INTRODUCTION
1. INTRODUCTION

Palm oil processing is carried out using large quantities of water in mills where oil is extracted from the palm fruits. During the extraction of crude palm oil from the fresh fruits, about 50% of the water results in Palm Oil Mill Effluent (POME). It is estimated that for 1 tonne of crude palm oil produced, 5 - 7.5 tonnes of water ends up as POME (Ahmad et al., 2003). Waste and / or by-product utilization will not only cut down the cultivation cost but also will take care of the environmental issues (Cheah et al., 1988). According to Malaysian Palm Oil Board (MPOB), 0.65 m³ POME is generated from every processed tonne of Fresh Fruit Bunch based on the figure of 59,800,000 tonnes of Fresh Fruit Bunches processed, resulting in an annual effluent generation of 38,870,000 m³.

Byproduct and waste utilization is one of the most important aspects for oil palm industry. This can provide considerable amount of remuneration to the industry at the same time cost of disposal of waste is reduced. Share of this income flows in turn to the farmers. Schemes are currently available for utilization, bioconversion and other processes for the production of fuels, food, feed and fertilizer (Webb et al., 1975 and Ma et al., 1988). By the above schemes it is possible to achieve near zero waste/ discharge (Wood, 1977). POME is a colloidal suspension of 95-96 % water, 0.6 - 0.7 % oil and 4-5 % total solids including 24 % suspended solids (Ma et al., 1994).

The raw or partially treated POME has an extremely high content of degradable organic matter, which is due in part to the presence of unrecovered Palm oil. In order to regulate the discharge of effluent from the crude palm oil industry as well as to exercise other environmental controls, the Environmental quality Act, (Order, 1977) and the environmental Quality Regulations, 1977, were promulgated under the environmental
Quality act, 1974. The characteristics of POME and its respective standard discharge limit by the Malaysian Department of the Environment is given in Table 1.1 (Hanif, 1994).

Due to these factors, the palm oil industry faces the challenge of balancing the environmental protection, its economic viability and sustainable development. Several innovative treatment technologies have been developed and applied by palm oil mills to treat POME; conventional biological treatments of anaerobic or facultative digestion are the most commonly used (Quah et al., 1982). However, this biological treatment system needs proper maintenance and monitoring, as the processes rely solely on microorganisms to breakdown the pollutants. Another treatment process that can treat POME as well as recover the water is the evaporation process (Ma, 2000). By using POME containing 3 - 4 % total solids as feed, about 85 % of the water in the POME can be recovered as distillate.

In India, there is shortage of energy and protein rich feeds. To bridge the gap between availability & shortage there is a need to explore economical and alternative feed resources available locally at farmer’s level. Among several agro-industrial by-products available, Palm Oil Mill Effluent is one of the important by-product available from palm oil processing industry. Usually, the mills simply employ an open pond for anaerobic treatment to handle the POME.

Palm oil sludge is the material that remains after decanting the palm oil mill effluent (Devendra et al., 1981). The suspended solid material in POME recovered through decanter process which is available in huge quantities at the mills forms a potential source for feeding of live stock viz., buffaloes, sheep, goats and pigs. Research work was carried out on different aspects of POME, which include the basic constituents of it; different treatment methods for making it usable and its use as feed have been presented in this work. The effective use of palm oil sludge as animal feed will be of economic significance, especially in view of its availability in huge quantities at processing plants and at the same time will reduce pollution.
Table 1.1: Characteristics of Palm Oil Mill Effluent

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Concentration, mg/L</th>
<th>Standard limit, mg/L</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>4.7</td>
<td>5-9</td>
</tr>
<tr>
<td>Temperature</td>
<td>80 - 90</td>
<td>45</td>
</tr>
<tr>
<td>Oil and grease</td>
<td>4,000</td>
<td>50</td>
</tr>
<tr>
<td>BOD</td>
<td>25,000</td>
<td>100</td>
</tr>
<tr>
<td>COD</td>
<td>50,000</td>
<td>—</td>
</tr>
<tr>
<td>Total solids</td>
<td>40,500</td>
<td>—</td>
</tr>
<tr>
<td>Total volatile solids</td>
<td>34,000</td>
<td>—</td>
</tr>
<tr>
<td>Suspended solids</td>
<td>18,000</td>
<td>400</td>
</tr>
<tr>
<td>Total nitrogen</td>
<td>750</td>
<td>150</td>
</tr>
</tbody>
</table>

In the present study an attempt was made to carry out the analysis and efforts were made to explore the possibilities of utilization of Palm Oil Mill Effluent (POME) as one of the feed ingredients in the diets of different species of livestock with the following objectives.

1. To determine the chemical composition of POME.

2. To evaluate the livestock feeds containing POME on the performance of sheep and buffaloes in terms of growth and milk production, respectively.

3. To determine the lipid profile, lipase activity and fatty acid composition in lambs fed diets containing POME.

4. To determine the lipid profile and lipase activity in lactating buffaloes.