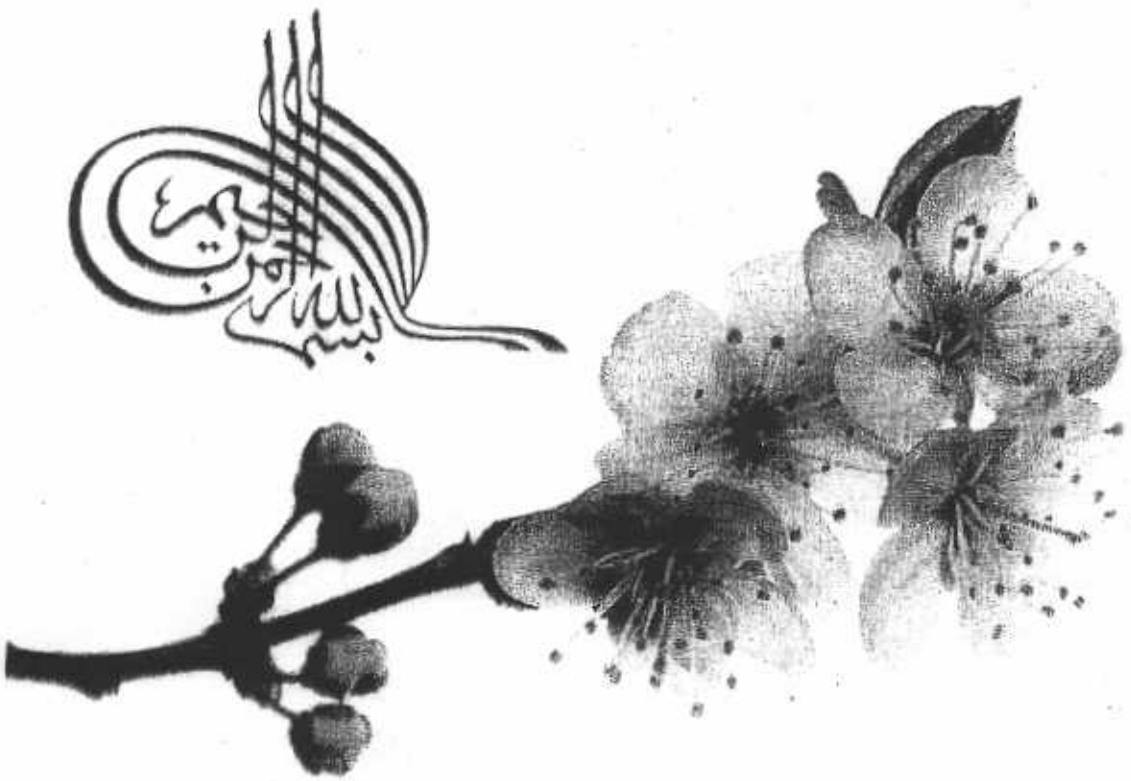

IN THE NAME OF ALLAH THE MOST BENEFICIENT, THE MOST MERCIFUL

INFLUENCE OF UREA SUPPLEMENTATION ON THE COMPOSITION OF MILK, BLOOD AND RUMEN NITROGEN FRACTIONS OF GOATS

BY

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★ 1981 ★

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By

Tanweer Ahmad Alvi
M.Sc. (UAL)

A thesis submitted in partial fulfilment of
requirement for the degree of

DOCTOR OF PHILOSOPHY

IN

NUTRITION

FACULTY OF ANIMAL HUSBANDRY
UNIVERSITY OF AGRICULTURE
FAISALABAD

1981

Dedicated to
HUNEEYA TANWEER, my 28 days old
daughter whose pleasant birth
BROUGHT THIS GOLDEN OPPORTUNITY
TO ENABLE ME TO SUBMIT MY THESIS

To

The Controller of Examinations.

The members of the Committee find the thesis submitted by Mr. Tanweer Ahmad Alvi satisfactory and recommend that it be processed for evaluation by External Examiners for the award of degree.

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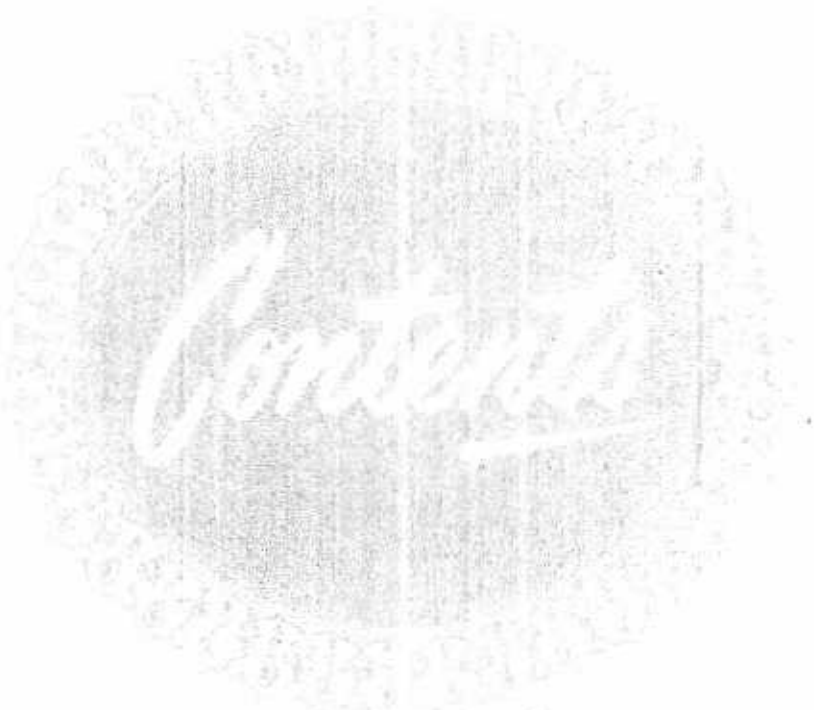
Acknowledgement

ACKNOWLEDGEMENTS

The author wishes to extend his thankful gratitude to Dr. M.A.Sial, M.Sc., Ph.D.(UAL) for providing all the facilities of his PL-480 Project and helping in the planning and conducting of research work; to Dr.M.Akmal Khan, M.Sc.(Hons); Ph.D. (London); Post-doctorate (Danmark); M.I.Biol., F.R.S.H. (London), for his overall supervision and inspiring guidance during the execution of this study; to Dr.Shaukat Ali M.Sc.(USA), Ph.D. (Danmark), for his constructive criticism, useful suggestions and guidance for the preparation of this manuscript; to Dr. Nazir Ahmad, M.Sc., Ph.D. (UAL) for his able supprt, suggestions and elderly guidance throughout his stay at the Campus and to Dr. A. H. Gilani, M.Sc., Ph.D.(UAL) for helping him in cannulation of animals. Without their proper guidance, the author could not have been able to complete his studies.

Last but not least, author wishes to extend his sincerest thanks to his parents, brother, sister and wife as they all remembered him in their prayers. Of course this is the sweet fruit of their good wishes.



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ABBREVIATIONS USED

CF - Crude Fibre

CP - Crude protein

DCP- Digestible crude protein

DM - Dry Matter

EE - Ether Extract

FCM- Fat Corrected Milk

NFE- Nitrogen Free Extract

NPN- Non Portein Nitrogen

OM - Organic Matter

TDN - Total Digestible Nutrients


Introduction

CHAPTER I

INTRODUCTION

Inadequate nutrition is one of the most important causes of low productivity of livestock in the developing countries. Malnutrition, because of deficiencies of calories, protein and minerals is common. Native vegetation without improvement or proper management and without some supplementation of required nutrients cannot sustain a productive livestock industry. Animals can use a wide variety of waste and by-products of agricultural and industrial operations for food. Unfortunately, many potentially valuable by-products currently are wasted, exported or used as fertilizer in these countries, because of the lack of a commercial feed industry to process and distribute them to livestock producers. This is particularly true in Pakistan where animal proteins are in short supply.

Growing scarcity of conventional protein supplements has necessitated research on exploration of new feed sources for livestock which can substitute the traditional feeds. Non-protein nitrogen (NPN) sources such as urea, ammonia etc., can be directly utilized by ruminants in meeting their protein requirements (Moller and Ahmad, 1977). Urea contains 46.6 per cent nitrogen and 1 kg of urea is potential equivalent to 2.9 kg of protein (Baker, 1968). Urea in appropriate amounts can be converted by the rumen microflora to amino acids, which are then utilized by the animal in the synthesis of meat and milk protein.

The use of urea for livestock feeding has its limitations and beyond a certain level can cause toxicity that may prove fatal (Barnett and Reid, 1961). The toxic level which has usually been determined by administering urea as a drench is about 20 to 30 g per 45 kg of body weight (Gallup et al. 1953, Davis and Robbert 1959, Nix and Anthony 1965 and Oltjen et al.1963). The mechanism of toxicity is due to rapid liberation of ammonia and lack of readily available energy for microbial synthesis, thus raising the blood urea level.

In view of the role of micro-organisms in the utilization of NPN, it is probable that this may vary amongst various species of domestic animals depending upon the ureolytic activity in the rumen. This warrants a detailed study on the use of urea in different species of ruminants. Some work, on the use of urea in cattle, buffaloes and sheep has already been done but its feeding in goats, which constitute 36 per cent of the ruminant population has not yet been investigated in this country. In order to study the effect of urea feeding in goats, the following experiments were carried out:

1. Influence of different levels of urea on feed intake and digestibility of various nutrients.
2. Changes in rumen parameters caused by urea feeding.
3. Blood composition as influenced by dietary urea.
4. Effect of urea on milk production and its composition.


Review
of
Literature

CHAPTER II

REVIEW OF LITERATURE

I. Feed Intake and Digestibility of Nutrients

Ali and Sorensen (1979) fed sheep on pelleted diets of alkali treated straw and beet pulp containing 0, 40, 60 and 80% of dietary nitrogen from urea. The digestibility of various nutrients was influenced by urea feeding. Animals fed ration containing 80% nitrogen from urea consumed 79 g of urea per day without any adverse affect on their health. These authors recommended that 60% of the dietary nitrogen from urea may safely be used in such rations for growing sheep. A study (Shukla and Talpada, 1976), on fistulated Surti buffalo bulls for eight weeks, revealed that replacement of 20 and 40% of dietary nitrogen by urea or ammonium bicarbonate did not adversely affect the dry matter intake, body weight or digestibility of nutrients.

White et al. (1975) conducted four metabolic trials in steers to study the influence of 0, 1, 2 and 4% urea and 0, 5, 10 and 20% molasses as nitrogen and energy sources on nutrient digestibility and nitrogen balance. The inclusion of 1% urea improved the digestibility of dry matter and energy but adding 2 or 4% urea failed to improve the digestibility. However, the digestibility of crude protein increased with all levels of urea but nitrogen retention was highest with 1% urea.

Phillips and Church (1975) conducted three metabolic studies on sheep to observe the effect of various combinations of

tallow and urea, as well as the effect of tallow in combination with bi-uret or cotton seed meal. Data from trial 1 indicated, that the addition of urea improved the crude protein digestibility and nitrogen retention. Data from trial 2 indicated that crude protein from urea or bi-uret was digested and retained efficiently than that of cotton seed meal, when the rations contained 5% tallow. In trial 3, urea at 2.17% level in the presence of 5% tallow resulted in an improved nitrogen balance as compared to rations with 1.16 or 1.50% urea. Digestibility of crude protein was not affected.

Urea as a source of supplemental dietary nitrogen, has been shown to promote intake (Campling et al. 1962, Clark and Quin 1951, Hamsley and Moir 1963, Weston 1967), and digestibility (Campling et al. 1962) of straw. Topps (1971) concluded that the addition of urea in the diet did not cause any significant difference on the digestibility of nitrogen. He further remarked that any difference in the digestibility of protein or protein nitrogen source, is the apparent digestibility of the animal.

Gihad (1976) conducted metabolic trials on sheep fed hay alone or supplemented with soy bean meal, dehydrated poultry manure and urea molasses mixture. The digestibility co-efficient of dry matter and crude protein of hay was lower than that of supplemented rations. Differences of crude protein digestibility among the supplemented rations were not significant.

From the literature cited it may be concluded that the use of urea or other NPN sources had variable effects on the