cylinders with 0.5% mold enzyme solution was 74.0 at 30°C and 79.3 at 60°C respectively (Table 2). A marginal increase in the per cent removal of milk soil was noticed with the increase in temperature of cleaning process. The soil removal of 80.3% at 30°C and 84.3% at 60°C with 1% of mold enzyme. The per cent soil removal was 84.5, 86.8, 87.9 and 88.6 at temperature levels of 30°, 40°, 50° and 60°C with 1.5% of enzyme solution respectively. Similarly, 2% of enzyme solution maintained at different temperature levels affected more cleaning of the soiled SS cylinders, the per cent removal of milk soil ranged from 91.0-93.9 and it increased with as temperature. Statistical analysis revealed, 0.13% increase in soil removal per degree increase in the temperature of mold enzyme solution. According to regression analysis for every one
degree increase in temperature of detergent solution, 0.13% increase in soil removal was noticed and every 1% increase in the per cent of detergent used, the soil removal was increased by 10.47% and the values obtained are highly significant at 1%. The regression equation explained over 93% of the variable in the dependent variable.

**CONCLUSION**

The built detergent can be used to remove soil to maximum extent compared to mold enzyme. But built detergent cannot be degraded by the sewage microflora whereas the mold enzyme can be easily degraded by the microflora and hence has the added advantage.

**REFERENCES**
