

## Effect of formaldehyde treated soybean meal at different incubation periods on *in vitro* digestibility and volatile fatty acids

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### ● ABSTRACT ●

An experiment was conducted to study the effect of formaldehyde treated soybean meal at different incubation periods on *in vitro* dry matter digestibility and total volatile fatty acids at Department of Animal Husbandry and Dairying, Nagpur during 2008-2009. The IVDMD values of soybean meal was significantly affected due to combination of HCHO treatment and incubation periods. Treatment means decreased with increasing level of HCHO. Whereas incubation mean increased with increasing level of incubation period. The TVFA values of soybean meal were significantly affected due to combination of HCHO treatment and incubation period. Result showed that TVFA of soybean meal decreased with increasing level of formaldehyde treatment.

**KEY WORDS :** Incubation period, Formaldehyde, Protein, Soybean meal

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### ● INTRODUCTION ●

Protein contents of ration are the important nutritional consideration for feeding animals. Protein supplements are more expensive ingredients in ruminant ration. Protection of natural proteins of high biological value from degradation in the rumen seems to have great potential in ruminant nutrition for better growth and production (Malik and Chopra, 1978, Tiwari and Yadav, 1989). Formaldehyde treatment has been found to be an efficient and comparatively cheaper method to protect highly degradable protein sources (Ramchandra and Sampath, 1995). Formaldehyde treatment at different incubation periods to soybean meal offers a possible means of protecting the protein from degradation by rumen microorganisms and decreases pH level. Hence, the present study was undertaken to assess the protection of *in vitro* dry matter digestibility and total volatile fatty acids by different levels of formaldehyde treatment at different incubation periods.

### ● MATERIALS AND METHODS ●

The soybean meal was treated with formaldehyde (37%) solution at 0.0 (untreated), 1.0 (T<sub>2</sub>), 1.5 (T<sub>3</sub>), 2.0 (T<sub>4</sub>) and 2.5 (T<sub>5</sub>) % per 100 gm cp. The crude protein content of soybean meal was 46%. Hence, amount of formaldehyde solution required was 0.0, 12.42, 18.60, 24.84 and 31.04 ml, respectively. The volume of the solution was made to 40 ml with water and formaline solution was sprayed over the samples and mixed immediately. There after, these samples were sealed airtight in polythene bags and kept for 7 days for proper reaction of formaldehyde with proteins. After 7 days, the polythene bags were opened and dried the sample at 75°C for 24 hrs. The treated samples were ground finely after drying. These samples were used for further analysis.

The well mixed samples of rumen liquor were drawn from different parts of rumen of two male animals by suction. This strained rumen liquor (SRL) was used for *in vitro* study. The samples were incubated in *in vitro* tubes at 39°C with strained rumen liquor and mc dougall's buffer solution for 4, 8, 12 and 18 hours.

The *in vitro* protein degradation technique recommended by Lohan and Gupta (1990) was followed. The data were arranged in Factorial Completely Randomized Design (FCRD) and analyzed by standard statistical method as per Snedecor and Cochran (1989).

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## ● RESULTS AND DISCUSSION ●

The results obtained from the present investigation are summarized under following heads :

### ***In vitro* dry matter digestibility (IVDMD):**

The IVDMD of soybean meal as affected by different formaldehyde treatments (%) and at different incubation periods (h) in combination are given in Table 1.

Treatments	Incubation period (hrs)				Treatment mean
	I <sub>1</sub>	I <sub>2</sub>	I <sub>3</sub>	I <sub>4</sub>	
T <sub>1</sub>	44.24	54.12	65.66	67.98	58.00
T <sub>2</sub>	40.43	48.48	55.24	58.64	50.69
T <sub>3</sub>	37.76	45.37	48.43	51.28	45.71
T <sub>4</sub>	35.60	41.95	46.06	46.71	42.58
T <sub>5</sub>	33.55	39.76	43.24	44.35	40.22

The IVDMD value of soybean meal was significantly ( $P<0.05$ ) affected due to the effect of HCHO treatment. The soybean meal treated with HCHO at different levels showed significant reduction in treatment T<sub>2</sub>, T<sub>3</sub>, T<sub>4</sub> and T<sub>5</sub> as compared to T<sub>1</sub>. The highest values were obtained in T<sub>1</sub> (44.24, 54.12, 65.66 and 67.98%) where as lowest values were observed in T<sub>5</sub> (33.55, 39.76, 43.24 and 44.35%). These results were found to be significant. Treatment mean was found decreased with increasing level of HCHO treatment.

The IVDMD values of soybean meal was significantly ( $P<0.05$ ) affected due to the effect of incubation period. The soybean meal incubated in rumen content showed increasing in I<sub>1</sub>, I<sub>2</sub>, I<sub>3</sub> and I<sub>4</sub> the highest values were found in I<sub>4</sub> (67.98, 58.64, 51.25, 46.71 and 44.35%). Where as lowest values were found in I<sub>1</sub> (44.24, 40.43, 37.76, 35.60 and 33.35%). The result was found to be significant.

The combined effect of HCHO treatment and incubation periods had significant effect on IVDMD ( $P<0.05$ ). The higher IVDMD value (67.98%) was noticed in T<sub>1</sub>, I<sub>4</sub> and lowest IVDMD value (33.55%) was noticed in T<sub>5</sub>, I<sub>1</sub>. The IVDMD value of soybean meal was affected significantly ( $P<0.05$ ) due to associative effect of HCHO treatment and incubation period. This may be due to non-availability of N to the microbes in the formaldehyde treatment.

Sampath and Sivraman (1987) noticed that due to HCHO treatment, the dry matter disappearance of groundnut cake was reduced by 26, 25 and 5%,

respectively during 24 hrs. of incubation in rumen.

Chatterjee and Walli (2003b) also noticed effective DM degradability ranging from 77 to 40% by increasing the level of HCHO solution.

### **Total volatile fatty acids (TVFA):**

The results in Table 2 show that the TVFA value of soybean meal was significantly ( $P<0.05$ ) affected due to the effect of HCHO treatment. Concentration of treatment decreased significantly as the level of HCHO increased from T<sub>1</sub> to T<sub>5</sub> (21.82, 13.87, 11.64, 9.61 and 7.87 meq/l). The highest value was noticed in T<sub>1</sub> (54.47 meq/l) where as lowest value was noticed in T<sub>5</sub> (7.87 meq/l). The results were found to be significant.

Treatments	Incubation period (hrs)				Treatment mean
	I <sub>1</sub>	I <sub>2</sub>	I <sub>3</sub>	I <sub>4</sub>	
T <sub>1</sub>	21.82	32.22	37.45	54.47	36.49
T <sub>2</sub>	13.87	25.17	29.43	47.34	28.95
T <sub>3</sub>	11.64	22.32	24.67	40.99	24.90
T <sub>4</sub>	9.61	20.15	22.54	38.20	22.62
T <sub>5</sub>	7.87	18.62	18.98	36.20	20.41

The TVFA of soybean meal was significantly affected due to the effect of incubation periods and the values increased as the incubation rate increased (T<sub>1</sub> I<sub>1</sub>) 21.82, (T<sub>1</sub> I<sub>2</sub>) 32.22, (T<sub>1</sub> I<sub>3</sub>) 37.45 and (T<sub>1</sub> I<sub>4</sub>) 54.47 meq/l). The highest value was found in I<sub>4</sub> (54.47, 47.34, 40.99, 38.20, 36.20) and the result was found to be significant. The value in incubation period T<sub>5</sub> I<sub>3</sub> (18.98 meq/lit) was found to be non significant to T<sub>5</sub> I<sub>2</sub> (18.62 meq/lit).

The combined effect of HCHO treatment and incubation periods had significant effect on TVFA ( $P<0.05$ ). The TVFA values of soybean meal was affected significantly ( $P<0.005$ ) due to associative effect of HCHO treatment and Incubation period. Significantly low concentration of TVFA in samples containing HCHO treated soybean meal at all hours of incubation appeared to be due to protective action of these treatments. Similar result was noticed by Singh *et al.* (1977) who observed that HCHO treated groundnut cake when incubated with rumen content, results in increased rate of TVFA production with increased period of incubation. They also observed that HCHO treatment was most effective.

Mehta and Srivastava (1997) observed that formaldehyde treatment significantly reduced the TVFA concentration in the incubation media due to the protection of starch. A significant increase in TVFA concentration

was observed with increase in incubation period.

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