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STUDIES ON COOPERIA CURTICEI
(RANSOM 1907) A NEMATODE
PARASITE OF SHEEP

A thesis
presented in partial fulfilment
of the requirements for the degree of
Doctor of Philosophy
at Massey University

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1970

ABSTRACT

This thesis records in part I studies on the ecology of the free living stages of Cooperia curticei, both under controlled and natural conditions.

At constant temperatures free living stages developed throughout the temperature range of 10-37°C. At all temperatures each larval stage occupied the same proportion of the total developmental time to reach the infective stage. The relationship between the rate of development in log days and temperature was found to be linear. Under natural conditions the rate of development was most strongly correlated with mean maximum air temperature and was not significantly different to that observed under controlled conditions. When faecal cultures were kept at 10°C, 27°C and 37°C a higher proportion of eggs completed development to the infective stage at 27°C than at the other temperatures. Under natural conditions the percentage recovery was influenced by weather conditions particularly rainfall.

Submergence of the free living stages in water inhibited their further development. First and second stage larvae survived longest at temperatures between 5°C and 15°C but for a much shorter time than infective larvae. Between the extremes of -6 and 52°C, the longest survival of infective larvae was 312 days at 10°C.

Techniques are described for the recovery of Cooperia curticei larvae from sample units of pasture, soil and faecal pellets. Under natural conditions the maximum survival of larvae from monthly experiments ranged from 9 - 26 weeks. Maximum survival was particularly influenced by temperature. Infective larvae survived through the winter. There was an exponential relationship between the percentage survival and percentage of larvae recovered from the herbage. Vertical migration of larvae appeared to be primarily affected by rainfall and evaporation.

It is concluded that infective larvae of Cooperia curticei are available to grazing sheep throughout the year. Theoretically the nematode can complete from 9 - 11 generations in each year.

Part II of this thesis records experiments on the relationship between Cooperia curticei and the host sheep.

Experiments carried out in vivo and in vitro demonstrated that infective larvae of C.curticei exsheath under conditions provided by the rumen. The process of exsheathment was similar to that described for H.contortus.

A series of experimental observations were made on the effect of Cooperia curticei infection in sheep using animals of differing ages, on different diets and with various sizes of infection. The prepatent period of infection was 14-16 days. Peak egg counts were recorded 5-7 days after infection became patent. Thereafter they declined gradually in sheep given 10,000 larvae but in sheep given 50,000 to 100,000 larvae the decline was more abrupt. The egg output per female worm was found to range up to 1,958 eggs per day.

No clinical sign of infection was observed from any experimental animal. Body weights, wool growth and blood analyses showed no significant changes and no gross lesions or significant histopathological changes were observed. The results indicate a well balanced relationship between C.curticei and the sheep.

The distribution of the C.curticei in the small intestine was skewed, and most of the worms were recovered from 5-10 feet from the gastric pylorus. A predominance of female worms was observed at all levels of the small intestine. Maximum percentage recovery of C.curticei was observed in sheep given 10,000 larvae. Experimental animals with higher doses besides giving a lower rate of recovery showed inhibition of development and stunted growth of worms.

Serum and intestinal mucus samples from infected animals were tested for precipitating antibodies by gel diffusion against five antigens. Antigens were prepared from first stage, second stage, ensheathed third stage, exsheathed third stage larvae and exsheathing fluid. Variable numbers of precipitin lines were obtained with serum and mucus from infected sheep more than 6-7 months old. Sheep 2-3 months old showed no such response but did show evidence of an acquired resistance to infection.

ACKNOWLEDGEMENT

I am pleased to acknowledge and thank my Chief Supervisor, Dr W.A.G. Charleston, for the stimulation, guidance and sincere constructive criticism that he has given me during this period. I am especially indebted to Mr P.L. Carter for assisting me with many of the experiments in this thesis.

The constructive criticism of Dr B.W. Manktelow, Professor of Animal Health and Dr L.S. Forbes is much appreciated. I am also grateful to Mr S. Hussain (Department of Mathematics) for his advice on statistical analysis; to Dr K.M. Moriarty (Department of Animal Health) for his guidance in the immunological studies; and to Dr R.M. Greenway (Department of Biochemistry) for helping me in the protein estimations on antigens. Miss Y. Gray, D.S.I.R., has been most helpful in supplying the meteorological data.

I am also thankful for the assistance of the staff of the histopathology section of the Animal Health Department and of the Library, Massey University.

I would like to thank Miss Ann Waugh and Mrs Rose Couling for typing the thesis. Mr P. Herbert kindly printed the figures.

I would like to express my gratitude to the Governments of India and New Zealand, and particularly the Bihar Government and the University Grants Committee, New Zealand, for granting me the opportunity and financial assistance to undertake this work.

Finally, I wish to express my appreciation to my wife, Lakhinder, for her encouragement and support throughout the whole period of this study.

CONTENTS

	Page No.
ABSTRACT	i.
ACKNOWLEDGEMENT	iii.
INDEX TO FIGURES	iv.
INTRODUCTION	1.
PART I. ECOLOGY OF <u>COOPERIA CURTICEI</u>	
CHAPTER I.	REVIEW OF LITERATURE
	1. CLASSIFICATION AND GENERAL DESCRIPTION OF THE GENUS <u>COOPERIA</u> 3.
	2. MORPHOLOGY AND DEVELOPMENT OF THE PRE-PARASITIC STAGES AT DIFFERENT TEMPERATURES 4.
	i) The egg 4.
	ii) First and second stage larvae 6.
	iii) Third stage infective larvae 8.
	3. SURVIVAL OF PRE-PARASITIC STAGES UNDER LABORATORY CONDITIONS 9.
	i) The egg 10.
	ii) First and second stage larvae 10.
	iii) Third stage infective larvae 10.
	4. ECOLOGY OF FREE LIVING STAGES 11.
	i) General considerations 11.
	ii) Ecology and development of free living stages 12.
	iii) Ecology and survival of infective larvae 14.
	iv) Migration of infective larvae 17.
	5. SEASONAL VARIATION OF WORM BURDENS OF <u>COOPERIA CURTICEI</u> IN SHEEP 19.

CHAPTER II.	GENERAL MATERIALS AND METHODS	
	1. GEOGRAPHICAL DEFINITION OF MANAWATU	23.
	2. THE ESTABLISHMENT AND MAINTENANCE OF A PURE CULTURE OF <u>COOPERIA CURTICEI</u>	23.
	3. TECHNIQUE USED FOR EGG COUNTS	24.
	4. ROUTINE CULTURE OF FAECES	24.
	5. TECHNIQUE USED FOR LARVAL COUNTS	24.
	6. PARASITE-FREE SHEEP	25.
CHAPTER III.	STUDY ON DEVELOPMENT AND SURVIVAL OF THE FREE LIVING STAGES OF <u>COOPERIA CURTICEI</u> UNDER LABORATORY CONDITIONS.	
	INTRODUCTION	26.
	1. DEVELOPMENTAL STUDY OF <u>COOPERIA CURTICEI</u> AT DIFFERENT TEMPERATURES	26.
	i) Materials and methods	26.
	ii) Results	28.
	2. EFFECT OF EXCESS MOISTURE ON DEVELOP- MENT OF THE EGGS AND PRE-INFECTIVE LARVAE OF <u>COOPERIA CURTICEI</u> AT 27°C	35.
	i) Materials and methods	35.
	ii) Results	36.
	3. EFFECT OF MOISTURE ON SURVIVAL OF THE EGGS OF <u>COOPERIA CURTICEI</u> AT DIFFERENT TEMPERATURES	39.
	i) Materials and methods	39.
	ii) Results	40.
	4. SURVIVAL OF THE FREE LIVING STAGES OF <u>COOPERIA CURTICEI</u> AT DIFFERENT TEMPER- ATURES	42.
	i) Materials and methods	42.
	ii) Results	43.

5. SUMMARY OF EXPERIMENTAL FINDINGS	50.
6. DISCUSSION	52.

CHAPTER IV.

THE ECOLOGY OF THE FREE LIVING STAGES OF
COOPERIA CURTICEI

1. MATERIALS AND METHODS	58.
2. TEST OF A TECHNIQUE FOR THE RECOVERY OF INFECTIVE LARVAE OF <u>COOPERIA</u> <u>CURTICEI</u> FROM SMALL SAMPLE UNITS	61.
i) Description of the technique	62.
a) Separation of infective larvae from herbage	62.
b) Separation of infective larvae from top soil surface of flower pots	62.
c) Separation of infective larvae from faecal pellets	63.
ii) Tests of the technique	63.
3. RESULTS	69.
i) Development of the free living stages	69.
ii) Survival of the infective larvae	91.
iii) Vertical migration of the infect- ive larvae	114.
4. SUMMARY OF EXPERIMENTAL FINDINGS	119.
5. DISCUSSION	122.

PART II. HOST PARASITE RELATIONSHIP
OF COOPERIA CURTICEI AND
THE SHEEP.

CHAPTER V.

REVIEW OF LITERATURE

1. EXSHEATHMENT	132.
2. DEVELOPMENT OF THE PARASITIC STAGES OF <u>COOPERIA CURTICEI</u> , MORPHOLOGY OF	

	THE ADULT NEMATODE, LOCATION IN THE SMALL INTESTINE AND EGG PRODUCTION	135.
	i) Development of the parasitic stages	135.
	ii) Morphology of the adult stage	135.
	iii) Location in the small intestine	136.
	iv) Egg production	137.
	3. PATHOGENESIS, PATHOLOGY AND IMMUNE RESPONSE OF <u>COOPERIA</u> INFECTION	137.
	i) Symptoms	138.
	ii) Feed intake, body weight and wool production	139.
	iii) Effects on constituents of the blood	141.
	iv) Gross lesions and histopathology	142.
	v) Resistance and immune response	143.
CHAPTER VI.	EXSHEATHMENT OF THE INFECTIVE LARVAE OF <u>COOPERIA CURTICEI</u> BOTH <u>IN VITRO</u> AND <u>IN</u> <u>VIVO</u>	
	1. MATERIALS AND METHODS	147.
	2. RESULTS	148.
	3. SUMMARY	150.
	4. DISCUSSION	151.
CHAPTER VII.	EFFECT OF <u>COOPERIA CURTICEI</u> IN SHEEP	
	1. EFFECT OF <u>COOPERIA CURTICEI</u> IN SHEEP 6 - 7 MONTHS OLD	153.
	i) Materials and methods	153.
	a) Experimental design	153.
	b) Parasitological technique	154.
	c) Faecal egg counts	154.
	d) Body weight and wool growth	154.

e)	Blood analysis	155.
f)	Necropsy procedure	155.
g)	Histopathology	156.
h)	Immunological study	156.
	Source of antibodies	157.
	Preparation of antigen	157.
	Serological method	158.
ii)	Results	158.
a)	Clinical observations	158.
b)	Faecal egg counts	158.
c)	Body weight and wool growth	158.
d)	Blood analyses	163.
e)	Gross lesions, frequency distribution in small intestine, sex ratio and percentage established in the host	163.
f)	Histopathology	174.
g)	Immunological response	174.
2.	EFFECT OF <u>COOPERIA CURTICEI</u> IN SHEEP 2 - 3 MONTHS OLD	181.
i)	Materials and methods	181.
ii)	Results	182.
3.	EFFECT OF DIET ON <u>COOPERIA CURTICEI</u> INFECTION IN SHEEP 9 - 10 MONTHS OLD	199.
i)	Materials and methods	199.
ii)	Results	200.
4.	SUMMARY OF EXPERIMENTAL FINDINGS	209.
5.	DISCUSSION	212.

CHAPTER VIII.

	GENERAL DISCUSSION AND CONCLUSIONS	
1.	GENERAL DISCUSSION	217.
2.	GENERAL SUMMARY AND CONCLUSIONS	222.

BIBLIOGRAPHY

APPENDICES

INDEX TO FIGURES

Figures		Page No.
1.	Egg of <u>Cooperia curticei</u>	5.
2.	Days development to infective stage (T90) at controlled temperatures	30.
3.	Regression of development time (log days) on temperature	30.
4.	Percentage survival of infective larvae of <u>C.curticei</u> in water at controlled temperatures	47.
5.	Maximum survival of first, second and third stage larvae of <u>C.curticei</u> in water at controlled temperatures	48.
6.	Days development to infective stage (>90%) and mean maximum air temperature during period of development	90.
7.	Regression of development time (log days) on mean maximum air temperature	90.
8.	Larval survival and migration with meteorological data. Experiment 1. (March 1968)	104.
9.	Larval survival and migration with meteorological data. Experiment 2. (April 1968)	105.
10.	Larval survival and migration with meteorological data. Experiment 3 (May 1968)	106.
11.	Larval survival and migration with meteorological data. Experiment 7 (September 1968)	107.
12.	Larval survival and migration with meteorological data. Experiment 8 (October 1968)	108.
13.	Larval survival and migration with meteorological data. Experiment 9 (November 1968)	109.

Figures		Page No.
14.	Larval survival and migration with meteorological data. Experiment 10 (December 1968)	110.
15.	Larval survival and migration with meteorological data. Experiment 11 (January 1969)	111.
16.	Larval survival and migration with meteorological data. Experiment 12 (February 1969)	112.
17.	Arcsin of percentage of larvae recovered from herbage (migrated) plotted against percentage of larvae surviving, expressed as mid points	118.
18.	Gel-diffusion reactions of serum from sheep infected for 34 days against various antigens	176.
19.	Gel diffusion reactions of mucus extract from small intestine of sheep infected for 34 days against various antigens	177.
20.	Gel diffusion reactions of serum from sheep infected for 56 days against various antigens	178.
21.	Gel diffusion reactions of mucus extract from small intestine of sheep infected for 56 days against various antigens	179.