

**IN VITRO STUDIES ON THE  
SUPPLEMENTATION OF PROTECTED OIL  
IN RUMINANT DIET**



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**CERTIFICATE**

This is to certify that the thesis entitled “*IN VITRO STUDIES ON THE SUPPLEMENTATION OF PROTECTED OIL IN RUMINANT DIET*” submitted in partial fulfillment of the requirements for the degree of *Master of Veterinary Science* to the **Tamil Nadu Veterinary and Animal Sciences University, Chennai** is a record of bonafide research work carried out by **THIRU C.SUGUMAR**, under my supervision and guidance and that no part of this thesis had been submitted for the award of any degree, diploma, fellowship or other similar titles or prizes and that the work has not been published in part or full in any scientific or popular journal or magazine.

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## ABSTRACT

TITLE : *IN VITRO* STUDIES ON THE SUPPLEMENTATION OF  
PROTECTED OIL IN RUMINANT DIET

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The sunflower acid oil was found to contain 0.74, 0.28, 0.21 and 98.77 per cent of moisture, crude protein, total ash and ether extract, respectively. The acid value, Saponification number, peroxide value and unsaponifiable matters were 94.18mg KOH/g, 186.32, 8.74 meq.oxygen/kg and 8.36 per cent, respectively.

A study was undertaken to evaluate protection of sunflower acid oil by various methods such as aldehyde treated protein encapsulated oil, calcium soaps of sunflower acid oil and Fatty acyl amides of sunflower acid oil.

Calcium soaps of sunflower acid oil was found, through evaluation in thin layer chromatography, to offer effective protection than other methods of protection.

The yield of calcium soaps of sunflower acid oil was 85.60 per cent and it was analyzed to contain 96.18, 12.70, 87.25 and 7.34 per cent dry matter, total ash, ether extract and calcium, respectively.

Effect of protected and unprotected sunflower acid oil on rumen fermentation was assessed, by supplementing sunflower acid oil at 2.50, 5.00

and 7.50 per cent and calcium soaps of sunflower acid oil at 2.50, 5.00, 7.50 and 10.00 per cent to a complete ration having 15.00 percent crude protein and 65.00 percent total digestible nutrients, using RUSITEC.

There was no significant difference in rumen pH and ammonia nitrogen concentration among the sunflower acid oil or calcium soaps of sunflower acid oil supplemented ration or control. Sunflower acid oil supplementation at 5.00 percent and beyond significantly ( $P < 0.05$ ) reduced gas production, total volatile fatty acids, acetate and butyrate production. But acetate to propionate ratio and microbial protein synthesis significantly ( $P < 0.05$ ) increased. However, no significant difference in gas production, total volatile fatty acids, acetate, propionate, butyrate, acetate to propionate ratio and microbial protein synthesis was observed in calcium soaps of sunflower acid oil supplemented rations.

A significant ( $P < 0.05$ ) decrease in *in vitro* dry matter, neutral detergent fibre, acid detergent fibre and hemicellulose degradability was noticed in ration supplemented with 5.00 or 7.50 per cent unprotected sunflower acid oil compared to control. A highly significant ( $P < 0.01$ ) reduction in crude fibre and cellulose degradability was observed in ration supplemented with 5.00 or 7.50 per cent unprotected sunflower acid oil. However, there was no significant change in the degradability of crude fibre and cell wall contents in calcium soaps of sunflower acid oil supplemented rations.

Thus it was concluded that calcium soaps of sunflower acid oil can be included up to 10 per cent of complete ration or sunflower acid oil up to 2.50 per cent, without affecting rumen fermentation and fibre degradability based on laboratory evaluation studies. However, *in vivo* studies are recommended to confirm the inclusion level of calcium soaps form of sunflower acid oil in the complete rations of high yielding dairy cows.

**Keyword:** Sunflower acid oil, calcium soaps, RUSITEC, fatty acyl amides, thin layer chromatography, free fatty acids, protection of fat.