

**NUTRITIONAL STUDIES ON GREEN FORAGE**

By

**Mostafa Hussein Ahmad Talha**

B. Sc. Agric. Sci., (Animal production) Ain Shams Univ., (1981)

M. Sc. Agric. Sci., (Animal nutrition) Ain Shams Univ., (1990)

A thesis submitted in partial fulfillment

of

the requirements for the degree of

**DOCTOR OF PHILOSOPHY**

in

Agricultural science  
(Animal Nutrition)

Department of Animal Production  
Faculty of Agriculture  
Ain Shams University  
Cairo - Egypt

1996





APPROVAL SHEET

NUTRITIONAL STUDIES ON GREEN FORAGE

By

**Mostafa Hussein Ahmad Talha**

B. Sc. Agric. Sci., (Animal production) Ain Shams Univ., (1981)

M. Sc. Agric. Sci., (Animal nutrition) Ain Shams Univ., (1990)

This thesis for Ph.D. degree has been approved by:

Prof. Dr. M. A. El-Ashry ( M. El Ashry )

Professor of Animal Nutrition, Ain-Shams University.

Prof. Dr. I. A. Gomaa ( I. Gomaa )

Professor of Animal Nutrition, Anim. Prod. Res. Institute.

Prof. Dr. H. S. Soliman ( H. Soliman )

Professor of Animal Nutrition, Ain-Shams University.

Date of examination 16 5 . 1996



## **NUTRITIONAL STUDIES ON GREEN FORAGE**

By

**Mostafa Hussein Ahmad Talha**

B. Sc. Agric. Sci., (Animal production) Ain Shams Univ., (1981)

M. Sc. Agric. Sci., (Animal nutrition) Ain Shams Univ., (1990)

Under supervision of :-

Prof. Dr. H. S. Soliman.

Prof. of Animal Nutrition, Ain Shams Univ.

Prof. Dr. S. A. Ibrahim .

Prof. of Animal Nutrition, Animal Production Research Institute.

Dr. S. M. Hamdy.

Associate Prof. of Animal Nutrition, Ain Shams Univ.



## ABSTRACT

Mostafa Hussein Ahmad Talha, Nutritional studies on green forage. Unpublished Ph. D. Of Science, University of Ain Ahams, Faculty of Agriculture, Department of Animal Production, 1996.

Two In-situ and two growth performance and digestibility experiments were conducted to evaluate two agro-industrial by-products and study their effect on the performance of growing Frisian calves fed berseem in pure stand or mixed with ryegrass.

\*\* First In-Situ trial aimed to study the effect of cotton seed oil refining by-product (black oil) at levels 0, 3, 6, 9, 12, 15 and 18% dietary dry matter on feed intake and rumen activity. The results showed that dry matter disappearance, ruminal pH,  $\text{NH}_3$  concentrations decreased with increasing black oil level. Dry matter intake also decreased. This reduction was slight with 3% and 6% but great with higher black oil levels.

\*\* Second In-Situ trial aimed to study the effect of sun dried potato processing by-product (SDPPB) at levels 0, 10, 20, 30 and 40% of dietary dry matter on rumen activity and feed intake. The results showed that dry matter disappearance,  $\text{NH}_3$  concentrations significantly decreased with increasing SDPPB levels. Ruminal pH, tended to decrease with increasing SDPPB levels.

\*\* According to the results of the first In-Situ trial, The 9% black oil has been selected to test its effect on nutrients digestibility and growth performance of growing Frisian calves fed the following experimental diets:-

- 1) Berseem + processed feed (concentrate mixture).
- 2) Berseem + processed feed supplemented with 9% black oil.
- 3) Berseem/ ryegrass mixture + processed feed.
- 4) Berseem/ ryegrass mixture + processed feed supplemented with 9% black oil.

The results showed that there were no significant ( $P < 0.05$ ) differences among the four diets with regard to gain and nutrients digestibility. Black oil improved feed efficiency for calves fed supplemented diets.

According to the results of second In-Situ trial 10% and 20% SDPPB levels have been selected to study their effects on nutrients digestibility, growth performance and carcass characteristics of fattening Friesian calves fed the following diets:-

- 1) Berseem + processed feed. (Control)
- 2) Berseem + processed feed. Supplemented with 10% SDPPB.
- 3) Berseem + processed feed. Supplemented with 20% SDPPB.

The results revealed that supplementing with SDPPB tended to increase daily gains. Moreover, SDPPB improved feed efficiency for calves fed supplemented diets. Feeding SDPPB had no significant effect on nutrients digestibility, dressing percentage or meat composition.

It may be concluded that black oil and sun dried potato processing by-product could be used as a good source of energy supplement of ruminants fed berseem in pure stand or mixed with ryegrass.

**Key words:** Ruminant, Egyptian clover, oil, potato, In-Situ, digestibility, growth, cattle, calves.

## ACKNOWLEDGMENT

I would like to express my profound gratitude to Prof. Dr. H. S. Soliman, professor of animal nutrition, animal production department, Faculty of agriculture, Ain Shams University, for his continuous assistance, encouragement guidance and supervising this work. Thanks to Prof. Dr. S. A. Ibrahim. professor of animal nutrition, Animal production institute, Agricultural Research Center. Ministry of Agriculture for continuous assistance, encouragement and supervising this work. Thanks to Dr. S. M. Hamdy associate professor of animal nutrition, animal production department, Faculty of agriculture, Ain Shams University, for the continuous encouragement and the great technical help, through out this work.

Thanks also to the staff of El-Gemmaza Animal production Research Station and Animal production Research Institute, Agricultural Research Center. Ministry of Agriculture for providing the facilities in terms of animals , feeds, labours and technical support.



## CONTENTS

	Page
INTRODUCTION.	1
1. REVIEW OF LITERATURE.	2
1. 1. Egyptian clover in ruminant feeding.	2
1. 1. 1. Chemical composition of Egyptian clover and its mixture with IRG.	2
1. 1. 2. Nutrients digestibility and nutritive value of berseem in pure stand and its mixture with IRG.	3
1. 1. 3. Effect of feeding berseem alone or its mixture with IRG on feed intake and animal performance.	8
1. 2. Fats in ruminants nutrition.	9
1. 2. 1. Fat classes.	10
1. 2. 2. Effect of dietary fat on rumen fermentation.	10
1. 2. 3. Effect of dietary fat on nutrients digestibility.	15
1. 2. 4. Effect of dietary fat on feed intake and animal performance.	19
1. 3. Potato processing by-products in ruminants feeding.	21
1. 3. 1. Potato processing by-product categories.	22
1. 3. 2. Effect of readily fermentable carbohydrates on rumen fermentation.	22
1. 3. 3. Effect of potato processing by products on nutrients digestibility.	24
1. 3. 4. Effect of feeding potato processing by-product on ruminants performance.	26
1. 4. Carcass Characteristics.	27
2- Material and methods.	30
2. 1. In - Situ experiment .	30
2. 2. Growth performance experiments.	32
2. 2. 1. First experiment.	32
2. 2. 1. 1. Animal and their management.	32
2. 2. 1. 2. Experimental diets.	33
2. 2. 1. 3. Digestibility trials.	33



2. 2. 2. Second experiment.	34
2. 2. 2. 1. Animals and their management.	34
2. 2. 2. 2. Experimental diets.	35
2. 2. 2. 3. Digestibility trials.	35
2. 2. 2. 4. Carcass characteristics.	35
2. 3. Chemical analysis	36
2. 4. Statistical analysis.	36
<b>3. RESULTS.</b>	37
3. 1. In - situ experiments.	37
3. 1. 1. Effect of black oil on feed intake and in - situ dry matter disappearance.	37
3. 1. 1. 1. Black oil composition.	37
3. 1. 1. 2. Feed intake.	37
3. 1. 1. 3. Dry matter disappearance of berseem hay.	39
3. 1. 1. 4. Dry matter disappearance of processed feed (concentrate).	39
3. 1. 1. 5. Dry matter disappearance of sun and hot air dried potato processing by-product.	42
3. 1. 1. 6. Effect of black oil on ruminal pH and NH <sub>3</sub> concentration.	43
3. 1. 2. Effect of sun dried potato processing by-product (SDPPB) on feed intake and in-situ dry matter disappearance.	50
3. 1. 2. 1. Feed intake.	50
3. 1. 2. 2. Dry matter disappearance for berseem hay.	50
3. 1. 2. 3. Dry matter disappearance for processed feed (concentrate).	51
3. 1. 2. 4. Dry matter disappearance for sun dried and hot air dried potato processing by-product.	56
3. 1. 2. 5. Effect of SDPPB on pH and NH <sub>3</sub> concentration.	60
3. 2. Growth performance experiments.	63
3. 2. 1. Exp. 1. Effect of black oil on performance of growing Frisian calves fed either berseem or berseem ryegrass mixture.	63

