ASURVEY OF DISEASES PREVALENT IN DAIRY COWS IN THE WHITE NILE AND GEZIRA STATES-SUDAN

By

Ala-Elddin Ahmed Saad
BVSc, University of Khartoum

Supervisors
Dr. Khitma.H .M ElMalik
Dr. Mohammed El-Amin Hamid

A thesis submitted in partial fulfilment for the degree of Master of Veterinary Science (M.V.Sc)

Department of Preventive Medicine. Faculty of Veterinary Medicine
٢٠٠٤

DEDICATION

To

My father, mother
Sisters, brothers
To Ustaz. Mika and Dr. Randa

ACKNOWLEDGMENTS

I wish to express my thanks gratitude and indebtedness to my previous Supervisor, Dr. Mohammed E. Hamid Department of preventive Medicine and public Health University of Khartoum whose Keen interest, supervision and assistance led to the initiation and completion of part one of thesis work .My gratitude and thanks are and further expressed to my present supervisor Dr. Khitma Hassan El- Malk, Department of preventive Medicine And Public Health Faculty of Veterinary Medicine University of Khartoum for her supervision guidance and careful scrutiny in all aspect of this study.

I am indebted to Miss Mlka El -Naeem for her patience, understanding and supports.I would like to express my especial thanks to Dr Randa Elfadil for her sustainable presence and unlimited help in all aspects of this work.

I am also grateful to my colleagues Drs. Ahmed. Hussein Elimam, Satti, Ismaeil, Tarig, Margani Gamar, Amal (Kosti Veterinary Office), El- Rayh, Yasir, El – manan,(Medani Vet office) for their help , encouragement and facilitation of this survey trips through –out the study period. The cooperation and immense help of Dr. Abd Ebaset ,Mr Ahmed Abdel Wahid , Adel Hassan Department of preventive Medicine, Faculty of Veterinary Medicine University of Khartoum and Mr Hassan Elfaki Department of parasitology I am is highly appreciated grateful to all collaborating farmers in Kosti, Assalya, El – Hassania, Ellaya, Medani, El –fawaida –Ozezat, El-Dinegella

and Abu – Sinaina for their cooperation and permission to use their animals and facilities. Special thanks are forwarded to Dr. Mohammed, .E. Hamid family at Eldineglia Village for their unlimited help and their worm welcomes and keen hospitality. Finally, we owe a dept of gratitude to Dr Somya Abd Eldaim who assisted in preparing the maps and technical work of GIs program and Miss Tahani Hassan in the final assistance in typing this work.

ABSTRACT

Dairy cattle, diseases were surveyed at ٥ selected farms at White Nile and ٥ at Gezira State. A total of ١٢٥ cows from each state constituting ٢٥ from each farm were subjected to the following screen testes

(Rose Bengal), test for Brucella, Rapid Mastitis test (RMT), Microscopic examination (Blood smear), Haematocreit Centrifugation of blood samples, sedimentation and floatation methods for fecal sample for Helminthes ova, investigation of skin infection and tick infestation. The average of milk production was between ٣-١٥L at both areas, and the breeds in this farms included Kenana, Butana, and their cross with Friezian (Kenana or Buttana vs Friesian).

The semi-intensive system is the common system plus the supply of cake at the milking time to the milking cows.

The result of this survey, showed that ٢ sera out of ١٢٥ (١,٦٪) at the White Nile farms were found Brucella positive, and ٨ sera samples (٦,٤٪) at Gezira farms were found positive for Brucella test.

The mastitis according to RMT at White Nile farms was detected in ٣٧ cattle (٢٩,٨ %) and in Gezira state farms in ٢٣ (١٨,٤٪).

Eight blood smear were showing Theilerosis at White Nile frams (٦,٤٪) Wile in Gezira farms ٥ (٤٪) were positive.

Babesiosis at White Nile farms was seen in ٦ cows (٤,٨٪) and at Gezira farms was in ٢ (١,٦٪).

Trypanosomiasis was found at the White Nile in Ellaya Farm in one animal only (٠,٨٪).

Microfalria was found in ٦ animals at the White Nile farms (٤,٨٪) and in ٢ animals at the Gezira state farms (١,٦ %).

Fascioliasis was detected in ٤٣ cows at the White Nile farms (٣٤,٤٪) and in ١٨ cows at Gezira farms (١٤,٤٪).

Paramphistomiasis at White Nile farms was found in ٥٠ animals (٤٠٪). And at Gezira farms was found in ٢٢ animals (١٧,٦٪). Schistosomiasis at White Nile farms was found in ٥ animals (٤٪).but none at Gezira.

Plantidium cyst at White state farms was found in ٦ animals (٤,٨٪). And at Gezira state farms in ٣١ animals (٢٤,٨٪).

Trichuris ova were found at White Nile State farms in one animal (٠,٨٪)

Monizia spp ova were found at Gezira Farms in ٣ animals (٢,٤٪), and

Taenia spp ova were found in ٢ animals (١,٦٪).

The prevalence of ticks infestation at White Nile farms was ٦٢ (٤٩,٦ %) and at Gezira Farms was ٥٥ (٤٤٪).

Gazira farms survey showed EHeesh infection in ٤ animals (٣,٢٪). And two cases showed lumpy skin disease (١,٦٪). One case had traumatic percarditits.

The over all observation was that diseases and disease agents were diagnosed and isolated from dairy cows which are supposed to be well taken care of. This indicates the endemicity of these diseases in the perspective states which should be more deeply studied for a sound prescription of control strategies.

ملخص الاطروحه

تحتوي هذه الأطروحه علي دراسات بيئيه ووبائية للأمراض التي تصيب ابقار الالبان إضافه الي طرق التغذيه وطبيعة المرعي وتأثير ذلك علي الانتاج وذلك من خـلال المـسح الميداني للامراض التي تصيب أبقار الالبان وذلك بأخذ عينات من الدم لفحـص البروسـيلا واطخات من الدم لفحص طفيليات الدم وعينات برازيه لفحص الطفيليات التي تصيب الكرش والامعاء والكبد وهذا بالاضافه لفحص الجلد لمعاينـة الامـراض الجلديـه (القـراد، الحلـم والفطريات والديدان التي تصيب الجلد) كما تم فحص الـضرع واللـبن بأسـتخدام اختبـار (كافورنيا) . تم أخذ متوسط الانتاج اليومي للبقره.

تمت هذه الدراسه في كل من ولايتي النيل الابيض وولاية الجزيره حيث تم اختبـار خمسه مزراع في خمسه مناطق مختلفه من كل ولاية (٢٥ بقره من كل مزرعـه) لاجـراء الدراسه.

كان معدل الانتاج يترواح ما بين ٣-١٥ لتـر فـي المنطقتـين وكانـت الـسلالات الموجوده هي كنانه وبطانه وهجين/كنانه اوبطانه مع فريزين.

النظام الغالب هو النظام المفتوح تقدم مركزات الامباز للابقار اثناء فترة الحليب.

اوضحت الدراسه وجود البروسيلا في النيل الابيض بنسبة (١،٦%) وفـي ولايـة الجزيرة بنسبة (٦,٤%).

التهاب الضرع بناء علي اختبار كلفورنيا بنسبة (٢٩,٩%) في ولاية النيل الابـيض ونـسبة (١٨،٤%) في ولاية الجزيره.

وجدت الثاليريا في ٨ بقرات من عدد ١٢٥ بقره بنسبة (٦,٤%) فـي ولايـة النيـل الابيض و ٥ بقرات بنسبة (٤%) في ولاية الجزيره. وجدت البابيزيا في ٦ بقرات بنسبة (٤,٨%) في ولاية النيل الابيض وفي بقرتين في ولاية الجزيره بنسبة (١,٦%).

وجد مرض التربانيسوما في في بقره واحده في ولاية النيل الابيض. المايكروفلاريا وجد في ٦ بقرات في ولاية النيل الابيض بنسبة (٤,٨%) وفي بقرتين في ولايـة الجزيـره بنسبة(١,٦%) .

الاصابه بالدوده الكبديه وجدت في عدد ٤٣ بقره في ولاية النيل الابـيض(٣٤,٤%) وفي ١٨ بقره في ولاية الجزيره بنسبة (١٤,٤%). الاصابه بدودة البرامفستوم وجدت في ٥٠ بقره في ولاية النيل الابيض بنسبة (٤٠%) وفي الجزيره وجدت في ٢٢ بقـره بنـسبة (١٧,٦%). البلانتيديم سست وجد في ٦ بقرات بنسبة (٤,٨%) في النيل الابـيض وفـي ولاية الجزيره في ٣١ بقره بنسبة (٢٤,٨%). وجدت الترايكيرس في بقره واحده بنسبة ٨% في ولاية النيل الابيض.

المونيزيا وجدت في ٣ بقرات بقره في ولاية الجزيره بنسبة (٢,٤%). التينيا وجدت في بقرتين في ولاية الجزيره بنسبن (١,٦%).

اعتبرت الدراسه وجود اكثر من خمسه قرادات علي جسم الحيوان اصابه عاليه عليه كانت نسبة الاصابه في النيل الابيض ٦٢ (٤٩,٦%) وفي منطقة الجزيره ٥٥(٤٤%) وجدت اربعه حالات مصابه بمرض الهيش وحاليتي اصابه بمرض الجلد العقـدي. وحالـه واحـده مصابه بالتهاب القلب والتامور الكدمي.

الملاحظه العامه دلت علي ان الامراض ومسبباتها التي شخصت وعزلت من ابقـار اللبن اصابة هذه الابقار والتي تجد عنايه أفضل من غيرها. هذا يـدل علـي تـوطن هـذه الأمراض في الولايه المعنيه مما يحتم دراسه متعمقه لها لوصف استراتيجيات فاعله للسيطره عليها.

TABLE OF CONTENTS

CHAPTER TOW

MATERIAL AND METHODS

. .

LIST OF TABLES

No **page**

LIST OF FIGURES

No **page**

LIST OF PLATES

No **page**

INTRODUCTION

Animal population in Sudan

Sudan is a vast country of one million square miles divided politically into ٢٦ States. The human populations of ٣٥ million are mostly pastoralists. Geographically the country extends over ١٨ degree of latitude-between ٤N and ٢٢N, and hence it has diversified climatic conditions. Temperatures are usually warm but cool spells occur during winter. The vegetation cover ranges from bare desert in the North to tropical forest in the south. The active rainy season in the Northern States falls between June and September and may extend as from March to October in the south. In most parts of the country the rest of the year is very dry and hot particularly in the northern part (Meteorological station ٢٠٠٤). The country is traversed by a net – work of streams in the south which join to form the White Nile. From the east originates the Blue Nile at the Ethiopian territory. The River Nile is formed mainly by the junction of these two major tributaries before it continues its northern journey to Egypt along which minor streams also join.

The latest estimates of live stock population of Sudan indicate that there are (٣٩،٣٧٩،٠٠٠) head of cattle's, (٤٨،١٣٦،٠٠٠) head of sheep , (٤١،٤٨٥،٠٠٠) head of goats and (٣،٣٤٢،٠٠٠) head of camels .The majority of these animal are kept under transhumance way of herd management. Moreover the ecological diversity in the Sudan governs the distribution of livestock as shown in Table (١), (Ministry of Animal Resource ٢٠٠٣).

Table (١): Distribution of cattle population in the State groups in Sudan

States	Cattle
Kordofan States	١٦,٠٣٪
Darfour States	٢١,٣٥٪
Eastern States	٣,٦٤٪
Central States	٢٧,٦٥٪
Northern States	١,٠٤٪
Khartoum State	٠,٥٧٪
Upper Nile States	٩,١٩٪
Bahr Elgazal States	١٠,٤٨ %
Warab State	٣,٨٧ %
Equatoria States	٦,١٨٪
Total	١٠٠ %

Source Ministry of Animal Resources & Fisheries (April ٢٠٠٣)

Economic significant of cattle in Sudan

Sudan has an immense animal wealth which satisfies all local needs of meat and about ٨٠ % of total milk needs, (Arab Organization for Agriculture Development, ١٩٩٢).

The statistics of livestock export showed an increase with meager percentage in comparison with the pervious years. Nevertheless the size of export is inappropriate to the size of production and the estimation of the number of livestock. It is an established fact that ٩٠٪ of the livestock is produced by the traditional nomadic system which is considered as the principle source to feed the internal and external market of meat .A considerable part of the nomadic stockmen are still suffering from illiteracy and under development. The major part of their activity is outside economic spheres, and the possession of livestock is a social inheritance through which they obtain their basic life needs only (Animal Resource Service Co, ٢٠٠٣).

Importance of animal's health for production

Table (٢) and (٣) indicate the significance of livestock in export and generation of foreign currency. Even though the health aspect is considered according to old information of herd diseases. Besides, changes in production systems, which emerged during the few past decades, necessitates the updating of disease distribution maps. Introduction of highly productive exotic dairy breeds of cattle need to be safeguarded by early warring and early response

preparedness mechanisms to avoid unnecessary losses. In this respect disease burden and mapping is an appropriate activity to start with.

Table (٢): Livestock Export (per head) (١٩٩٨ – ٢٠٠٢)

Year	Cattle	Sheep	Goat	Camel
١٩٩٨	٣١٦٥٩	١٥٨٦١٩٣	٤٨٨٩١	١٥٩٤٨٣
١٩٩٩	٤١٠٨٩	١٦١٦٣٦٣	٤٠٥٠١	١٣١٥٧٠
٢٠٠٠	٣١٣٩٦	٧٣١٢٤٢	١٦٥٩٩	١٤٥٢٤٦
٢٠٠١	١٣١٣٣	١٥٥٠٧	١٥٨٨٣	١٨٥٥٠٠
٢٠٠٢	٧٩٩٠	١٦٠٢٦٣٨	١٥٢٠٩	١٥٥٧١٠

Table (٣): Meat Export in Tones (١٩٩٨ –٢٠٠٢)

Year	Cattle	Sheep	Goat	Camel
١٩٩٨	٤١٣٦	٧٩٤٣	٥٠٠	١٢
١٩٩٩	٦٠٩٣	٩٥٠٨	٤٤٢	٢٣
٢٠٠٠	٣٥٨٦	٥٨٢٧	٣٣٦	٢١
٢٠٠١	٢٣٥٠	٤٨٥٥	٣١٢	١٠
٢٠٠٢	١٧١٤	٧١٤٠	٣٦	١٢

Source: Animal Resource Service Co, (٢٠٠٣)

Gezeria and White Niles States lie in a fertile area of the country which provides food for the country and outside. The high potentialities in crops and crop residues makes the area attractive to a growing dairy industry. On the other hand the long history of endemic disease particularly those which can not be controlled by vaccines, prophylactic treatment or environmental management made it difficult to proceed at a fast pace towards high economic achievement. Studies are therefore needed to develop sound disease control strategy for the area to built minimize the economic loss in national herd. So the objectives of this study are upon recognizing the importance of the white Nile in Gezeria States as an area between the White and Blue Nile where suitable water and fodder conditions are encouraging for substantial food production, the influence of their central position in the country and discriminate location, which links all the Sudan States. Existence of Gezira project (Gezira State) a Kenana Sugar Assalaya Factories (White Nile State are also out stanting infrastructures. So the objectives of this study are

- To assess the prevalence of and map locations of diseases in a random population of dairy cattle in the two selected states.
- To determine the major management and epidemiological factors associated with occurrence of these diseases.
- To assess the impact of the diseases and their burden on dairy cattle population production.

- To suggest a strategy for the control of diseases in a developing dairy industry environment.

CHAPTER ONE

LITERATURE REVIEW

١,١ Herd disease studies

Recent advances in disease studies in herd enabled formulation of strategies for their control, good use had been done of methods of epidemiology.

١,١,١ Definition of Epidemiology

Epidemiology may be defined as study of the pattern of disease that exit under field conditions. More specifically, epidemiology is the study of the frequency, distribution, and determinants of health and disease in populations since the literal translation of epidemiology is the study (Logos) of what is upon (epi) the population (demos). And because of the many similarities between human and animal medicine, there is little need to continue using the term epizootiology, (Andrew, ٢٠٠١).

Certain terminologies are important to anticipate for the study of epidemiology such as.

١,١,١,١ Infection

Is the presence of the pathogenic agent in the host.

١,١,١,٢ Infective period

Is the longest period during which an effected animal can be a source of infection (Terrestrial Animal Health Code, ١١th ٢٠٠٣b).

١,١,١,٣ Outbreak of diseases

Is the occurrence of one of the diseases, in OIE list A, or list B, in an agricultural establishment, breeding establishment or premises, including all building and all adjoining premises, where animal are present. Where it cannot be defined in this way, the outbreak should be considered as occurring in the part of territory in which, taking local condition into account, it cannot be guaranteed that both susceptible and non- susceptible animals have had no direct contact with affected or suspected cases in that area. (Terrestrial Animal Health Code, ١١th edition – ٢٠٠٣c)

١,١,١,٤ Incidence

Means the number of new cases or out breaks of a disease that occur in a population at risk in particular geographical area within a define time interval (Terrestrial Animal Health Code, ١١th edition –٢٠٠٣a).

١,١,١,٥ Prevalence

Is the total number of cases or out breaks of disease that are present in a population at risk, in a particular geographical area on specific time or during a given period (Terrestrial Animal health Code, ١١th edition – ٢٠٠٣c).

١,١,١,٦ Rate

Specifying the denominator and time components.

١,١,١,٧ True rate

Describes the average speed at which the event of interest (i.e. infection, disease occurrence, culling, death) per unite of animal time at risk (Green ١٩٨٢, Kleinbaumetal, ١٩٨٢).

١,١,١,٨ Morbidity Rate

Morbidity rates describe level of clinical disease in an animal population

١,١,١,٩ Mortality Rate

Mortality rates describe quantitative impact of death in an animal Population

١,١,١,١Notifiable diseases

Means diseases listed by the veterinary administration and that as soon as detected or suspected must be brought to the attention of the veterinary Authority (Terrestrial Animal Health Code ١١th edition ٢٠٠٣c).

١,١,١,١١ List A

Transmissible diseases that have the potential for very serious and rapid Spread, irrespective of national borders, that are of serious socio-economic of public heath consequence and that are of major importance in the international trade of animals and animal products (OIE classification of disease, ٢٠٠٤a**).**

١,١,١,١٢ List B

Transmissible diseases that are considered to be of socio-economic and /or public health importance within countries and that are significant

in the international trade of animal and animal products (OIE classification of diseases ٢٠٠٤ a).

١,١,٢ Geographical Information System (GIs)

Is a computer -based tool for mapping and analyzing things that exist and events that happen on earth. GIs is more than a computer map, it gives the power to link data bases in a way not possible with traditional spread sheets. GIS is used in education, government, and to improve information management and decision making (W.w.w.eseri.com, ٢٠٠٤).

١,١,٢,١GIs-Application

GIs was applied in non-Veterinary field

To city management refuse collection route analysis, road emergency (Evacuation) management, assessment of community attitude, industrial site selection rail net Work and trip-rate, electrical design, water supply and sewerage, manpower, fish farming marine and filling for airport construction, police force and other diversified Fields.

١,١,٢,٢ GIs-Application in Veterinary Medicine

A list of uses include

- Disease mapping
- Epidemiological studies as to show the association between the disease and the hypothesized risk factor.
- Conjunction with another software, it can show how disease Progress in a population.

- **Assist in monitoring vaccination coverage and immunity levels and design or readjust strategies**
- Theileriosis in Africa
- Determination of potential habitat of the snail Fassaria bulimoides
- The distribution of Lyme disease ticks and FMD
- **The risk of Rift Valley Fever transmission to Saudi Arabia** with cattle imported From East Africa
- Priority areas for Tsetse / Trypanosomosis control in West Africa

١,١,٣ Global Position System (GPS)

GPS are sets of satellites in geostationary earth orbits used to help determine Geographic location anywhere on the earth by means of portable electronic receivers. The satellites provide specially code signals from radio waves that can be processed in GPS receiver, enabling the receiver to compute position, velocity and time.

١,١,٤ The concept of Disease mapping

The concept of disease mapping is not new. In his detailed description of the history of disease mapping, Howe (١٩٧١) identified several American and British studies dating from the beginning of the ١٨٠٠s in which maps were employed to demonstrate the distribution of disease. Mostly, these maps portrayed the distribution of infectious disease such as yellow fever in the United States and contagious fever in Ireland. Possibly the most famous uses

of mapping in epidemiology were the studies by Jon Snow(١٩٣٦) of the cholera epidemic in London during the middle of nineteenth century .At that time, the method of spread and nature of the *cholera vibirio* were unknown . Through the careful observation of his patients and by plotting where the cases lived, Snow was among the first to show clearly that cholera could be spread through a contaminated water supply. His dot map of the residence of the victims of the ١٨٥٤ cholera epidemic in the Golden Square of London demonstrate a distinct cluster of cases around the water pump in Broad Street. Later investigations indicated that the pump had become contaminated by faecal material from a case of cholera. When studying the outbreak of cholera in south London during July to October ١٨٥٤, Snow also perceived that the dual system of water supply to that district constituted a natural experiment in which the question of the contribution of the polluted water to the epidemic could be studied epidemiologicaly. So the mapping in disease mapping refers to the visual representation of the geographical distribution and the disease in disease mapping refers to the geographical distribution of disease within population. A map is simply a collection of spatially defined objects. Thus a disease map is a collection of disease objects (residential location of individuals) in their geographical association. The mapping of disease became more common at the turn of the twentieth century In Britain between the World Wars, Stocks (١٩٣٩). Produced the first maps of the infectious and non infectious disease in England and Wales which were standardized for

differences in age, sex and urbanization. In ١٩٣٩ Stocks presented maps using mortality ratio .Between World War ٢ and ١٩٦٠s, the techniques of mapping remained constant, with many of data being collated, calculated and present manually. However, the advent of easily operated computers in the late ١٩٦٠s, with their modern data processing and graphical facilities, allowed the mapping of disease distribution to become almost common place, (Andrew, ٢٠٠١).

١,١,٤,١ The Value of mapping

Maps provide an efficient and unique method of demonstration, distributions of phenomena in the space. Though maps are constricted primarily to show the facts, to show spatial distribution with an accuracy which can not be attained in pages of description or statistics, their prime importance is as research tools. They record observations in succinct form, they aid analysis, they stimulate ideas and aid in the formation of working hypotheses; they make it possible to communicate findings.

Maps answer the question: where? They can reveal spatial patterns not previously recognized or suspected from the examination of table of statistic. They reveal high-risk communities or problem areas, where in depth studies can be undertaken in the search of causal mechanisms. They can assist health authorities in allocating their limited resources in areas of greatest need. Andrew, (٢٠٠١).

١،٢. Diseases of cattle

Cattle in Sudan are under risk of many diseases, Bacterial, Viral and parasitic diseases in additions to metabolic problems in the nomadic areas.

Table No (١،١) summarizes the report of Veterinary Laboratories and Research Administration for the incidences of diseases in Sudan During (٢٠٠٢) According to, (OIE), classification.

Table (١،١): Report of Veterinary Laboratories and Research Administration for the incidences of diseases in Sudan during (٢٠٠٢)

List A

Disease	LAST INCCIDENT	INCCIDENT DURING٢٠٠٢
FMD	١٩٩٠	Note reported
Rinder Pest	April ١٩٩١	Note reported
Rift Valley Fever	١٩٧٣	Note reported

List B

Disease	species	Herd	Morbidity %	Mortality%
Brucellosis	Cattle	٤٢٠٠	٢٠٦	٠
Theilerosis	Cattle	٤٨١	٢٤٩	٠
Coccidiosis	Cattle	١٨١	٢١	٠
E.Coli	Cattle	١٣٤	١٢	٠
Fascioliasis	Cattle	٤١٦	٤	٠
Paratuberclosis	Cattle	٧١	٨	٠
Trypanosomiasis	Cattle	١	١	١
Coli isolated	Cattle	٣	٣	٠
Clostridi	Cattle	١	١	٠

Table (١،٢): - Percentage of the Morbidity & Mortality rate of diseases (Reported from the states)

Disease	State/Province	Morbidity	Mortality
FMD	Southern Kordofan/Taloudy	٣٤,٣٪	٠٪
	Southern Kordofan/abuojebaha	٩,٥٪	٧٣٪
	Western Kordofan/Elnehoud	١٦٪	٠٪
	Western Kordofan/Abuzabad	٢٠٪	٠٪
	Upper Nile/Elrank	١٠,٥٪	١,٥٪
	Southern Kordofan/Kadogly	٣,٩٪	٠,٩٦٪
Lumpy skin disease	Eastern Equatoria/Kaboyta	٠,١٣٪	٠,٠١
	Blue Nile/Eldamazine	٣٪	٠٪
CBPP	Eastern Equatoria/Kaboyta	٠,٧٪	٠,١٣٪
	Bahr Egazal/Eljour Nile	٢,٩٪	٠,١٩٪
	Blue Nile/Elruosiars	١٣٪	٠٪
	Bahr Eljabal/ Juba	٤٨٪	٠٪
	Egaddarif/ Elgalabat	٣,٣٪	٢,٣٪
Black Quarter	Western Darfour/ Zalengy	٠,٦٪	١,١٩٪
	Southern Kordofan/Taloudy	٩,١٤٪	٠,١٩
	Southern Kordofan /Abu Jebeha	١٠,٨٣٪	٣,٤١٪
	Southern Kordofan/ Rashaad	٢,٧٨٪	٠,٦٨٪
	Blue Nile/Eldamazine	٣٣,٣٣٪	١٠,٨٣٪
	Northern Darfour/Kabkabya	٥,٩٥٪	٢,٦١٪
Babesiosis	SouthernDarfour/Rhead Elberdy	٩,٨٪	٠٪
	Southern Darfour/ Nyala	٣,٧٪	٠٪
	Southern Kordofan/Abu jebeha	٢٢٪	٠,٤٪
	Southern Kordofan/Kadogly	٣١,٦٪	٦,١٪
Brucellosis	Eastern Equatoria/Kaboyta	٠,٢٪	٠٪
Clostridia	Northern Darfour Kabkabya	٢,٤٪	٩,٨٪
Internal parasite	Southern Kordofan	١٠٠٪	٠٪

	Western Bahr Egazal /Wawu	٦,٣٪	٠٪
	Western Bahr Elgazal /Eljour Nile	٧,١٪	٠٪
	Southern Kordofan/Rashaad	٦٢,٧٪	٠٪
Bovine Tuberculosis	Eastern Equatoria/Kaboyta	١٪	٠,٣٣٪
	Western Bahr Elgazal/Eljour Nile	٢,٧٧٪	٠,٢٧٪
Haemorrhagic Septicemia	Southern Darfour/Bouram	٢,٥٪	١,٥٪
	Eastern Equatoria/Kabkabya	١,١٪	٠,٣٪
	Elgaddarif/ Ffao	٠,٣٪	٠٪
	Elgaddarif /Elbutana	٤٤٪	٧,٨٪
Theileriosis	Kassala/Kassala	٢٥٪	٠٪
Trypanosmiaisis	Eastern Equatoria /Kabkabya	١٠٪	٠٪
	Upper Nile/Elrank	٠,٨٪	٠,٣٪
	Bahr Eljabal	٦٧,٧٪	٠٪
	Southern Darfour/Abujebeha	٧,٤٪	٠٪
	Southern Darfour/Rehad Elberdy	١,٨٪	٠,٣٪
	Western Bar Egazal/Eljour Nile	١,٣٪	٠٪
	Sinnar/Eldinder	٢٣,٥٪	٠٪
Heart water disease	Eastern Equatoria /Kaboyta	٠,٥٪	٠,١٣٪
	Western Bahr Elgazal/Wow	٢,٧٥٪	٠,١٩٪
	Bahr Eljabal/Juba	٢١,١٣٪	٧,٠٤٪
	Southern Kordofan/ Abujebeha	٢٣,١٨٪	٧,١٪
	Western Bahr Elgazal/Eljour Nile	١,٧٨٪	٠٪
	Southern Kordofan/Toluody	١٢,٥٪	٢,٥٪
	Sinnar/Eldinder	١٢,٤١٪	٠٪

١,٢,١ List A

١,٢,١,١ Foot and Mouth disease (FMD)

Foot – and –Mouth Disease is a sever, highly communicable disease of cattle, pigs, sheep, goats and deer, It is caused by one of the smallest disease producing virus known. There are several different strains of the virus that cause the disease. The strain now in England and Europe is harder on pigs and cattle but milder on sheep and goat. Humans don't catch the virus .The disease is characterized by blisters- like lesion on tongue, nose and lips, in the mouth, on the teats and between the toes which then burst leaving painful ulcers, The blister cause heavy flow of sticky, foamy saliva hung from the mouth. Infected animals sway from one foot to the other due to the feet tenderness. Although older cattle usually don't die from the infection, they suffer sever illness which leaves them in a weakened state, they have high fevers. Stop eating, give less milk and become lame (Cattle Website ٢٠٠٤a).

(FMD) is highly endemic in Sudan (Abu –Elzen ,١٩٨٣). Four of the seven-virus sero - types have been recorded in the country, those were Type O, A, SAT-١ (Anon ١٩٨٠) and SAT-٢ (Abu-Elzen and Crowther, ١٩٧٩).

١,٢,١,٢ .Rinder Pest

The world wide spread of Rinder Pest in ١٩٧٥ was describe by Scott (١٩٨١), when the last pandemic swept through the Middle East from Afghanistan to the Mediterranean in١٩٦٩ –١٩٧٣. The disease persisted and attained endemically high rates largely because of nomadism and difficulties in

conducting widespread vaccination campaigns (Taylor, ١٩٨٦). Early, Scott (١٩٦٤) estimated, from data published by OIE that around ٤٠٠٠٠ outbreaks occurred during which over one million death was recorded in the decade before ١٩٦٤. In epizootic where highly suspect populations are anticipated, morbidity and mortality rates as high as ١٠٠ and ٥٠٪ respectively, were scored, (Scott, ١٩٨١). It was observed that the incidence of RP is age- related and it is high within young animals in enzootic areas (Losos – ١٩٨٦, Blood and Radostits; ١٩٩٨). It is now known in general that vaccination and the existence of high innate resistance among indigenous breeds govern the incidence of RP (Blood and Radostits, ١٩٨٩). In Sudan, RP, among other cattle disease is no doubt of great economic concern. During the year ١٩٥٥-٥٨ animals were reported to be involved in out breaks in the southern states (Ali unpublished Data). The prevalence of RP in Sudan and ١٦ other African countries lead to many trials in the past aiming at containing the disease. Mass vaccination efforts of the Organization of African Unity, (O.A.U). Joint Project No.١٥ (JP-١٥), which extended from١٩٦٢ –٧٦ was the largest (Cheneau, ١٩٨٥). Although the campaign did produce remarkable result in most of the٢٢ African countries involved in the JP-١٥ including northern Sudan, (Majok *et al* ; ١٩٩١) infections foci continued to exist in Sudan and Ethiopia and disease re-emerged during the year ١٩٧٩; (Rossiter *et al.*١٩٨٣). The southern Sudan axis was considered as an endemic constituting the greatest risk to farming areas of East Africa, (Anon, ١٩٩٧).

The pan African Rinder Pest Campaign (PARC) was organized under the auspices of Inter African Bureau for Animal Resource (IBAR) of the OAU and the support of the European Economic Community (EEC). The goal of the campaign had been the complete vaccination coverage of cattle population in all the ٣٤ African countries that participated in the campaign within two years of the starting, then annual vaccination of at least all Nine-month-old new crop calves for the successive following three years (Cheneau, ١٩٨٥).

In Sudan the campaign started in ١٩٨٩ but epidemics of RP continued to reoccur. The last officially reported outbreak was that of ١٩٩١ in Lagawa Southern Kordofan State (Rossiter, ١٩٩٥). Between ١٩٨٩ and ١٩٩٣ Almost ١٢,٥ million head of cattle were successfully vaccinated (Anon, ١٩٩٣).

At the central Veterinary Research Laboratory (Soba) competitive enzyme linked Immune Sorbent Assay (ELISA) was used to study the prevalence of antibodies of Rinder Pest virus in the sera collected from province of Darfour and over all immunity level in the cattle was ٤٦٪; (Shekh Eldin *et al;* ١٩٩٥).

١,٣. List B

١,٣,١. Anthrax

Anthrax, a highly infectious and fatal disease of mammals and humans is caused by a relatively large spore- forming rectangular shaped bacterium called *Bacillus anthracis*. Most outbreaks occur in areas where animals have previous died of anthrax, as the spores remain viable for decades. The predominant sign in cattle with anthrax is a progression from a normal

appearance to death in a matter of hours. Most animals are simply found dead. Once an outbreak begins in the herd animals maybe observed with signs of weakness, fever, excitement followed by depression, difficult breathing uncoordinated movements and convulsions. Bloody discharges from the natural body openings as well as edema in different parts of the body are sometime observed after death and the dead animals' body rapidly decomposes. Some animals may be saved if treated very early with penicillin or tetracyclines. Vaccination is very effective in preventing further disease to occur in animals. However full immunity takes ١٠ –١٤ days to develop. Antibiotic must not be used at time vaccines are given otherwise interfere with development of immunity (Cattle Website, ٢٠٠٤b).

In Sudan Anthrax has been known to exist since ١٩٢٠ and hence vaccination of export cattle against the disease was practiced since ١٩٤٦. Research was conducted during ١٩٨٣- ١٩٨٥ to produce anthrax live spore vaccine which was issued to the different part of Sudan.

١,٣,٢. Ticks

Ticks are arthropods of the Class of Arachnida, as do mites. There are many different tick species that vary greatly in many aspects. They have a life cycle of three stages, the larval, nymph and adult stages, on one, two or three hosts. (FAO, ١٩٩٨a).

The tick parasitising livestock mostly belong to the family of Ixodidae. They vary in importance and some of them are vectors of tick- borne diseases.

Ticks genera that had been incriminated are Amblyomma, Haemaphysalis, Rhipicephalus, Boophilus, Hyalomma, Dermacentor and Ixodes (FAO١٩٩٨b).

They attach to host for a blood meal. While doing so they can cause irritation and infection of the skin. Which can sometimes be very sever. When ticks are attached in great quantities, they also can cause anemia in the host. Furthermore ticks can be carriers of disease, which they transmit from host to host while sucking blood. In ruminants the most important ticks borne diseases are thieleriosis including East Coast Fever and tropical thieleriosis, heartwater, anaplasmosis, babesiosis and ehrlichiosis. These diseases generally affect the blood and /or lymphatic system and cause symptoms of: fever; anemia and jaundice due to the destruction of red blood cells anorexia; weight loss; milk drop; lymph node swelling and dyspnoea abortions and death. With heartwater symptoms of nervous disorder; dyspnoea, diarrhea and peracute death can be seen (FAO, ١٩٩٨a).

When tick – borne diseases (TBDs) are mentioned it generally refers to blood parasites. The five most important ones in livestock are Anaplasmosis, Babesiosis, Cowdriosis , Theileriosis and Ehrichiosis. Worldwide ups to ٥٠٠ million cattle are exposed to one or more of these TBDS. However indigenous cattle breeds often have devolved acertain degree of natural resistance to them. In some TBDs a passive acquired or innate immunity is seen under circumstance of enzootic stability. By introducing exotic (susceptible) cattle breeds to upgrade livestock production, TBDs can cause a high morbidity and

mortality. Other diseases transmited by ticks are Q-fiver (Coxiella bruntii) tick-bite-fever (Rickettsia coroni); Nairobi Sheep disease; tick paralysis ; tularemia; TBE –virus complex; Crimean-Congo Hemorrhagic fever; Rocky Mountain spotted fever; Russian spring –summer encephalitis and other viral diseases (FAO, ١٩٩٨c).

Most of the important species of Africa ticks are found in Sudan (Hooestraal, ١٩٥٦). The major contribution in tick ecology and tick-borne disease research in Sudan originated from FAO tick control project (GCP/SUD/٠٢٤/DEN) between ١٩٧٨ and ١٩٨٢. The relation- ship between Amblyomma Lepidum infestation and epidemiology of heartwater in Kassla province was investigated by Karrar *e tal* (١٩٧٧); Osman *etal*;(١٩٨٢)and Osman, (١٩٩٠).

Ahmed Hussein; (١٩٩٩) carried out a study at White Nile and examined cattle in five different locations and found eleven different species of Ixodid ticks including:

Amblyomma.Lepidum, Al..varigatum,. Boophilus.annulatus, B.decolartus, Hyalomma anatolicum anatolicum , H. exeavatum, H. dromedaric, H. varginatum rfipes, H.trucatum and Rhipcephalus.

١,٣,٣ Babesiosis

There are two important cattle Babesia species in Sudan *B. bovis* and *B. bigemina*. The latter is transmitted by *Bophilus decoloratus* and *Bophilus annultas* while *B. bovis* is only transmitted by *Bophilus annulatus* (Abdulla,

١٩٨٤). Little is known about the incidence of babesiosis in local Sudanese cattle. A sever outbreak due to *B.bovis* with heavy mortality among cattle was reported in Sagadi area (White Nile) in ١٩٧٩; (FAO, ١٩٨٣; Tachell,١٩٨٣). In addition, several minor outbreak of *B.bovis* were further reported to occur from time to time in indigenous breeds (Jongejan *et al*; ١٩٨٧). The same authors reported that *B. bigemina* demonstrated by serological test in Blue Nile, was shown to be of wide spread, but no mortality could be attributes to this parasite. Also investigation indicated that *B.bigemina* was found to be a minor cause of economic losses in the Sudan (FAO, ١٩٨٣)

١,٣,٤. Theileriosis

The genus Theileria comprises several species cause different disease syndromes in livestock. Four species have been reported in Sudan (FAO, ١٩٨٣), those include *T.annulata, T.parva, T.mutans, T.hirci*.

T.annulata in particular is considered as a major obstacle to the development of livestock industry in northern Sudan (Osman, ١٩٩٠).Latent *T.annulata* infection, were detected in ٣٧٪ of apparently healthy cattle in River Nile State Northern Sudan, the prevalence rate of infection was higher in adult Cross breed than in indigenous cattle (El Hussein *et al*, ١٩٩١).

١,٣,٥ .Bovine Brucellosis

Brucellosis of cattle, also known as contagious abortion and Bangs disease, it caused by the infection with the bacterium *brucella abortus,* which can also cause a disease of humans known as undulant fever.

Brucellosis infection of cattle cause abortion or premature calving of recently infected animals most often between the fifth and eight month of pregnancy. Infected cows frequently suffer from retained after birth are difficult to get rebreed and sometimes become sterile.

Brucellosis is spread from the vaginal discharge of an infected cow or from an aborted fetus. The organism has an affinity for the reproductive tract and abortion retain placenta, weak calves and infertility frequently occur. Breeding Bulls which are infected can transmit the disease to cows at the time of service by infected semen produced from an effected cow my also harbor the organism. The infected milk creates a public health hazard, as this is the organism that causes undulant fever in humans (The Cattle Website Experts, ٢٠٠٤c).

Brucellosis was reported in Sudan as early as ١٩٠٨; (Haseeb, ١٩٥٠). *B.abortus* was first isolated from a diary farm in Khartoum (Bennett, ١٩٤٣) while *B. meletensis* was isolated from goats milk among British residents in Gazira State (Barakat), (Daffalla and Khan, ١٩٥٩)Thereafter many investigators reported the disease from different parts of Sudan (Dafalla, ١٩٦٢, Shigidi and Razig, ١٩٧١,Ibrahim, ١٩٧٤, Musa and Mitchel, ١٩٨٥).

In another study Musa *et al* (١٩٩٠) undertook the subject of identification an behavior of *Brucella .species* isolated from infected cattle under nomadic, semi nomadic and sedentary husbandry system in Southern Darfour, a total of ١٠٤٠ head of cattle examined ٢٠٪ were positive,

accordingly they concluded that Brucellosis was widespread in the area. Omar *et al* (١٩٩٠) tested serum samples collected from native crossbreed and exotic dairy cattle in Khartoum State and the result obtained was ٠,٥٧٪, ٩,٢٢٪, ٢٨,٧٢٪ in ١٩٨٨, ١٩٨٩ and ١٩٩٠ respectively.

١,٣,٦. Hemorrhagic septicemia

Classical hemorrhagic septicaemia is a particular form of pasteurellosis caused by *pasteurella multocida* and manifested by an acute and highly fatal septicaemia in susceptible cattle and water buffaloes.

The name hemorrhagic septicaemia is used rather loosely in some countries to include pneumonic pasteurellosis (shipping or transport fever), a disease caused mainly by *p. hemolytica*, although various serotypes of *p.multocida* are occasionally involved. Although the morbidity of pneumonic pasteurellosis of cattle can be high, the mortality rate is much less than that of hemorrhagic septicemia.

Hemorrhagic septicemia is caused by two serotypes of *p.multocida*; namely, B: ٢ and E: ٢.The letter denotes the capsular antigen as determined originally by the indirect hemagglutination test of Carter (١٩٨٤), and the numeral ٢ stands for the somatic or O antigen as determined by the agar gel diffusion precipitin test developed by Heddelston (١٩٧٢).

In a new classification, *pasteurella multocida* strains causing most pasteurella infections, including hemorrhagic septicemia, are called

p.multocida subspecies *multocida(Web site* file://f:\HEMORRHAGIG;٢٠٠٤-١١-٠٧).

Hemorrhagic septicemia in epidemic form is a disease mainly of cattle and water buffaloes either maintained separately or together. Radical changes in weather, including the advent of monsoons, debility caused by seasonal levels of low nutrition, and the pressure of work (draft animals) are related to the explosive occurrence of the disease in certain parts of the world.

Hemorrhagic septicemia in cattle in Sudan was first reported in the Nile province (Anon, ١٩٣٣).The disease was then reported from all over the (Anon, ١٩٣٣- ١٩٥٩). In ١٩٤٣ formalized whole cultural vaccine prepared from a field strain was adopted for the control of the disease. Shigidi and Mustafa (١٩٧٩) worked in the vaccine. Mustafa, (١٩٨٦) improved the quality of the vaccine in the Sudan by using different adjuvants. Muna *etal* (١٩٩٥) mentioned that the adjuvants improved the gauilty of Hs vaccine and future vaccine in the Sudan should be prepared with addition of the potash alum, ZnSo٤or Al (OH٣).

١,٣,٧ **Trypanosomiasis**

Cattle trypanosomiasis is caused by the trypanosomes *T.brucei*,*T.congolense* and *T.vivax* which are transmitted by various members of the tsetse fly species Glossina .Zebu cattle are very sensitive to trypnosomiasis and after infection they rapidly lose weight and die within several months. This is the major reason why it is very difficult ,if not impossible, to breed cattle within the tsetse belt ,especially since there are

many nomadic tribes in Africa that move from one place to another with animals by which it is very difficult to avoid contact with tsetse.

The indigenous African cattle, called N,dama, is much more resistant to trypanosomiasis and the animals may develop some kind of immunity. Although they develop the disease, the animal do not die and so the said to be trypanotolerant.

The only possibility to breed cattle in Africa in an economically interesting way is in large ranks, where the cattle is checked routinely by a veterinarian for the presence of the infections. When the animals are infected, they are mass-treated with drugs, such as Ethidium, isomethamidium or berenil. These drugs are effective, both for treatment and prophylaxis, but are supposed to intercalate into the DNA and therefore are suspect to be mutagenic Website.file://:F:\Trypanosomiasis ٢٠٠٤-١١-٠٧).

Bovine trypanosomiasis is regarded as one of the major enzootic disease of cattle in Sudan(karib,١٩٦١;Hall *etal*, ١٩٨٣،١٩٨٤).the prevalence of the disease and its vectors have been investigated by several workers (osman ١٩٧٢;Yagi;nd Abdrazg,١٩٧٢;Hall*etal*,١٩٨٤).

Kheir *eta*l (١٩٩٥) studied the disease in southern Sudan and they reported low levels of infection, this was similarly reported by Hall et al (١٩٨٣), Rahman and Abdoon, ١٩٨٢).

١,٤. Others Diseases

١,٤,١. Bovine Salmonellosis

Few workers investigated the prevalence of Salmonella in cattle in Sudan, Horggan, (١٩٤٧) investigated an outbreak of food poising at Wad Medani and isolated *S.dublin* from stools of two persons who feel sick after eating meat. Soliman and Khan, (١٩٥٩) reported an outbreak of salmonellosis in a small herd of cattle at malakal and isolated *S. dublin*. Khan, (١٩٦٢) isolated S.dublin from one out of (١٦١) apparently healthy cattle and Salih, (١٩٧٢) isolated Salmonella from retail meat. Abdel Rahman *et al*, (١٩٩٥) isolated Salmonella from faecal samples of diseased calves.

١,٤,٢ .Black Quarter (blackleg)

Clostridia chauvoei *(C.ferseri*) cause blackleg disease which is an epidemic fatal disease of cattle and sheep (Sterne and Batt; ١٩٧٥) the disease was reported in Sudan in ١٩٣٩ in Kordofan province Western Sudan (Anon; ١٩٣٩ –١٩٤٥). In ١٩٤٤ the first successful isolation of the etiological agent was done and used to replace the imported strain for vaccine production (Anon, ١٩٣٩ – ١٩٤٥). El Azhari *et al*, (١٩٨١) isolated a local Sudanese strain of *C..chuvoei* Kadougli١K). El Sonousi *et al*, (١٩٧٧) used CH٤ for challenge. Other workers had confirmed the pathogenic properties of, K١ strain (Elsawi; ١٩٨٦, El Hag; ١٩٨٦).

١,٤,٣. Contagious Bovine Pleruropneumonia (CBPP)

Contagious bovine Pleruropneumonia (CBPP) is a highly contagious acute, subacute, or chronic infection primarily of cattle caused by *Mycoplasma mycoides subsp. mycoides* (small colony type,). The disease is characterized by sero-fibrinous pleuritis, pulmonary interlobular septa thickened by edema and/or connective tissue and consolidation and necrosis in the lung (Bvinevol١٣/page١, ٢٠٠٤).

The first record of CBPP was in Germany in١٦٩٣. From Germany, the disease spread over all Europe,.In١٨٤٣,it was introduced into the United States via a dairy cow that was purchased off a ship from England. By ١٨٨٤ it had become wide spread.

M.mycoides subsp.mycoides was first isolated and cultivated in artificial media in France by Nocard and Rouxin ١٨٩٨ (Bovinevol٣/page٣, ٢٠٠٤).CBPP is present in parts of Africa, Asia, Spain, and Portugal. It had been observed following long transportation and mixing of cattle from different localities (Blood *et al,* ١٩٧٩) these two factors may be important epidemiological characteristic.

In Sudan *M.mycoides subsp mycoides*, the causative agent of contagious bovine pleropneumonia (CBPP) is still one of the major diseases that cause serious economic loss among young and adult animals. In adults the disease is

characterized by rise in body temperature, coughing, laboured respiration, nasal discharges and progressive loss of body weight.

Experimentaly, arthritis had been produced in calves by intratracheal inoculation of a virulent strain of *M.mycoides subsp. mycoides* (Harbi and Salih,١٩٧٩) .Under field conditions; clinical signs and pathological lesions of CBPP can pass without observations since the swelling of joints usually subsides and the animals appear normal a few days after the onset of the disease, this was the situation when a natural outbreak of CBPP among adult and young cattle at the Kanana Sugar Company was investigated in January ١٩٨٧, (El – Tahir *et al;* ١٩٩٥).

١,٤,٤. Bovine farcy (Dermatophilosis)

Bovine farcy is a chronic infectious disease of cattle affecting mainly Zebu.

The disease is one of the important mycobactrial infections. Nocard (١٨٨٨) was the first to isolate and describe the causative agent. In Sudan the disease was reported for the first time in ١٩٢٩ (Annual report of veterinary science ١٩٢٩). (Elsanowsi *et al* ١٩٧٧) stated that the causative agent is atypical Mycobacterium thus supported Asselineau (١٩٦٩) and Chamoiseau (١٩٧٣) .Awad and Karib (١٩٥٨) found that ١٤,٦٪ of the carcasses condemned at Malakala abattoirs Southern Sudan were due to bovine farcy. Later Mustafa (١٩٦٧) reported ٣٦,٦٪ at Omdurman central abattoir, Awad Elkareem and Mustafa (١٩٧٤) reported ٧٪ and Hamid *et al* (١٩٩١) reported only ١٪ from the

same abattoir. Hussein (٢٠٠١) using indirect ELISA found that out of ١٣٥ serum samples from Kordofan areas, ١٢٥(٩٢,٧١٪) were positive for Bovine farcy.

١,٤,٥. El heesh

It was recognized since ١٩٥٦ by Griner *et al* as a fatal disease, of young cattle in feedlot in the United State of America. In (١٩٦٠) Kennedy and others described the characteristic pathological lesions of the disease and were able to isolate the etiological agents, which were later named as *Haemophilus somnus* by Bialie (١٩٦٩). Kennedy *et al*, (١٩٦٠) were able to reproduce the disease experimentally in cattle via intravenous route.

The disease was subsequently reported in many countries all over the world by many investigators (Humphery and stephens, ١٩٨٣).

This disease is known locally as (AL Heesh). Field veterinarians related the disease initially to Theileriosis, foot and mouth disease (FMD) and fascioliasis (Eltom notes, ٢٠٠١). Elsanowsi *et al*; (١٩٩٨) succeed in isolating the causal organism, which he defined as *Haemophilus. somnus* and he reported the disease as Infectious Thromboembolic Meningoencephalitis (ITEME). Symptoms of disease were first observed in cattle with high percentage of foreign blood that had acquired FMD infection. Nevertheless subsequent reports of the disease include the local breed (Eltom, ٢٠٠٣). Few had known about this disease in Sudan, although some investigations were conducted. Elsanowsi and Randa (١٩٩٨) did experimental infection of cattle

with *H.Somnus*, ELtom and Hassan, (٢٠٠١) conducted treatment trial Elgazali Gumma, (٢٠٠٢) studied the disease in cattle in western Sudan and reported that the prevalence rate of the disease in the total cattle population of the state was about ٣,٢٪.

١,٤,٦. Mastitis

Mastitis is recognized as one of the major disease problems concerning the dairy industry (Jain,١٩٧٩).The disease result in a major loss in milk yield (Blosser, ١٩٧٩), various attempts had been made to quantify the reduction of milk yield in relation to both clinical and subclinical mastitis (Forster; ١٩٦٤). On the other hand King (١٩٧٤) observed highly significant differences between healthy and diseased animal and this was proved later by Wagner ;(١٩٧٨) and Timms and Scultze; (١٩٨٧). Futher Ashworth *et al* ;(١٩٦٧), Meyer, (١٩٨٠) O'leary and Leavitt (١٩٨٣) and Shuster, (١٩٨٨), reported significant difference between the infected and the none infected quarters in the same cow. Ebtisam *et al*, (١٩٩٩) showed a highly significant reduction in milk yield due to mastitis and this was also reported by Mcfadden *et al* (١٩٨٨). Hamid *et al*, (١٩٩٨) Isolated Nocardia from Zebu cattle suffering from mastitis.The public health significance of this disease in Sudan has been highlighted by Ibrahim, (١٩٦٨). Ibtisam *et al*, (١٩٩٥) assessed the production loses and economic importance of mastitis. Therapy doesn't improve milk yield, (Oleary and Leavitt, ١٩٨٣). Moreover mastitic quarter's milk yield will never return to

its production values; (Mcfaddan *et al*, ١٩٨٨), even in the following lactation's, (Lucery and Rowlands, ١٩٨٤).

١,٥. Internal Parasites

The economic losses from worm parasite infections of cattle can be significant. Calves under one year of age are more susceptible than older cattle that frequently have been exposed to the parasites and have developed a degree of immunity. Adult worms in cattle produce eggs that are passed in the manure. The eggs hatch producing larvae that developed and move up onto the pasture grasses where cattle consume them. Eggs can survive the winter and hatch out with warm weather. Infection is most likely to occur when temperatures are between ١٥c° and ٣٠c° and there is adequate rainfall. Deworming prior to the grazing season will greatly reduced the contamination of pasture during the grazing season. Cows dewormed in fall usually have a higher conception rate the next breeding season, winter better and wean heavier calves (cattletody.info, ٢٠٠٤).

In Sudan, Knowledge on the incidence of internal parasites in domestic animals came from the surveys and from the studies conducted by Abed Malek, (١٩٥٩), Esia, *et al* (١٩٦٢),Esia and Dali(١٩٦٣), Esia, *et al* (١٩٧٦),Saad *et al*,(١٩٨٣),El-Awad, (١٩٨٧) Saad and Magzoub,(١٩٨٩),Ali -babiker,(١٩٩٣) and Mohammed El-Amir (١٩٩٥).Parasites cause serious mortality but their true damage comes from the high degree of mortality and the reduced herd efficiency. Unfortunately, there is lack of statistical records on the mortality

and financial losses due to parasitism. Esia (١٩٦٦) investigated the incidence of helminthes parasites of cattle in Upper Nile province, and found that the total strongyle eggs –per gram counts never exceeded ٨٥. He believed that the continuous and wise used of phenothizine had reduced the contamination of the pasture which resulted in protection of young animals from heavy infestations early in their lives. Esia, (١٩٦٦) stated that investigations carried in Upper Nile province in ١٩٦٤ indicated that these infections caused high economic losses in cattle to the extent that the Morly cattle with about ٧٦٪ incidence, did not find any market to accept them. Khawad *et al*; (١٩٧٦) observed no egg indicating the presence of nematod in cattle, sheep and goat in Equatoria, Bahr-El-gazal and Upper Nile. Never the less they reported that the incidence of *C.boves* in cattle was ٩٪ in Equatoria and ١٨٪ in Upper Nile simillary. In Western Sudan it reached ٢٣٪, in Khartoum province Gotbi and Suliman; (١٩٧٥) showed an infection rate of ١,٠٪ in cattle slaughtered at Omdurman central abattoir.

١,٥,١. Schistosomiasis

Shistosomiasis is one of the most common parasitic diseases of man and domestic animals, the disease is a considerable public health problem in developing countries ,In Asia, Africa and South America (WHO; ١٩٨٥)*Shistosoma bovis* was discovered in Egypt and described ١٨٧٦ by Sansino Since then it had only been recorded in Egypt on one other occasion (Soliman; ١٩٥٦). Malek (١٩٦٩) suggested that *S. matthei* might occur in the

southern region of Sudan. *S. bovis* was first reported from Sudan in ١٩١٥ when an infected cow was recorded in the White Nile province. Several epizootic of *S. bovis* infections were recorded among cattle and sheep causing heavy economical loses (Eisa; ١٩٦٦), (Hussein;١٩٦٨) The parasite was also shown to occur in the western and eastern province of the country ,(Malek;١٩٦٩) , (Hussien;١٩٧٣) (El -Badawi and Slepnov ;١٩٧٦) A/Magid; (١٩٧٩) Carried out a survey in Kosti cattle slaughter house and found that among ٣٨٧ cattle examined ٨٤٪ harbored bovine schistosomiasis . A prevalence of ١٠٠٪ was found in cattle at the age of eight years in preliminary cattle survey at Ummhani village and the over all prevalence in these animals was approximately ٨٨٪ and that cattle as young as three months were infected. The over all prevalence of *S. bovis* in cattle in both the Hissay village and Abba Island was found to be ٤٨٪ (A/Magid, ١٩٧٩).

١,٥,٢. Fascioliasis

Fascioliasis is one of the disease that cause major economic losses. The disease is cause by two species *Fasciola .gigantic* (Cobbold; ١٨٥٥) and *F. hepatica* (Linnaeu١٧٥٨), the most common liver fluke in Africa is *Fasciola gigantica* and only few reliable records of *F. hepatica* occurs, though this species is believed to cause a high prevalence of fascioliasis in Lesotho (Brown ١٩٨٠).

Generally human fascioliasis is rare in Africa Goldsmid (١٩٧٥) perhaps because Africans do not usually eat water-grass, the common source of infections in Europe, North America, Asia and Australia

In Africa Fascioliasis is present in almost every country. On of the basis of cattle livers condemned at abattoir, a prevalence of ١٠,٣٪ was found in Zimbabwe during the period ١٩٥٦ to ١٩٦١and ٥٧٪ in South Africa during the Years ١٩٥١ to ١٩٥٧(Pantelouris, ١٩٦٥). In Nigeria, when ١٤،٢٧٠ cattle were examined the prevalence was found to be ٣١,٧ %(Malek; ١٩٨٠).

In Sudan in ١٩٤٨ sever outbreaks with heavy moralities were encountered in the White Nile province among cattle and sheep. In ١٩٥٩ an outbreak near Wau in Bahr El-Gazal province in which ٦٠ cows perished, was also reported. In ١٩٧٣ a high number of sheep near Kosti died from Acute fascioliasis (Haroun; ١٩٧٥).

Fasciola. gigatican was first mentioned in ١٩١٤ in the annual reported of the Sudan veterinary service (S.V.S). In١٩٣٨ fascioliasis was again reported in Malakal, in١٩٣٨ the disease in upper Nile province was reported to be more prevalent than previously believed, especially after the heavy rains of ١٩٣٨. The annual report of ١٩٤٨ recorded fascioliasis during the dry months of the year causing mortality among cattle, goats and sheep in the river areas of Kosti and El-Dueim in White Nile province. The report of ١٩٥٣-١٩٥٤ stated that the incidences of fascioliasis increased in Kosti and ElDuiem district. it was also reported that of more than ٣٠,٠٠٠ cattle slaughtered ٥٥-

٦٧٪ of livers were condemned because of *F.gigantica* infections. The annual reports since ١٩٥٥ indicated that the highest percentages of liver condemnation due to fascioliasis were as follows

Upper Nile province (٢٧-٣٨٪) Bahr ElGazal province (١٨-٦١٪) Equatorial province (١٣-٤٠٪) and the Blue Nile province (٧-٤٣٪) .

١,٥,٣. Paramphistomiasis

Paramphistomiasis is caused by several species of rumen flukes which infect cattle and sheep in various parts of the world. Infections with the adult flukes do not seriously affect the animals; however, the disease is caused by immature worms while still in the intestine before migration to the stomach. When present in large numbers in the intestine the young immature paramphistomes are pathogenic, particularly for sheep of all age. According to Malek; (١٩٨٠), fatal outbreaks of intestinal paramphistomiasis has occurred in many parts of the world. paramphistoma rumen flukes have an almost world wide distribution according to Malek (١٩٨٠), *paramphistomum crvi* has been reported from Germany, USSR, Bulgaria, Poland France, and Italy. *P. microbothrium* is reported from Italy, Yugoslavia, Bulagaria and Hungaria. In Asia *P.microbothrium* has been reported from Iran, Israel and India. In USA paramphistomes of the rumen seems to occur more in American cattle than in other ruminants Malek; (١٩٨٠).

Animals in Africa are commonly infected with several species of stomach flukes at the same time (Malek; ١٩٨٠). Malek (١٩٥٩) found that about

٩٠٪of cattle slaughtered in the region of the White Nile reservoir were infected with these flukes. Intisar; (١٩٩٢) found high infection in the White Nile.

١,٥,٤. Onchcercosis

Onchocerciasis is a chronic infectious disease of man and animals caused by filarid worms of the genus Onchcerca and transmitted by *Culicoids species*, *ceratopigonidae* and *mosquitoes*. The disease is known by different names for example worm nodular disease, summer mange, allergic dermatitis," Wahi" and "Kasen" in cattle. The microflariae are found mainly in the blood of infected animals and cause the major symptoms whereas the adult filaria resides in different parts of the body causing nodular lesions and dermatitis. The disease affects man, cattle, horses, donkeys, camels, sheep and goats (Soulsby, ١٩٨٢).

Infestation by the filarid worms of Onchcerca species cause rejection of meat for human consumption, while their microflariae have been associated with ocular and skin lesions (Blood *et al* ١٩٨٣).

Further studies showed that the largest infestation is found in the skin of wither followed by the skin of the rump then the skin of the abdomen, the skin of tail and finally the skin of the ear.

EL Sinnary & Hussein (١٩٨٩) reported the transmission of *O. gutturosa* in Shambat (Khartoum North) in Sudan where the parasite is endemic and high percentages of cattle were infected. *Culicoides ringi* probably serves as a natural vesctor of *O. gutturosa* in the Sudan.

El Sinnary and Hussein, (١٩٨٩) were able to release *O.armillata* from the aorta of infected Sudanese cattle by the injection of normal saline in tunnels and nodules followed by gentle traction of the worm.

CHAPTER TWO

MATERIALS AND METHODS

٢,١. Study areas

٢,١,١. Location

The White Nile and Gezira States are situated in central Sudan. The White Nile State is neighboured on the east by Sinnar State, on the north by Khartoum state, on the west by Kordofan state, and on the South by Upper Nile State-Figure (٢,١).

Gezira state, the second study area, is boarded by Sinnar State to the south, to the North by Khartoum State, to the west by the White Nile state and to the east by Gadarife state- Figure (٢,١). Most of the areas of the two states lie between the blue and white Nile with its rich soil and abundance of water

٢,١,٢. Climate

Weather data of the two States are made available from (meteorological stations ٢٠٠٣). Throughout the year different types of climates prevailed. Maximum day temperature was ٤١c° in April and the minimum temperature was ٢٤c° in January. The rainy season was between June and October but the bulk of rain fall took place during the period between July and September, the annual rain fall average ranged from ٢٠٠mm in the poor Savannah zone to ٥٠٠mm in the rich Savannah in the southern part of the two states. The amount of rain fall in rich Savannah belts supported the growth of light to heavy Savannah grasses.

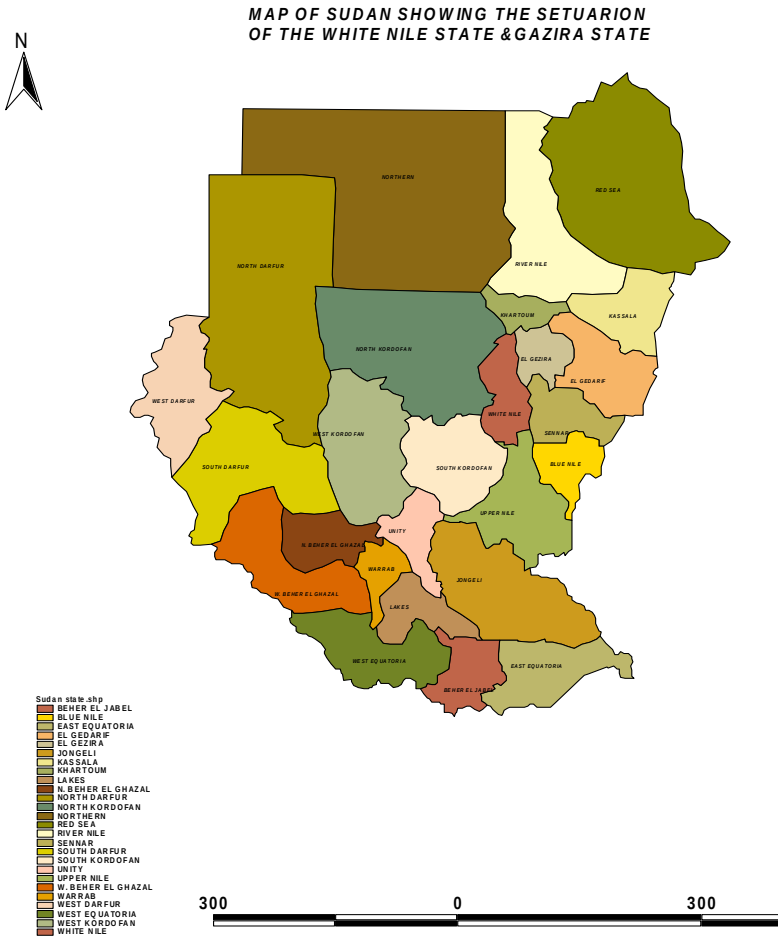

Figure (٢،١): - Map of the Sudan showing the situation of the White Nile State &Gezira state (Blue Nile).

٢،١،٣. Livestock population management

White Nile state holds a livestock population comprising ٢٩٨٥٩٣٤ cattle, ٢١٧٢٣٨١ Sheep, ٢٠٠٤١٩٤ Goats and ٢٥٠٥ Camel's and large numbers of donkeys, horses, dogs and cats,(Kosti Vet Office, ٢٠٠٣) Gezira state has a livestock comprising ٢٢٦٠٢٠٤ cattle, ٢٤٨٢٢٠٠ sheep,١٦٠٧٥٥٠ goat's, ٨١٩١ Camles,٢٥٠٠ Horses, ٧٨٦ donkeys ,and a large number of dogs and cats,(Gezira, Vet office ٢٠٠٣).

The major sector of the population in the White Nile State is nomadic cattle owners but in Gezira state they are farmers and their main occupation is land cultivation (Gezira project). In the White Nile state the main cattle belt is in the rich Savannah, the need for good grazing forces the nomads to migrate into wet areas in the southern part of the belt and reach the upper Nile state. Sheep and goats are grazed in poor Savannah in dry season. Camel on the other hand are raised in the western borders in the White Nile state and eastern border of Gezira state.

٢،٢. Study sites

Established farms were chosen to carry out this study. They were included in the study to monitor the disease hazards to dairy industry in the ecological system of the two states. Five different farms had been chosen in each state to carry out the investigation on external parasites, internal parasites, blood parasites, udder infection and Brucellosis as a group of affections that affect production. At White Nile state the farms were as shown in Figure (٢،٢).

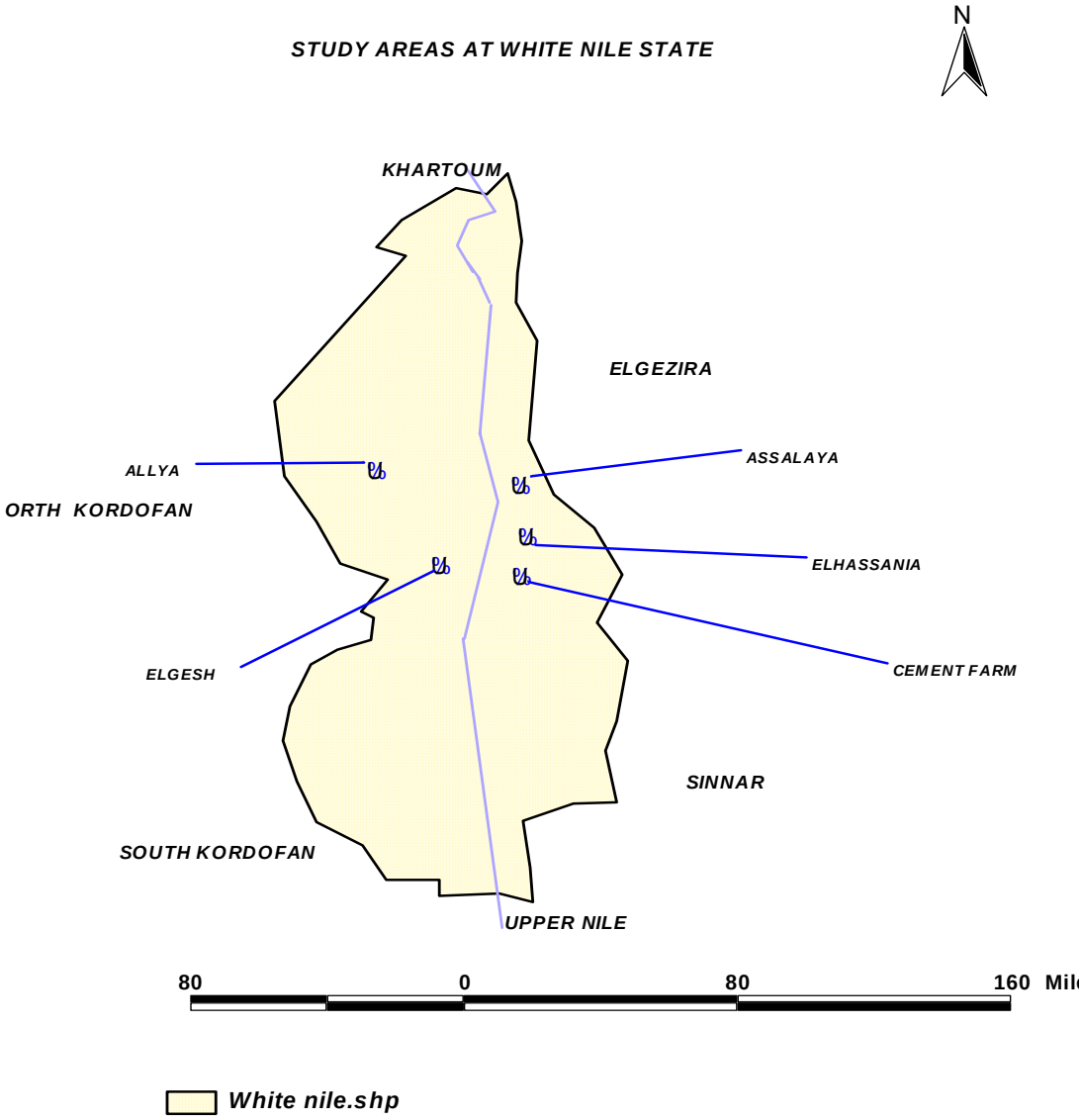

Figure (٢,٢): map showing the study areas at the White Nile State

Ellya farm, Elgesh Dairy farm, Elhassania farm and Cement factory farm.At the Gezira State the farms were as shown in figure (٢،٣). Ubusineana farm, El-Fuaida Ozzisat farm, Yasir farm, El-ghadia farm and El-denegila farm.

The farms were selected on the following bases

- The numbers of dairy cattle in each farm which constituted ranged between (٧٥-١٢٠).
- The different management system in the different farms which were semi intensive, intensive and opened system.
- The geographical distribution of these farms , which covered the area of the two states.
- The lack of recent information about the diseases of dairy cattle in these areas.

Adult milk in cows were included in the study.

This study aims at providing information on disease of dairy cattle irrespective of clinical manifestations.

٢،٣. Sample size and data collection

The sample constituted ٢٥ dairy cattle randomly chosen from each selected farm and a total of ١٢٥ cattle from each state were subjected to clinical and laboratory examinations.

Data about management, nutrition and milk production were also collected in a pre-designed form (Appendix).

٢,٤. Management and production data

The management system was observed and reported the system were classified as semi-intensive or open system. The level of milk production was observed and the range of milk production was reported in litres.

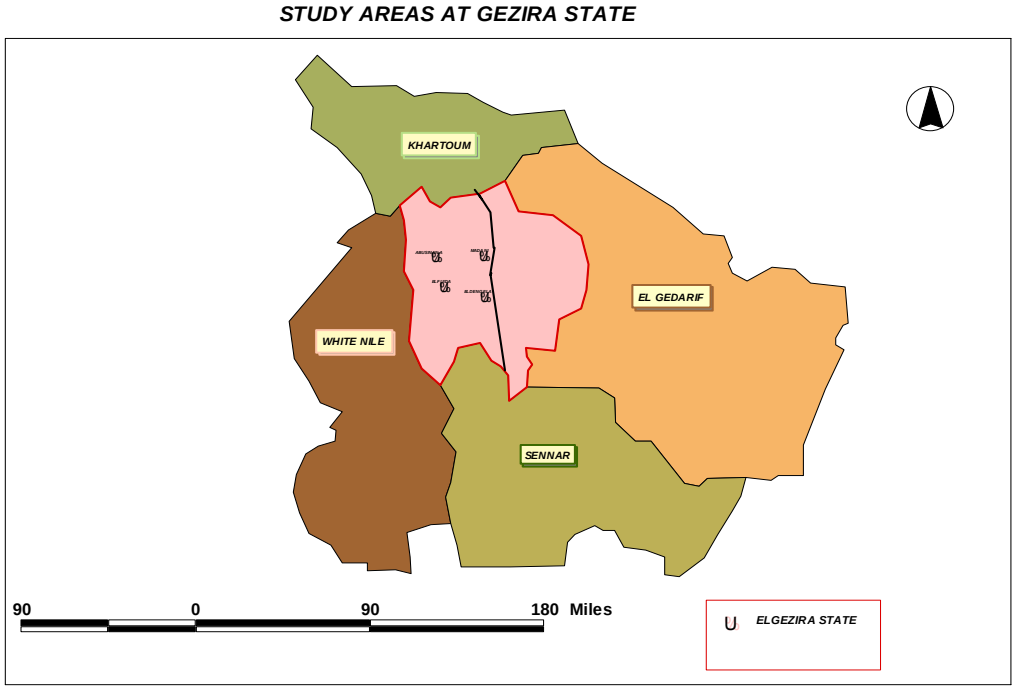

Figure (٢،٣): map showing the study areas at the Gezira State

٢,٥. Clinical investigation

Each cow in the study group was examined clinically for any abnormal conditions and the vaccination record was inspected.

٢,٥,١. Mange inspection

The animal was examined visually for mange infestation and the result was recorded.

٢,٥,٢. Ticks inspections

Animals were examined in standing position and were partially restrained. The process was done by searching the animal and passing the hand over certain body areas such as the brisket, dewlap, axiallary region, hump, ears, and inner hind legs and under the tail, the method of search was simple and quick. A cow was considered as heavily infested when more than five ticks were found.

٢,٦. Laboratory investigations

٢,٦,١. Faecal samples

Faecal samples were collected from each animal in the study group in nylon sachet, the faecal samples were examined using direct , sedimentation and floatation techniques for the helminthes ova.

٢,٦,١,١. Direct Method

The direct smear, is made by mixing small portion of faeces in a drop of water on a slide until a uniform suspension was secured, any large pecies of solid matter was removed and the film of faecal suspension was covered with

a cover slip and examined under low power of microscope (١٠×٢٠) (Kelly;١٩٨٤).

٢,٦,١,٢. Sedimentation Method

A leveled dessert spoonful of faeces is thoroughly mixed with ٣٠- ٤٠ volumes of water; the suspension is then poured through a wire mesh screen with an aperture of ٠,١٥mm in a cylinder and allowed to stand for ٢٠ minutes. The supernatent fluid was then discarded. The process of mixing, sedimentation and decantation was repeated until the supernatant fluid is clear a small quantity of the final sediment was withdrawn with pipette and transferred to microscope slide., a cover slip then applied and examined microscopically under low power (Kelly; ١٩٨٤).

٢,٦,١,٣. Floatation Method

For the method a level dessert spoonful of faeces was placed into ١٠-٢٠ times, volume of saturated salt solution (٦٦٠gSodium chloride dissolved in water to ٢,٤ L), in a stoppered glass containing about ٤٠-٥٠ small glass balls, thoroughly shaken and the suspension poured into a wire mesh sleve with an aperture of ٠,١٥, standing in a funnel into a centrifuge tube and the tube was allowed to stand in a rak for about ٣٠ minutes. Any ova at the surface of the solution maybe recovered by filling the tube to the brim with the flotation solution and then touching the meniscus lightly with the under side of cover slip held horizontally, the resulting drop on cover slip was then placed on microscope slide for examination (Kelly;١٩٨٤).

٢,٧. Blood samples

٢,٧,١ Serum preparation

Blood samples were taken as described by Alton (١٩٧٥), the skin over the jugular vein was rubbed with ٧٠٪ alcohol and disinfected, by application of tincture of Iodine, then ١٠ ml of the blood was withdrawn using a vaccinator, samples were put in a rack under shade, before taken to the laboratory with minimum possible shaking.

These samples were kept overnight at ٤C° in a refrigerator to separate the serum; some times the blood samples were centrifuged at ٢٥٠٠ rpm for five minutes to separate the serum.

٢,٧. ٢ Preparation of dry blood smears

Blood smears were prepared according to the method of Mc Cosker; (١٩٧٥).

A small drop of blood was taken from the ear vein and put on a precleaned microscope slide, and then another slide was used as spreader .The angle between the slide and the spreader was kept acute in order to obtain one cell thick smear. The smear was taken in such a way that the tail of the smear was rounded and did not extend to the end of the slide; the slides were air- dried and immediately fixed in absolute methyl alcohol for a minimum of one minute, stained with Giemsa's stain for blood parasite detection Examination was done under high magnification oil immersion lens.

٢,٧,٣ Wet blood smear

A drop of blood was placed on a clean slide and covered with a cover slip, examined under the microscope at magnification ١٠x٤٠ to check for the presence of trypanosomes and microfilaria (Kelly, ١٩٨٤).

٢,٧,٤. Haematocrite centrifugation technique (Kelly, ١٩٨٤)

٠,٥ ml of the blood was collected directly from the ear vein in heperinzed a capillary tube and then sealed on one side by plastoceal and centrifuges for three minute at ٤٠٠٠rpm. After centrifugation the capillary tube was placed into a clean slide and covered with one drop distilled water then examined under the microscope at ١٠x٤٠ magnification. Trypanosome and microfilaria were checked in the Buffy coat layer.

٢,٨. Rose Bengal plate Test

The Rose Bengal plate Test (RBT) is a single dilution serum agglutination test. The antigen consists of Brucella cells with a packed cell density of ٨٪ stained with Rose Bengal and suspended in acidic buffer at pH ٣,٦ (Morgan *et al;* ١٩٧٨, Anon, ١٩٦٥).It has been used as a screening test (Morgan *et al*; ١٩٦٩).

The procedure of the test was as follows

- Allow capillary action to draw serum up into the capillary tube to the black link (٠,٠٣).
- Place antigen on teardrop spill by covering the whole area and

then compressing the bulb.

- Place antigen (٠,٠٣ml) adjacent to the serum. The antigen must be well mixed and the dispenser held vertically. Mix the serum and antigen with a rod the spread it over the entire surface of the teardrop test area.
- Rock the card slowly about ١٢ times per minute for four minutes.
- Read the result as follows
    ١. Negative no agglutination or clumping, or showing a pattern of dispersed particles without clumps.
    ٢. Positive agglutination, with moderate to large clumps.

Known positive and negative sera are include in each set of test as controls.

٢,٩. Rapid Mastitis Test

In performing the test, about ٣ml of milk from each quarter were drawn into one of the shallow cups of the paddle, and then an equal volume of test reagent (Alvertras solution) is squirted from a squeeze bottle into each pool of milk, clear results were obtained with an access of the reagent, the milk and reagent were mixed by gentle circular rotation of the bottle held horizontally (Kelly; ١٩٨٤).

٢,١٠: Postmortem examination

For farther confirmation of clinical examination a dead cow at El-ghadaia was subject two postmortem examination for gross –pathological

changes. The cow was suspected to suffer from fascioliasis. The symptoms were an extensive swelling covering the dewlap and the thorax.

CHAPTER THREE

RESULTS

٣،١. Management Systems

In the selected farms the semi-intensive (open) plate (٣،١) or intensive system (closed) plate (٣،٢) management practice were followed. The nutritional status and breeds of dairy animals were recorded as shown in tables (٣،١, ٣،٢) .The system of management is not governed by the breed as both groups of local and cross can be kept in either system. There is no significant different between the farms of the White Nile and Gezira in this respect.

The average milk production was recorded for each farm. It was found to range between ٣-٤ liter per cow for local breeds (Kennana and Butana) and ١٣-١٥ liter for their crosses with Freizian .The nutritional status of the dairy cattle of local breeds was found to be poor compared to those of cross bred animals.

٣،٢. Clinical observations

None of the cows examined showed symptoms suggestive of infectious diseases that are vaccinated for which include HS, BQ, CBPP and anthrax. Skin lesion suggestive of lumpy skin disease were observed in two animals at Abu-sinnina dairy farm plate (٣،٣).

Two cows at Yasir dairy farm showed Elheesh syndrome as well as two other at El-ghadaia dairy farm plate (٣،٤). The symptoms of this disease was high fever, respiratory embarrassment, hyper salivation and frothing, tendency to stand under the shade and in wet places, decreased and eventually cessation of milk yield, and the infection of Elheesh took place after the infection of FMD.

All these were confined to Gezira state no such syndromes were noted in the White Nile State during the study period.

One case of traumatic pericarditits was seen in El-ghdaia dairy farm in the Gezira state plate (٣،٥)as confirmed in postmortem examination where a nail was found penetrating the heart.

Plate (٣،١): Feeding system at Ellaya dairy farm showing the provision of Cakes during milking time

Plate (٣،٢): Feeding system at Yasir dairy farm in the Gezira state showing the provision of cotton seeds during milking time

Table (٣،١): basic management and milk production in the selected farms at the White Nile State

Location	Breed	Management	Nutrition	Average of milk production per cow per day in litre
Elhassania dairy farm	Kenana and Botana	Open system	Poor	٣-٤
Cement factory dairy farm	Cross (Friesien +Kenana)	Open system	Good	١٣-١٥
Asslaia dairy farm	Cross (Friesien +Kenana	Open system	Cood	٤ -٧
Elgesh dairy farm	Kenana& Botana	Open system	Poor	٣-٤
Allaya dairy farm	Bagara & Botana	Open system	Poor	٣-٤

Table (٣،٢): basic management and milk production in the selected farms at the Gezira State

Location	Breed	Management	Nutrition	Average of milk production per cow per day in litre
Abu-Sinana dairy farm	Kenana	Open system	Poor	٣-٤
Yasir dairy farm	Cross (Friesien +Kenana	Intensive system	Good	١٣-١٥
Elghadaya dairy farm	Cross (Friesien +Kenana	Intensive system	Good	١٣-١٥
El-Fuida Oizaziat dairy farm	Kenana and Botana	Open system	Poor	٣-٦

Eldinagela dairy farm	Kenana and Botana	Open system	Poor	٣-٤

Plate (٣،٣): Photograph of cow affected with Lumpy skin disease at Abu-Sinana Dairy farm

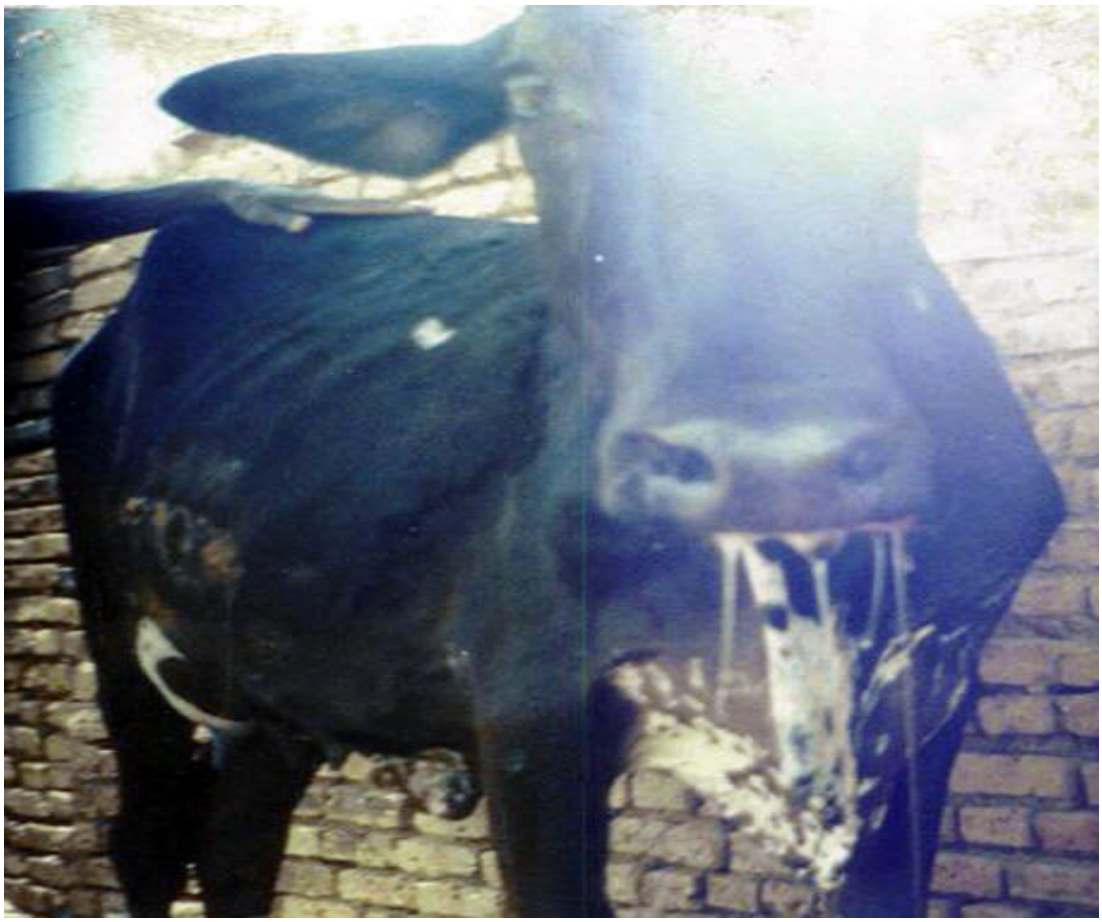

Plate (٣,٤): Photograph of cow affected with Elheesh at El-ghadia dairy farm

٣. ٣. Penside examination results

٣. ٣,١ Mastitis

The result of mastitis among ٢٥٠ dairy cows submitted to (CMT) was detected with some frank clinical cases plates (٣,٦،٣,٧) the distribution in the different farms table (٣,٣ , ٣,٤) was as follows:

At the white Nile areas El-hassania dairy farm ٧ cows were found positive (٢٨٪), at Cement factory dairy farm ٥ cows were found positive (٢٠٪), at Assalaya dairy farm ٤ cows were found positive (١٦٪), at Elgesh dairy farm ١٢ cows were found positive (٤٨٪) and at Ellaya dairy farm ٩ cows were found positive (٣٦٪).A total of ٣٧ cows out of ١٢٥ (٢٩,٥٪) were found positive.

At the Gezira areas at Abu-sinana dairy farm ٤ cows were found positive (١٦٪),at Yasir dairy farm ٢ cows were found positive (٨٪) ,at

Elghadaia dairy farm ٥ cows were found positive (٢٠٪),at El-fuaida Oizaizate dairy farm ٦ cows were found positive (٢٤٪)and at El-denegila dairy farm ٦ cows were found positive. A total of ٢٣ cows out of ١٢٥(١٨,٤٪) were found positive.

Plate (٣،٥): photograph of cow affected with traumatic percarditits at El – ghadaia dairy farm

Plate (٣،٦): Photograph of cow affected with Mastitis at Yasir dairy farm

Plate (٣،٧): The atrophy of the teat due to infection at El-denegila dairy farm

Table (٣،٣): mastitis and brucellosis in the White Nile farms

Farm Name	Mastitis (CMT)	Brucellosis Rose Bengal test
Elhassania dairy farm	٢٨٪	Nil
Cement factory dairy farm	٢٠٪	Nil
Asslaia dairy farm	١٦٪	٨٪
Elgesh dairy farm	٤٨٪	Nil
Allaya dairy farm	٣٦٪	Nil

Table (٣،٤): mastitis and brucellosis in the Gezira State farms

Farm Name	Mastitis (CMT)	Brucellosis Rose Bengal test
Abu-Sinana dairy farm	١٦٪	Nil
Yasir dairy farm	٨٪	Nil
Elghadaya dairy farm	٢٠٪	Nil
El-Fuida Oizaziat dairy farm	٢٤٪	٢٤٪
Eldinagela dairy farm	٢٤٪	٨٪

٣,٣,٢. External parasites

٣,٣,٢,١ Mange and lice infestation

Mange and lice were not encountered in any animal in the two states

٣. ٣,٢. ٢Ticks infestation

At the White Nile state as shown in table (٣,٥)and Figure(٣,١) the number of ticks infested animals was at El-Hassania dairy ١٢ (٤٨٪), at cement factory dairy it was ١٥ (٦o%),at Assalaya dairy ٨(٣٢٪), at Elgesh dairy ١٢(٤٨٪) and at Ellaya dairy ١٥ (٦٠٪).A total of ٦٢ cows (٤٩,٦٪) were found heavily infested.

At Gezira areas as shown in table (٣,٦) and figure (٣,١), at Abusinana dairy ٢١(٨٤٪), at Yasir dairy ٢(٨٪), at El-Fuida Oizaizate ٢٥(١٠٠٪) and at Eldinagela ٧(٢٨٪).A total of ٥٥ cows (٤٤٪) were found heavily infested

٣. ٤. Laboratory examination results

٣,٤,١. Brucellosis

The prevalence of Brucellosis among ٢٥o dairy cows submitted to Rose Bengal test shown in figure (٣,٢).At thes white Nile state Assalya dairy farm showed ٢ cows positive (٨٪)and the Gezira farms at El-fuaida Oizaizate dairy farm ٦ cows were found positive (٢٤٪)and at El-deneglia dairy farm ٢ cows were found positive (٨٪).A total of ١٠ cows out of ٢٥٠(٤٪) were positive..

Table (٣،٥): parasitic infestation in cows in White Nile State farms

Farm Name	Gastro intestinal parasite	Blood parasite	External parasite ticks
El hassania dairy farm	Fasciola ٤٨٪ Paraphm ١٢٪ Shisto ٠٪ Plantidium ٠٪ Trichuris ٠٪ Scaris ٠٪ Monizia ٠٪	Theileria ١٦٪ Babesia ٠٪ Trypano ٠٪ Microflari ٨٪	٤٨٪
Cement factory dairy farm	Fasciola ٨٤ % Paraphm ٦٤٪ Shisto ٠٪ Plantidium ٠٪ Trichuris ٠٪ Scaris ٠٪	Theileria ٠٪ Babesia ٠٪ Trypano ٠٪ Microflari ١٦٪	٦٠٪
Assalaia diary farm	Fasciola ٠ % Paraphm ٦٤٪ Shisto ٨٪ Plantidium ٠٪ Trichuris ٠٪ Scaris ٠٪	Theileria ٤٪ Babesia ٢٠٪ Trypano ٠٪ Microflari ٠٪	٣٢٪
El gesh diary farm	Fasciola ٣٢ % Paraphm ٥٢٪ Shisto ١٢٪ Plantidium ١٦٪ Trichuris ٤٪ Scaris ٠٪ Taenia ٠٪	Theileria ٨٪ Babesia ٤٪ Trypano ٠٪ Microflari ٠٪	٤٨٪
Allaya diary farm	Fasciola ٨ % Paraphm ٨٪ Shisto ٠٪ Plantidium ٨٪ Trichuris ٠٪ Scaris ١٢٪ Monizia ٠٪	Theileria ٤٪ Babesia ٠٪ Trypano ٤٪ Microflari %	٦٠٪

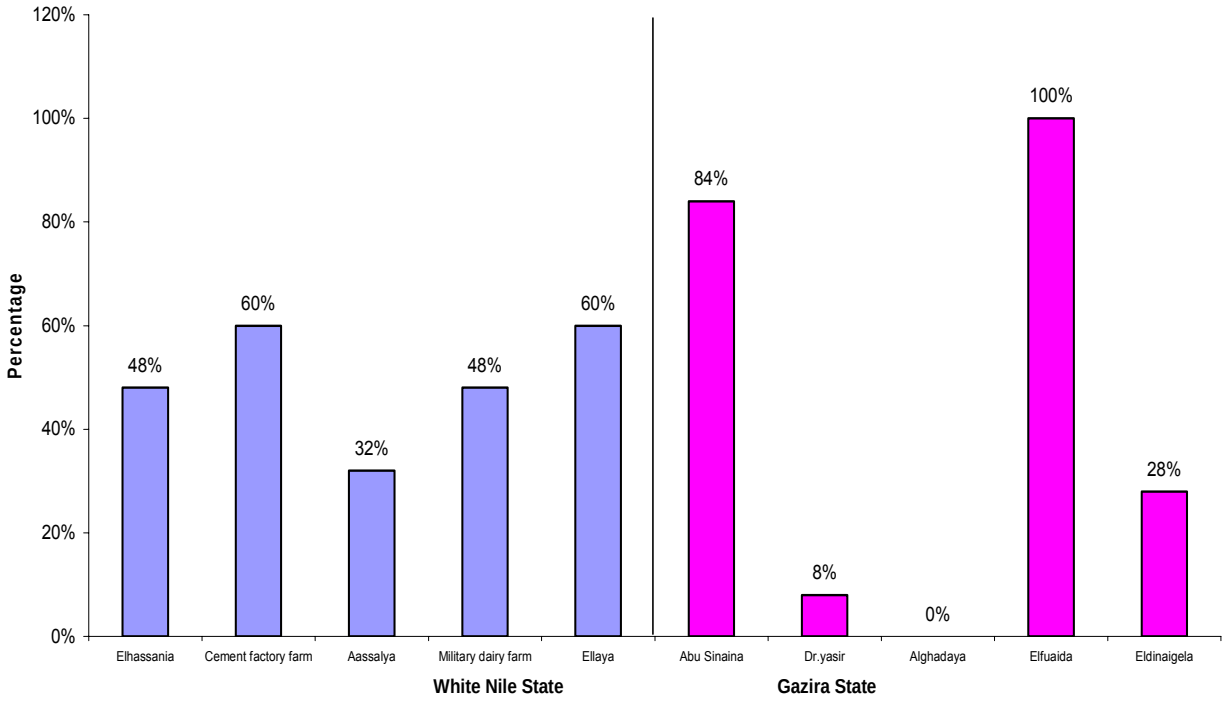

Figure (٣،١) prevalence of ticks infestation among dairy cattle at selected farms in the White Nile and the Gezira States

Table (٣،٦): parasitic infestation in cows in Gezira State farms

Farm Name	Gastro intestinal parasite	Blood parasite	External parasite ticks
Abu-Sinana dairy farm	Fasciola ٣٢ % Paraphm ٦٤٪ Shisto ٠٪ Plantidium ١٦٪ Trichuris ٠٪ Scaris ١٦٪ Monizia ٤٪	Theileria ٠٪ Babesia ٠٪ Trypano ٠٪ Microflari ٠٪	٨٤٪
Yasir dairy farm	Fasciola ٠ % Paraphm ٠٪ Shisto ٠٪ Plantidium ٠٪ Trichuris ٠٪ Scaris ٠٪	Theileria ٠٪ Babesia ٤٪ Trypano ٠٪ Microflari ٠٪	٨ %
Elghadaya dairy farm	Fasciola ٠ % Paraphm ٠٪ Shisto ٠٪ Plantidium ٠٪ Trichuris ٠٪ Scaris ٣٢٪	Theileria ٤٪ Babesia ٠٪ Trypano ٠٪ Microflari ٠٪	Nil
El-Fuida Oizaziat dairy farm	Fasciola ١٢ % Paraphm ٠٪ Shisto ٠٪ Plantidium ١٢٪ Trichuris ٠٪ Scaris ٤٤٪ Taenia ٨٪	Theileria ١٢٪ Babesia ٤٪ Trypano ٠٪ Microflari ٠٪	١٠٠٪
Eldinagela dairy farm	Fasciola ٢٤ % Paraphm ٢٤٪ Shisto ٠٪ Plantidium ١٦٪ Trichuris ٠٪ Scaris ٣٢٪ Monizia ٨٪	Theileria ٤٪ Babesia ٠٪ Trypano ٠٪ Microflari ٨٪	٢٨٪

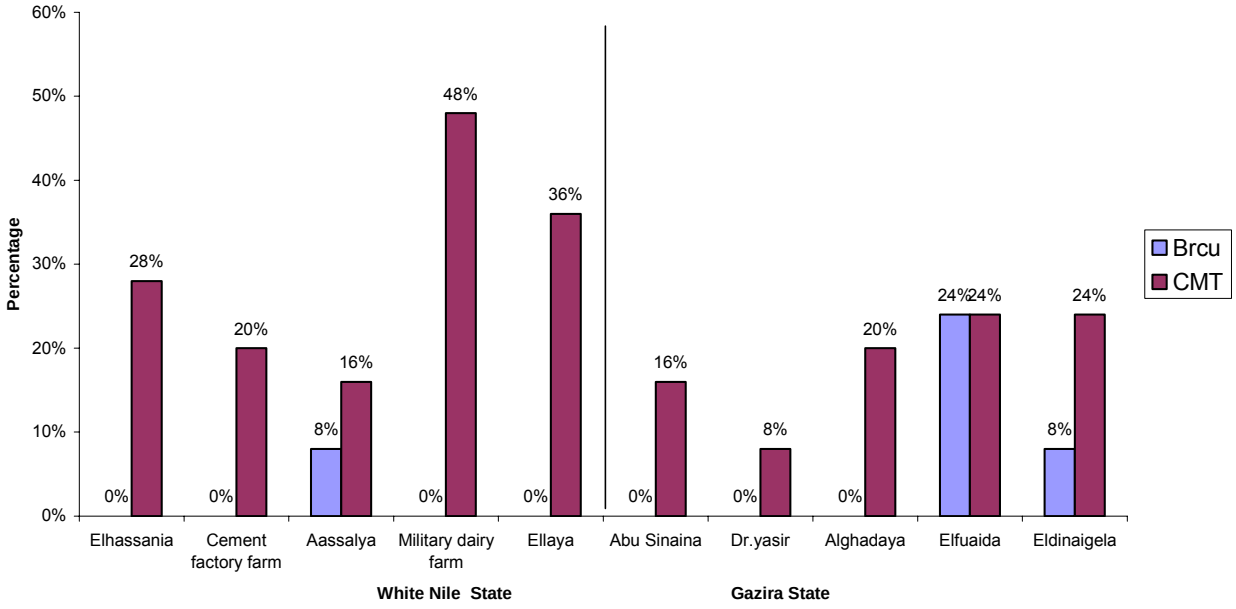

Fig: (٣،٢) prevalence of mastitis and Brucellosis

٣. ٤,٢.Blood parasites.

At the White Nile area the result of blood smears were as shown in table (٣,٥) and figure (٣,٣).

At El-Hassania ٤ cows were found positive for theileriosis (١٦٪)and ٢ cows were found positive for microflaria (٨٪).At Cement factory dairy farm ٤ cows were found positive for microflaria (١٦٪),At assalaya dairy farm one cow was found positive for theilerosis (٤٪),and ٥ cows were found positive for babesiosis (٢٠٪).At Elgesh dairy farm ٢ cows were found positive for theileriosis (٨٪) and one cow was found positive for babesiosis (٤٪).At Ellaya dairy farm one cow was found positive for theileriosos (٤٪) and one cow was found positive for trypanosomiasis (٤٪).

At the Gezira areas the result of the blood smears were as shown in table (٣,٦) and figure (٣,٣).

At Yasir dairy one cow was found positive for babesiosis (٤٪).At El-fuida Oizaizate dairy one cow was found positive for babesiosis (٤٪) and ٣ cows were found positive for Theilerosis (١٢٪).At Elghadaya dairy one cow was found positive for theilerosis (٤٪). At Eldnegela dairy one cow was found positive for theileriosis (٤٪) and ٢ cows were found positive for microflaria (٨٪).

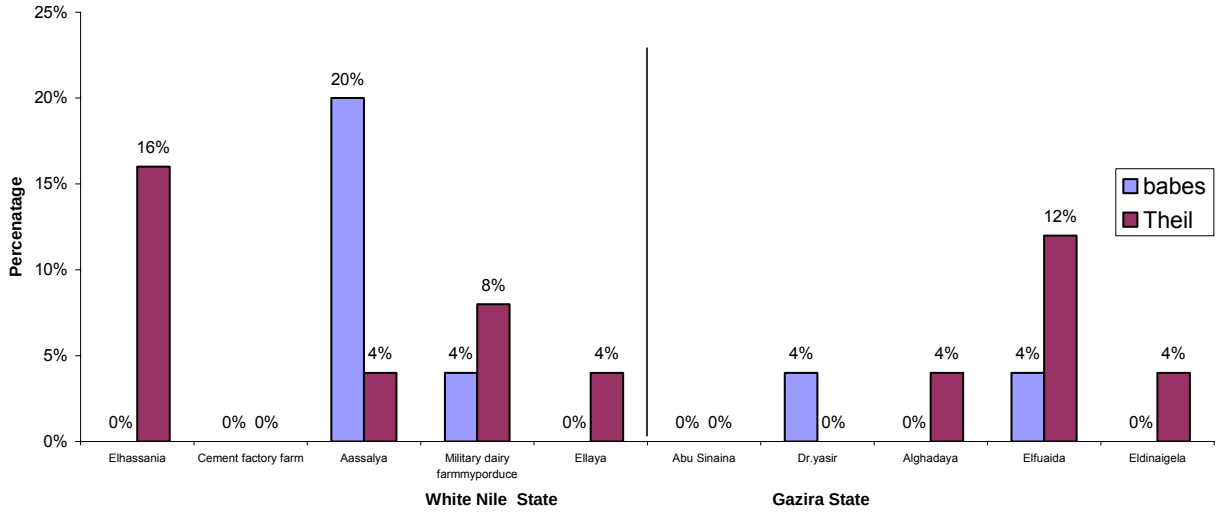

Fig: (٣،٣) prevalence of Babesosis and Theileriosis among dairy cattle at selected farms in the White Nile and the Gezira States

٣,٤,٣. Faecal examination results

٣,٤,٣,١. Protozoa

At the White Nile area, at Ellaya dairy ٢cows faecal samples showed Plantidium cyst (٨٪), at Elgesh dairy ٤ cows faecal samples showed Plantidium cyst (١٦٪) plate (٣,٨).A total of ٦ cows out of ١٢٥ showed plantidium cyst.

At the Gezira aera at Abu-Sinana dairy ٤ cows faecal samples showed plantidium cyst (١٦٪), at El-fuida Ozizate ٣cows faecal sample showed plantidium cyst (١٢٪) and at El-denaigela ٤cows faucal sample showed plantidium cyst (١٦٪).Atotal of ١١cows out of ١٢٥ showed plantidium cyst.

٣,٤,٣,٢ Trematoda

At the White Nile the result of the faecal samples examined for the fascioliasis were as shown in table (٣,٦).at El-Hassania dairy ١٢ cows showed *fasciola spp* eggs (٤٨٪) plate (٣,٩, ٣,١٠), at cement factory dairy ٢١ cows were found positive (٨٤٪), at Elgesh dairy farm ٨cows ٢٥were found positive (٣٢٪), and at Ellaya dairy farm ٢ cows were found positive (٨٪).A total of ٤٣ out ١٢٥(%) were found positive.

At the Gezira areas the result of the faecal samples examined for the fasciolaisis as shown in table (٣,٦).at Abu-sinanna dairy farm ٨ cows were found positive (٣٢٪),at El-gadaya dairy farm one cow was found positive (٤٪),

at El-Fuida Oizaziate dairy farm ٣ cows were found positive (١٢٪) and at El-denegela dairy farm ٦ cows were found positive (٢٤٪). A total of ١٨ out

Plate (٣،٨): plantidium cyst in faecal sample of cow at Elgesh dairy farm

Plate (٣،٩) Photograph of cow affected with fascioliasis and Paramphistomiasis at El-Hassania dairy farm

Plate (٣،١٠) *Fasciola spp* egg in faecal sample of cow at El-denegila dairy farm

Of ١٢٥(٦,٤٪) were found positive.

At the White Nile the result of faucal samples showed paramphistome spp ova as shown in table(٣,٥),at El-hassnia dairy farm ٣cows were found positive (١٢٪) plate(٣,٨),at Ciment factory dairy farm ١٦ cows were found positive (٦٤٪),at Assallaya dairy farm ١٦ cows were found positive (١٦٪) ,at Elgesh dairy farm ١٣cows were found positive (٥٢٪)and at Ellaya dairy farm ٢ cows were found positive (٨٪).A total of ٦٠ cows out ١٢٥(%) were found positive.

At the Gezira areas the results of the faecal samples showed paramphestomes pp ova as shown in table (٣,٦),at Abu-sinana dairy ١٦ cows were found positive(٦٤٪),and at El-denegel adairy ٦ cows were found positive (٢٤٪).A total of ٢٢ cows out of ١٢٥(%) were found positive.

Figure (٣,٤،٣,٥) showed prevalence of fascioliasis and paramphestomiasis in the two states. At the White Nile farms the faecal samples examined for schistosmmiasis showed the following results

At Assalaya dairy farm ٢cows were found positive (٨٪) plate (٣,١١), at Elgesh dairy farm ٣cows were found positive (١٢٪).

٣,٤,٣,٣. Cestoda

At the Gezira area, at Abu-Sinana dairy one cow faecal sample showed *Monizia spp* egg (٤٪), and at El-denaigela dairy ٢cows faecal samples showed *Monizia spp* egg *(*٨٪).At El-fuida dairy ٢ cows faecal samples showed *Taenia spp* egg.

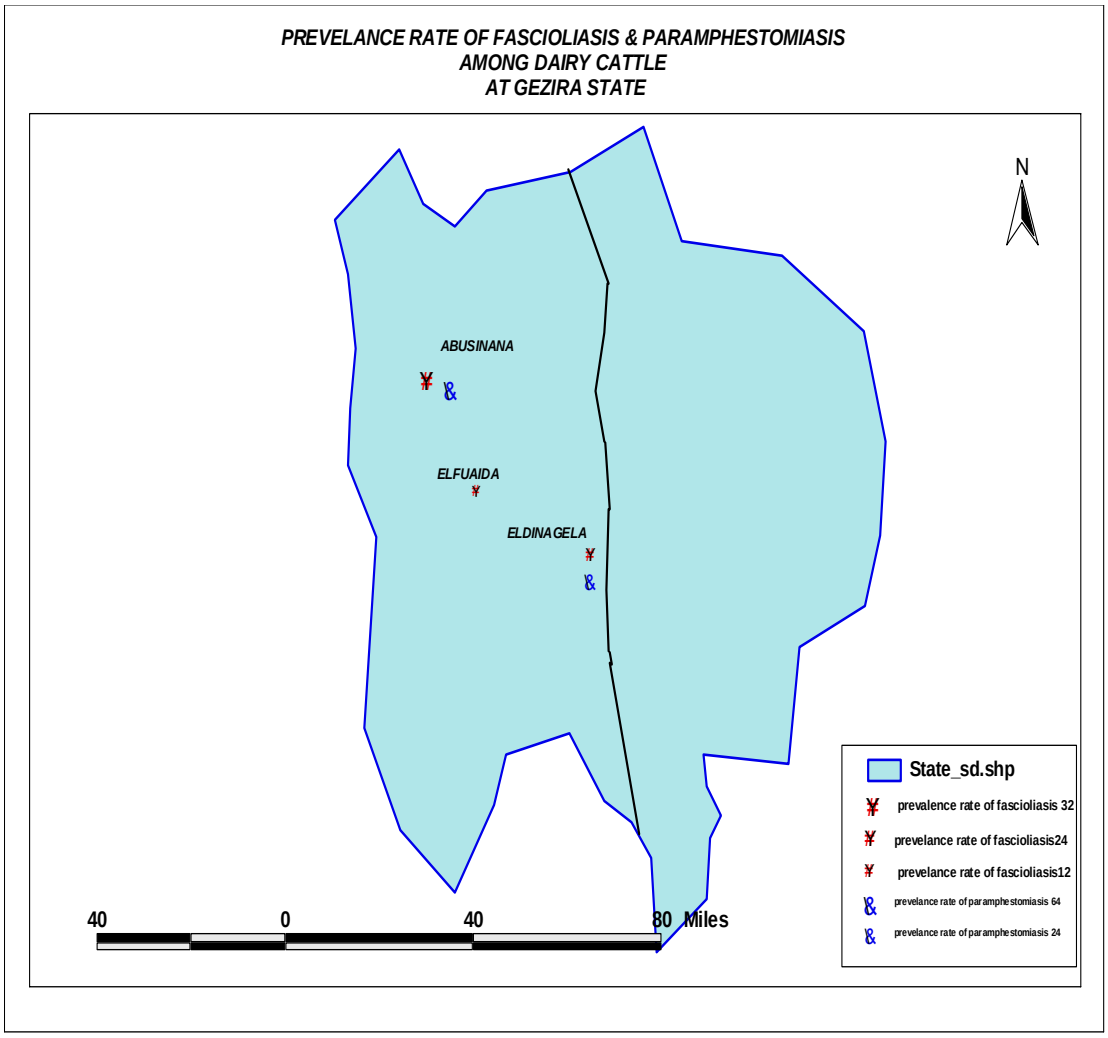

Figure (٣،٤) prevalence of Fascioliasis and paramphestomiasis among dairy cattle at selected farms in the Gezira stste

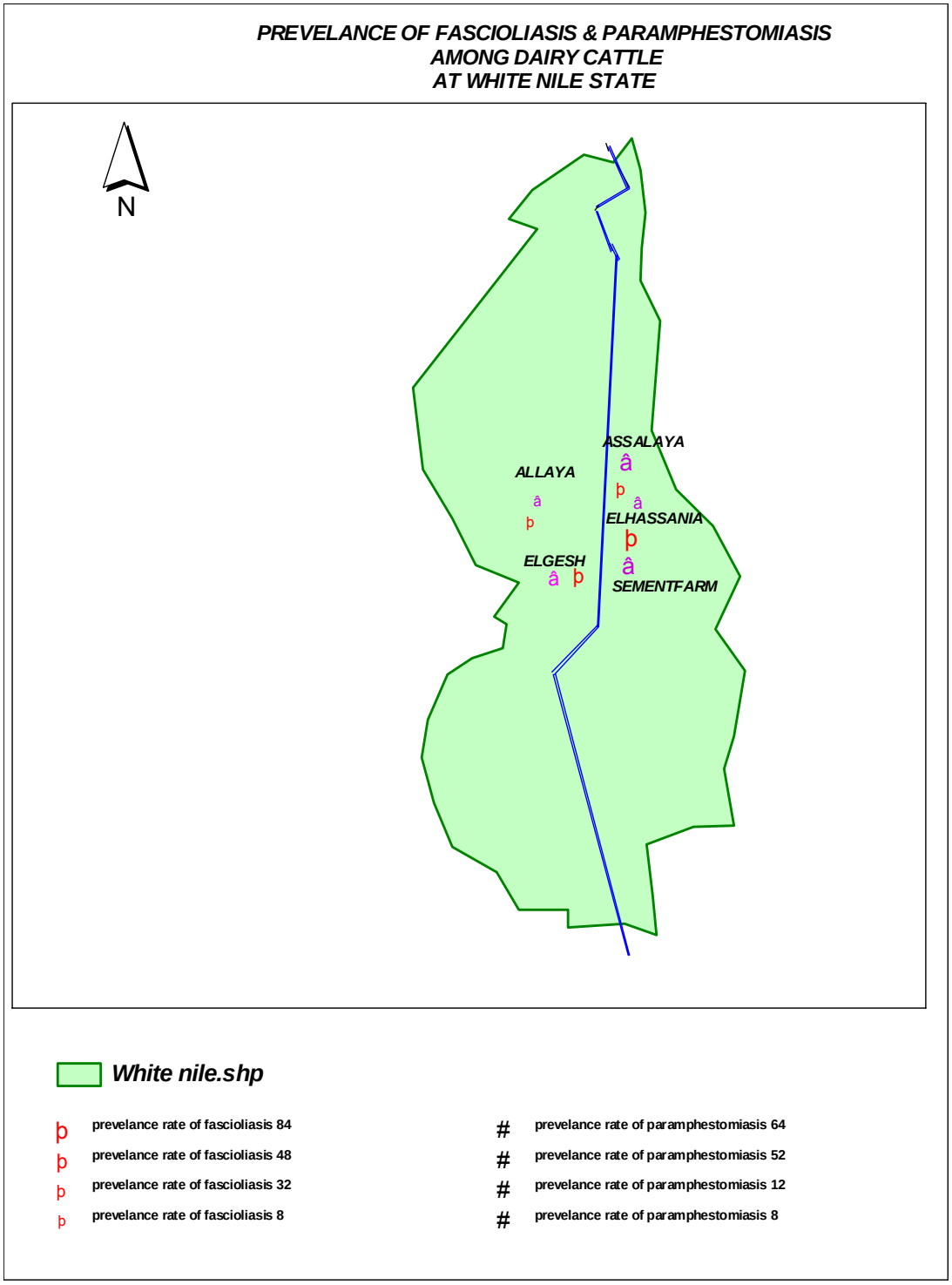

Figure (٣،٥): prevalence of fascioliasis and paramphestomiasis among dairy cattle at selected farms in the Gezira state

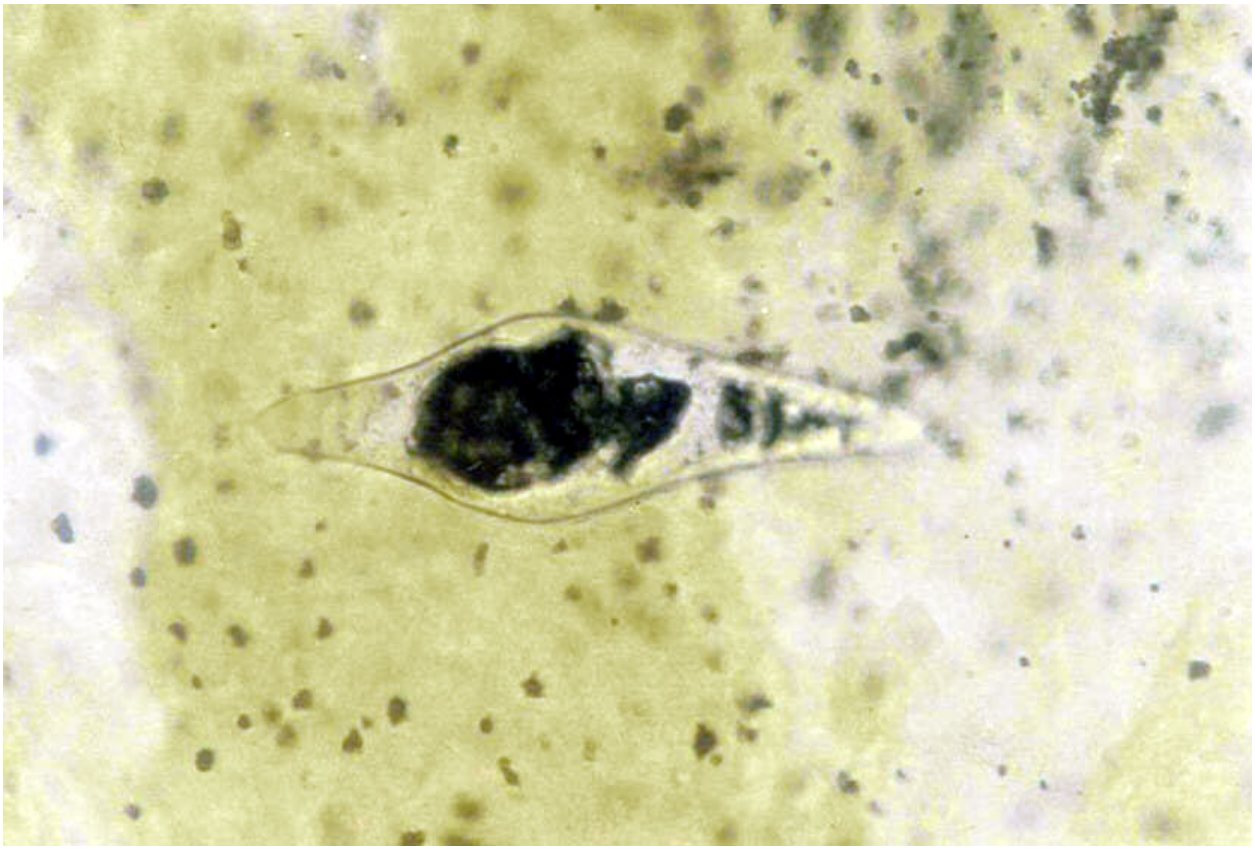

Plate (٣،١١): *Schitosoma spp* egg in faecal sample of cow at Assalaya dairy farm

٣,٤,٣,٤ Nematoda

At Ellaya dairy farm ٣ cows faecal samples showed Ascaris spp egg (١٢٪), plate (٣,١٢). At Elgesh dairy one cow faecal sample showed trichuris spp egg (٤٪) plate (٣,١٣).

At the gezera area ,at Ab-uisinana dairy ٤ cows faecal samles showed Ascaris spp egg (١٦٪),at Elghadaia dairy ٨cows showed Ascaris spp egg (٣٢٪),at El fuaida dairy farm ١١ cows faecal sample showed Ascaris spp egg(٤٤٪) ,at Eldiniaigela dairy farm ٦ cows faecal samples showed Ascaris egg spp(٣٢٪) .

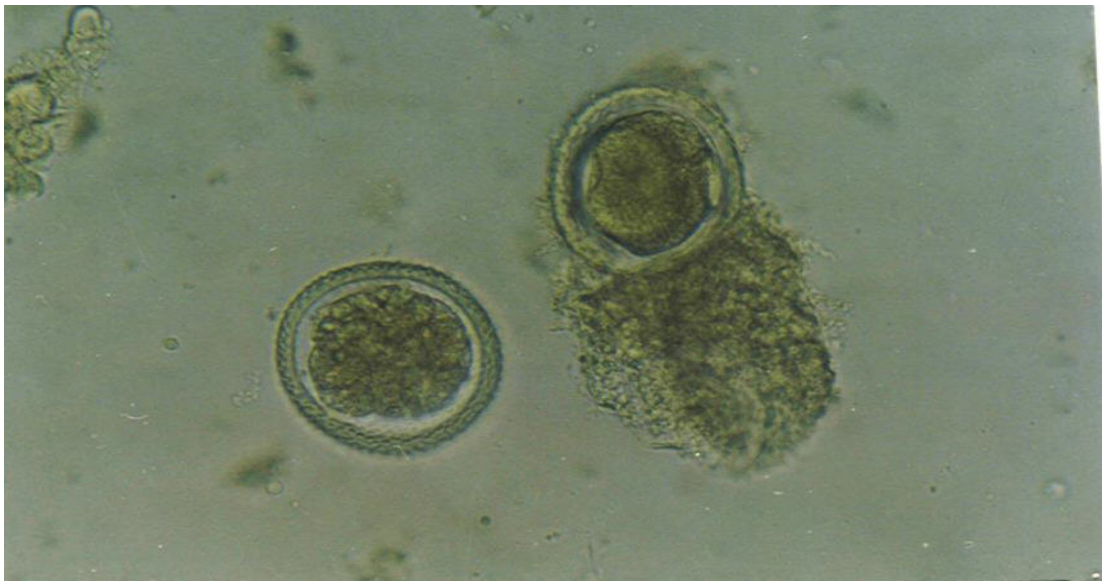

Plate (٣،١٢): *Ascaris spp* egg in faecal sample of cow at Ellya dairy farm

Plate (٣،١٣): *Trichuris spp* egg in faecal sample of cow at Elgesh Dairy farm

CHAPTER FOUR

DISCUTION

Most of the studies on cattle diseases in Sudan targeted one disease and its epidemiological characters. These diseases present a special challenge to community-based program that covers a large area characterized by very poor infrastructure, minimal laboratory facilities and operational constrains such as severe conflicts.

Studies on diseases caused by bacterial agents were numerous. Examples are prevalence of Brucellosis (Mustafa, ١٩٩٠), Haemorrhagic septicemia (Mustafa, ١٩٨٦), Contagious Bovine Pleropnemonia (Harbi and Salih, ١٩٧٩), Black Quarter (Elsanousi ١٩٧٧, Elsanousi ١٩٨٧, Eltag ١٩٨٦), Bovine Farcy (ElHussain, ٢٠٠٢).

Mastitis had been studied by Ibtisam *etal*. Elsanosi (١٩٩٨). El-gazali Gumma, (٢٠٠٢) did studies on Elheesh.

Viral infection included Rinder Pest and FMD, (Shekh eldin etal; ١٩٩٤, AbuElzin; ١٩٨٣).

Parasitic problems studied included ticks and tick borne diseases (Latitf١٩٨٤, Ahmed Hussain ١٩٩٩). Khan and Abdon ١٩٨٣ studied trypanosomiasis and

surveys on internal parasite were done by Malek; (١٩٥٩), Eisa *etal;* (١٩٦٢)Karib; ١٩٦٢, Eisa ; (١٩٦٣).

This study differs in conducting a survey on dairy cattle diseases and disease burden in both traditional and modern system. It is a trial to assess the disease load on dairy animals which are usually kept under the best husbandry system. The disease load can be reflected as an economic impact of the diseases on milk production. The study is also a trial to map the prevalence of diseases to help in determining the geographical distribution and to asses the impact of the environmental factors and their effect on the epideomiology of these diseases.

Each selected animal in the study population had been examined for all possible infection carried at the time of the survey. The selection included both apparent clinical conditions and apparent normal animals.

The study showed the prevalence of brucella in the central Sudan states with percentage of (١,٦٪) in the White Nile dairy farms and (٦,٤٪) in the Gezira dairy farms and this may be due to high percentage of the foreign blood in the Gezira dairy farms. This result confirms the findings of Dafalla and Khan ;(١٩٥٨) and Musa;(١٩٩٠) who cited the occurrence of Brucellosis in all over Sudan.

The percentage of mastitis according to (RMT) at the White Nile dairy farms was (٢٩,٨٪) and at Gezira dairy farm was (١٨,٤٪) and these may lead to significant loss in milk production. These results agreed with Ebtisam *etal*;(١٩٩٩)who stated that mastitis cause significant loss in milk production. Mastitis in some cases lead to the atrophy of affected quarters

and it is not predicated that the lost quarter will return to normal production and function. The result agree with Mcfaddan *etal ;*(١٩٨٨) and Ebtisam *etal* ;(١٩٩٥).

In the Gezira areas the farmers are settlers and they have economic consideration to dairy farming, this explains the low ratio of the mastitis as compared with the White Nile areas where the farmers are nomadic and hardly have economic plans for their production. This is more clear when individual farms are considered

The percentage of the theileria at the White Nile dairy was higher (٦,٤٪) than the Gezira dairy farms (٤٪) and this may be due to ticks control and good management and the educated farmers in the Gezira dairy farms. This can also explain the high ratio of babesiosis at the White dairy farms(٤,٨٪)compared with the gezira dairy farms(١,٦٪).One the other hand occurrence of babesiosis in the two states indicates its widespread in these localities. This a grees with Jongeian *etal;* (١٩٨٧), who reported the widespread of babesiosis in the Sudan.

Trypanosomiasis was found at the White Nile in Ellaya dairy farm only in one cow. An outbreak took place in Kenana dairy farm after this study and was investigated by Gundi Suliman and Khalid Taha; (٢٠٠٤unpublished data). ٣ cases were also detected at Assalaya dairy farm after this survey. It is evident that this disease is confined to certain environmental conditions. These conditions can be natural or man made

as in Sugar Cane farming created for sugar industry observed in Kenana and Assalaya locations.

Microfalria at White Nile dairy farms (٤,٨٪) was higher than Gezira dairy farms (١,٦٪). This may due to the existence of vector at the White Nile zone thus the owner of the two cases that were found in Eldenegila explained that they were brought from Sinnar. In the Gezira the routine spraying of crops can affect the vector population and hence transmission of blood parasites. Also the awareness in the Gezira about parasites and strategic deworming reduces the burden of such parasites.

The percentage of fascioliasis, paramphestomiasis and schistosomiasis were higher in the White Nile dairy farms (٣٤,٤٪), (٤٠٪) and (٤٪) respectively as compared with the Gezira dairy farms where they were (١٤,٤٪), (١٧,٦٪), (٠٪) respectively. This may due to the regular use of the anti helminthes, the awareness and good under standing of economic value of helminthes control and the great loss of milk yield in the affected cattle by the Gezira farmers. The control reduced the pasture contamination with the worm's ova.

In spite of the difference in prevalence yet the flukes are widely distributed (fasciola, paramphestome)in the White Nile and Gezira areas this agree with Malek;(١٩٨٠),who indicated the wide spread of these parasites in the Areas of good water supply where the snail intermediate hosts are found in high numbers.

The percentage of Monizia and Taenia at Gezira dairy farms were (٢,٤٪), (١,٦٪) respectively, which showed that some parasites which are not readily transmitted can be confined to certain locations.This can creat a hazard if such infected animals move and mix with susceptible ones.

The prevalence of tick infestation, at White Nile dairy farms and Gezira dairy farms was(٤٩,٥٪),(٤٤٪)respectively,the difference being not significant. Ticks were found to induce considerable traumatic injuries to bovine udder resulting in irreversible damage of teats and consequent dysfunction, this beside the lost of milk and the diseases that ticks transmitted, the result agreed with Ahmed Hussein ;(١٩٩٩) who stressed the injury of teats and may lead to mastitis. Four cows were affected with elheesh (٣,٢٪) at Gezira dairy farms, the symptoms of this diseased were high fever, respiratory embarrassment, hyper salivation and frothing, tendency to stand under the shade and in wet places, decreased and eventually cessation of milk yield, and the infection of Elheesh took place after the infection of FMD. This was similar to the syndrome which was denitrified by Elsanousi *etal*; (١٩٨٨) in Khartoum area as Thromobotic Menningoencephalitis in cattle (TME) and by El-gazali (٢٠٠٣) in cattle of western Kordofan state.Although some bacterial agents were isolated by these workers but its causative agent is still controvercial.

In Abu-Sinana farm two cows showed healing lesions suggestive of Lumpy skin disease. The owner sayed it was the healing lesions after an outbreak which affected a number of cows in the area and two in his farm.

Elgadaia dairy farm had one cow affected with Traumatic precarditis, which wasintially suspected as fascioliasis, but after post morteum a nail penetrating the heart was detected. The symptom was swelling in the in the dewlap region extending to cover the thorax.

Economy plays an important role in every day live and decision. Based on information collected in this survey considerable part of the nomadic stockmen are still suffering from illiteracy and under development, and great bulk of their activity is out side the economic sphere. The economic loss from worm parasite infection is significant. Parasites caused serious mortality and they reduced herd efficiency and these lead to a great financial loss. Fascioliasis is one of the basis of cattle livers condemnation at abattoir (Kosti office ٢٠٠٣).The annual reports since ١٩٩٥ indicated that the highest percentage of liver condemnation was due to fascioliasis.

Blood parasite led to significant loss in milk production, and high cost in controlling the vector and the are costy in their treatment.

Mastitis results in major loss in milk yield and may lead to atrophy of the affected quarter as shown plate (٣،٧), this beside the high cost of

treatment. Elheesh led to immediate drop in milk yield and significant financial loss.

Worldwide losses due to diseases transmitted by ticks and the cost of ticks control have been estimated to be in the range of several billion US dollars annually (Jongean and Uilenbeg).Ticks were also found to induce considerable traumatic injuries to bovine udder resulting in damaged teats and consequent dysfunction.

The seasonal movement characterizing traditional nomadic system which depends mainly on natural pasture and therefore cattle are under risk of worm infection when they graze in the channales and riverbanks. Following long transportation and mixing of cattle from different localities is an important epidemiological characteristics. The great impact of economic approaches to disease control and management has been in the more intensive production system particularly the dairy industry. The control of worm infections is significant in the intensive system, and these led to increase in milk yield.

The intensive system is the best system to be followed according to this study, and the extension program is needed to enlighten the nomadic about the economic value of their wealth.

In conclusion this study revealed the occurrence of a number of pathogenic organisms in all dairy farms surveyed. This is an indication that animals are subjected to these pathogens as environmental

contamination is continuous. Also the vectors and intermediate hosts are endemic in the area of study.

It is therefore recommended that in both sites if dairy industry is to be successful it is important to conduct extensive surveys on disease burden and locations if any upgrading breeding programmes are to be conducted. Also the general awareness on diseases and their economic implications are to be raised for farmers and decision makers who set priorities for disease control and eradication.

REFERENCES

A/Magid.A.M. (١٩٧٩). Studies on *schistosoma bovis* in the White Nile,Sudan.Ph.D thesis, faculty of veterinary Science, University of Khartoum

Abdel Rahman S.M, Yassin .T.E.M.Yassin and Bagadi .H.O .(١٩٩٥). Bovine Salmonellosis in Sudan. *Sud.J.Vet.Sc. Anim. Husb. Vol.* ٣٤. (١,٢) pp٧٨-٨١.

Abdulla, H.M, ١٩٨٤, Studies on babesia bigemina in cattle in Northern Sudan M.Sc thesis, University of Khartoum

Abu-Elzein, E.M.E. (١٩٨٣): Rev. Tech. off, Int. Epiz ٢, (١), ١٧٧-١٨٨.

Ali,B.H.and Elsheich,H.A.(١٩٨٧). The effect of experimental infection of sheep with fasciola gigantica on the activity of drug metabolizing enzymes in the liver .١١١confernce of the Union of Africa Societies of pharmacology,Cairo.Egypt

Ahmed, H. Elimam. (١٩٩٩): Ecological and Epidemiological Studies on Ticks and Ticks-borne Disease in Kosti province, Sudan, M. v. sc. thesis .U.K

Andrew,B.Lawson ٢٠٠١. An Introductory Guide to DISEASE MAPPING University of Aberdeen, UK and Fional L.R. Williams, University of Dundee, UK. Introdductory Guide to Disease Mapping.

Anon (١٩٢٩). Annual report Veterinary Services Minstery of Animal Resource, Sudan

Anon, (١٩٣٩) Annual Reporte of Sudan Veterinary Service (١٩٣٩-١٩٤٥), ٣, ٣٦.

Anon, (١٩٣٣-١٩٥٩) Annual reporst of Sudan. Veterinary Services

Anon (١٩٩٣).PARC Sudan Report

Anon (١٩٩٧): Resurgenence of rinderpest in East Africa. The EMPRES Transboundary Animal Disease Bulletin, May ١٩٩٧

Anon (١٩٨٠): annual report of Ministry of Animal resource Sudan.

AOAD, (١٩٩٢), . The role of Animal Resources in Arab Veterinarian Conf. ١٢-١٦ jan. ١٩٩٢ P.١ Arab organization for Agricultural Development

Ashworth, U.S. Forster, T.L.; and Luedeke, L.O., (١٩٦٧). Relationship between C.M.T. reaction and composition of milk from opposite quarter . J. Dairy. Sc. **٤٩:** ١٠٧٨ -١٠٨٢

Asselineau.J.,Laneelle,M.A.&Chamoiseau,G.(١٩٦٩). De Iaetiologie du farcin de zebus tchadiens:Nocard ou mycobacteriose?١١.Composition lipidique.*Revue dlavage et de Medicine Veterinarie des pays Tropicaux* ٢٢, ٢٠٥ - ٢٠٩.

Awad .F.I & Karib A.A. (١٩٥٨). Studies on bovine farcy (Nocardiosis) among cattle in Sudan .Zentralblatt. for Veterini medizen ٥.-٢٦٥-٢٧٢.

Awad Elkareem , M.H. and Mostafa , A. A. (١٩٧٤). Bovine nocardiosis, tuberculosis and other caseous infections at Omdurman central Abattoir, Sudan Journal of Veterinary Science and Animal Husbandary ١٥ -٥٦ -٦٠.

Baillie ,W.E .Anthony ,H.D and Weide ,KD.(١٩٦٩) Infective Thrombotic Meningao-encephalomyelitis(sleeper syndrome) in feedlot cattle .J.A.M.Vet.Ass.,١٤٨, ١٦٢ -١٦٦

Bennett, S.G (١٩٤٣). Annual Report, Sudan vet.ser, ٢٩-٣٢.

Blood,D.S,J.A. Henderson, and .O.M.Radostits (١٩٧٩), Veterinary, Medicine^{٥th}.-ed, Bailliere _Tindall, londan p,٥٤٣.

Blosser, T.H (١٩٧٩), Economic losses from and the national research program on mastitis in the Unitied states .J. Dairy Sci.**٦٥:**١١٩ - ١٢٧.

Bovinevol١٣/١;(٢٠٠٤. Http://www.aphis.usda.gov/vs/ep/fadtraining/Bovinevol٣/page١ htm.

Brown,D.S.(١٩٨٠) fresh water – snails of Africa and their medical importance.Taylor& Francis, London.

sCarter, G.R. (١٩٨٤): stereotyping pasteurelia multociga. Methods in Microbial., ١٦:٢٤٧-٢٥٨.

Cattle Website(٢٠٠٤a).http:Cattletoday-info/foot Mouth.htm

Cattle Website(٢٠٠٤b) hptt://cattletoday.info/anthrax.htm

Catlle Website(٢٠٠٤c).hptt://cattletoday.info/brucellsis.htm

Chamoiseau,G.(١٩٧٣) *M.farcinogenes* agent causal du farcin du boeuf en Afrique.*Annales de Microbiologie* (Institut Pasteur) **١٢٤A,**٢١٥-٢٢٢.

Cheneau.Y.(١٩٨٥). Prevalence of rinderpest and strategy of Pan African Rinderpest Campanig (PARC).Revue Scientique et Technique O.I.E.٤(٢):٤٠٣-٤٢٥.

Dafalla , F.N and Khan ,A.(١٩٥٩). The occurrence, epidemiology and control of animal Brucellosis ,In the Sudan *Bull.Epiz.Dis. Afr.*٦, ٢٤٣ ٢٤٧

Dafalla,E.N.(١٩٦٢) Incidence.of.Animal.and.human.Brucellosis.in.Sudan .*Sud.Vet.J.Anim.Husb.*,٣:٨٠-٨٩

E.J.L.Soulsby ١٩٨٢, Helminthes ,Arthropods and protozoa of Domesticated Animals

Eisa A.M. (١٩٦٣): normal worm burden of cattle in upper Nile province .sudan.J.Vet.Sci &Anim.Husb.٤-٦٣-٧١

Eisa, A, M (١٩٦٦), parasitism -- achallenge to animal health in the Sudan *J.Vet. Sc.Anim ,Husb* .١٧,٤١.

Eisa,A.M,Mustafa,A.A.andSoliuman,K.N.(١٩٦٢). Preliminary,report,on cysticercosis.and,hydatiosis,in,souyhern,sudan.*Sud.J.Vet.Sci.Anim.Husb.*,٢(٢):٩٧-١٠٨.

Eisa,A.M.Elbadawi,E.S.Saad,M.B.Ibrahim,A.M.andElgezali,A.Y.(١٩٧٩). Check list and first records of helminth parasites of domastic and wild animals reported in the sudan during the peroid ١٩٠٢ -١٩٧٥.*Sud.Vet Res.*١,٥٥-٦٣.

EL Azhari,G; ELSanousi ,S.M, Meki,N.T;Mousa,M.T. and ELJack,M (١٩٨١). Acomparative study of Sudaneses (KAD),a highly immunogenic (CH٣) and pathogenic (CH٤) strains of *C.chauvoei*. *Acta Veterinaria* (Beograd),٣١,٩٥,١٠٢.

El Hag, M.O. (١٩٨٦). Comparative studies of *C.Chavuoei* (Sudanese Kad١ strain and CH٣ strain) and the prevalence of *C. chauvoei* and *C. septicum* on livers and spleens of slaughtered animals .M.Sc .thesis Universitiy of Khartoum,Sudan .

EL- Hussein A.M,S.A Mohammed, A.K Osman, and O.M.Osman(١٩٩١) Preliminary Survey of blood parasite and brucellosis in dairy cattle in Northern State , Sudan ,*Sud .J.Vet.Res* ١٠;٥١ – ٥٦.

El Sanousi, S.M., Yagi, A. I; Hassan,Z .M; El Azahri, G., (١٩٧٧). Investigation on an economical medium for production of blackleg vaccine in the Sudan .٨th Vet .Conf; Sudan Vet .Assoc, Khartoum, Sudan.

El Sanuosi, S.M.Tag El - Din, M.H.& Abdel Eahab , S.M (١٩٧٧) Classification of bovine farcy organism . Toropical Health and production ٩،١٢٤.

EL Sawi ,O.,(١٩٨٦). Studies on the properties of .*C.chauvoei* and *C. septicum* and their role in black leg disease. M.Sc. thesis ,University. Of Khartoum, Sudan.

El Sinnary, K.,and Hussien,H.(١٩٨٠). Culicoides Kingi, Austen :A vector of *onchocerca gutturosa* (Neuman(١٩١٠) in the Sudan*, Annals Trop.Med. parasitol* ٧٥:٦٦٩-٦٧٠

El Tahir *etal*;(١٩٩٥),M.S El Tahir and A.M.Ibrahim;Expermintal infection of calves with Sudanese field isolate of Mycoplasma mycoidessubsp;mycoides,*Sud.J.Vet.Sc.Anim.Husb.Vol.*٣٤(١,٢)pp١- ٥.

EL-Awad. M.E.(١٩٨٧). Experimental and field studies of some gastro-intestinal nematodes of ruminants in Sudan M.V.Sc. Thesis University of Khartoum**.**

El-Badawi .E.S.and Slepnov.(١٩٧٦) A note on Bovine Schistosomiasis in the southern Region of the Sudan *J.Vet.Sc.Anim. Husb* ١٧- ٤١.

El-Ghali, and El-Hussein M(١٩٩٥) disease of livestock in Eddamer province , El-Nile State , Sudan : Atwo - Year retrospective study . *Sud J.Vet.Sc.Anim. Husb*.٣٤,٣٧ - ٤٥

El-Ghazali .G.M.G(٢٠٠٣) .Studies on Thrombotic Meningo-encephalitis (T.M.E) in cattle of Western Kordofan state .Thesis of M.Sc. University of Khartoum

El-Sanousi,S.M.(١٩٩٨). Aletter to vice chancellor of University of Khartoum. About Alheesh disease of cattle ١٤th Agust, ١٩٩٨ in arabic'

Elsinnary,K.A.Hussein.S.H.,William.J.F. And Hatt Elmannan.A.M.(١٩٨٩). Natural and experimental infection of Culicoides Kindi with onchocercaguttrosa in *sudan.Sud.J.Vet.Sci.Amin.Husb* ٢٨:١٧-٢٣

Eltom,K.H.A. and Hassan,A.B.(٢٠٠١). Therombatic meningoencephalitis "Alheesh" Annual report of Institute for promotion of animal exports, University of Khartoum.

Eltom,K.H.A.(٢٠٠٣). Document ١:April ٢٠٠٣; The Research Committee of Alheesh Disease(Thrombotic Meningocephalitis) Faculty of Veterinary Medicine. University of Khartoum

FAO Report ,(١٩٨٣) Tick and Tick- borne Disease Control . The imprtant tick-borne disease of cattle. Technical Report ٢ AG: Gcp/SUD/SUD/٠٢٤/DEN. Food and Agricltural Organization of the United Nation. Rome pp٣٣

FAO Report,(١٩٨٣) Ticks and ticks- borne Disease.The imprtant tick - borne diesae of cattleTechincal Report ٢ AG; GCp/SUD/٠٢٤ DEN .Food and Agriculture Organization of the United Nations Rome, pp٥٢

FAO(١٩٩٨a)http://www.fao.org/WAICENT/faoInfo/Agriclt/AGA/AGH/PD/pages/tick٠١**.**htm

FAO(١٩٩٨b)http://www.fao.org./WAICENT/faoInfo/Agricult/AGA/AGAH/PD/pages/ticksp١.htm

FAO(١٩٩٨c)http://www.fao.org/WAICENT/faoInfo/Agricult/AGA/AGAH/PD/pages/tbd٠١.htm

Forster, T.L. (١٩٦٤). Relation ship between C.M.T reaction and production of milk from opposite quarters. *J. Dairy Sc.*٤٧ - ٦٩٦.

Goldsmid,J.M.(١٩٧٥). Ecological and cultural aspects of human trematodiasis (excluding Schistosomiasis) in Africa .*Cent.Afr.J.Med.,*٢١،٤٩

Gotbi,O.and Suliman,H.(١٩٧٥). Incidence of bovine cysticercosis at Omdurman slaughter house**,**proceedings,:٧th Conference,Meat industry in the Sudan ,Sudan Veterinary Association,Khartoum.pp٢-١٧

Green ,A١٩٨٢. The epidemiologic approach to studies of association between HLA and disease .١. the basic measures, concept s and estimation procedures Tissue Antigens ١٩:٢٤٥-٥٨

Griner .L.A.; Jensen ,R. and Brown, W.M. (١٩٥٦). Infectious Embolic Meningo Encephalitis. In cattle. J.A.V.M.A. ١١,١٢٩. ٤١٧- ٤٢١.

Hall, M.J,R heir,S.M, Rahman, A.H.A. and Noga ,S. (١٩٨٤),.KTsetse and Trypanosomiasis Survey of South Darfur province ,Sudan , *Trop.Anim , Hlth,.prod.,*١٦،١٢٧ - ١٤٠

Hall, M.J.R; Kheir , S.M; Rahman, A.H,A.Noga ,S.(١٩٨٣) Tsetse and Trypanosomiasis survey of suoth Darfour province , Sudan .١. Bovine and trypanosomiasis *Trop, Anim .Hlth . prod.* ١٥،١٩١ -٢٠٦.

Hall,M.JR.;Kheir,S.M.;Rahman,A.H.A.and Nogna,S.(١٩٨٤). Tsetse and trypanosomiasis survey of South Darfour Province, Sudan; *Trop.Anim.Hlth prod*; ١٦،١٢٧ -١٣٥

Hamid, M.E, Mohamed. G.E. Abu-Samra ,M.T.EL-Sanuosi S.M , Barri, M.E.(١٩٩١) Bovine Farcy, Acilinco - Pathology study of the disease and its aetiological agent.Journal of Comparative Pathology١٠٥،٢٨٧ -٣٠١

Hamid,M.E.,El-Sanoousi,S.M..Minnikin,D.E.andGoodfellow,M.(١٩٩٨). Isolation of Nocardia farcinica from Zebu cattle suffering from Mastitis:Arepor of cases from sudan and somalia.Sud.J.Vet.Sci.Anim.Husb.Vol.٣٧(١،٢),١٩٩٨.pp ٦٦-٧١

Harbi.M.S.M. A and M.M.Salih (١٩٧٩). Artificial reproduction of arthritis in calves by inoculation of a virulent strain of *Mycoplasma mycoides sup sp . mycoides*. Vet , Res., ١٠٤,١٩٤.

Haron E.M (١٩٧٥) Studies on bovine fascioliasis in the Sudan with particular reference to the White Nile province M.SC.Thesis faculty of Veterinary Science University of Khartoum

Haseeb, M.A.(١٩٥٠). Undulant fever in the Sudan. J.Trop,Med,and Hyg-٥٣،٢٤١-٢٤٤.

Heddleston, K.L., Gallagher, J.E; and Rebars,P.A. ١٩٧٢: Fowl Cholera: Gel diffusion precipitin test for stereotyping Pasteurelia multocida from avian species. Avian Dis; ١٦:٩٢٥-٩٣٦.

Hoogstraal,H.(١٩٥٦) Africa Ixoidae.١. Ticks of the Sudan U,S navy, Washington D.C١١٠١pp,cited by S.M .khair and A.A.Majid (١٩٩٩) ,Ticks ,Tsetse and Bitting Flies of Importance in Sudan. *Sud .J.Vet .Sc.Anim* Hus.vol٣٨(١،٢)١٩٩٩ p(١٣٧ - ١٤٢)

Horggan, M.E (١٩٤٧). Ann.Report.Sudan Med.Service١،٥١. Sud.J.Vet.Sc,Anim, Husb.Vol ٣٤(١،٢)١٩٥٩.

Howe(١٩٧١). The mapping of disease in history In:clarke E(ed) Modern in the History of Medicine London: University of London.,Athlone press, ch:٢٠

Humphrey, J.D, and Stephens .L.R (١٩٨٣) Haemophilus Somnus a review. vet bulletin.١١،٥٣, ٩٨٦ -١٠٠٣

Hussein .A.E. Babiker (٢٠٠١). Evaluation of indirect and absorbed Elisa for the sero diagnosis of bovine farcy M.V.Sc thesis University of Khartoum (٢٠٠١).

Hussein .M.F.(١٩٦٨) , Observation on the pathology of natural and experimental bovine schistosomiasis Trans. *Roy .Soci .Trop. Med. Hyg* ٦٢/٩٠

Hussein.M.F.(١٩٧٣). Animal Schistosomiasis in Africa, a review of *Schistosoma bovis* and *S.Mattheei. Vet.Bull.,*٤٣ .٣٤١

Hussien,M.F; Abdel Nar ,O.M.Gassouma, M.S and Nilson , G.S (١٩٧٥). Onchcerca guttrosa (Numan١٩١٠) infection in Sudanse Cattle . Br .Vet.J.١٣١; ٧٦ -٨٤, cited by Higazi etal (١٩٩٩) *Sud ,J.Vet.Sc.Husb vol.*٣٨.(١,٢)١٩٩٩ p١٢٤ -١٣٠.

Ibrahim, ALE.(١٩٧٤). Milk hygiene and bacteriology in the Sudan. Isolation of *Br.Abortus* from cows milk. *Bull. Eiz.Dis.*١٢, ٢٣١.

Ibrahim,A.E (١٩٦٨). Mastitis of goats and sheep in Khartoum province. Sud.*J.Vet.Sci.Anim.Husb.*٩: ٢٠ -٢٨.

Ibtisam, E.Mohamed;O.A.O.El Owni and G.E.Mohammed.(١٩٩٥). Production losses and economic

importance of mastitis among friesian cattle in the Sudan.*Sud.J.Vet.Sci.Anim.Husb.Vol.*٣٤(١,٢)١٩٩٥.pp٥٩-٦٣

Ibtisam,E.Mohamed,O.A.O Elowni,and G.E.Mohamed (١٩٩٩). The effect of Mastitis on Milk Yield of friesian cattle in Sudan.*Sud.J.Vet.Sci.Anim.Husb.Vol.*٣٨ (١,٢) ١٩٩٩,pp١٣١-١٣٦.

Intisar E.S.(١٩٩٢). Studies on the transmission of Schistosomiasis,fascioliasis and paramphistomiasis in kosti Area, White Nile province of Sudan M.V.Sc,Thesis University of Khartoum.

Jain, N.C.(١٩٧٩). Common mammary pathogens and factors of infection and mastitis .J. *Dairy. Sc.* ٦٢ - ١٢٨-١٣٤.

Jongejan, F, Zivkovic., pegram , R.G,Tatchell, R.J., Fison , T. Latif. A.A and paine G. (١٩٨٧). Ticks (Acari:Ixodidae) of the Blue and the White Nile Ecosystsem in the Sudan with particular reference to the Rhipicephalus sanguinous group . Exp.App.Acarol.,٣:٣٣١ -٣٤٦.

Karib,E.A(١٩٦١); cited by S.M.Kheir,H.Sabdalla and A.H.A.Rahman; Bovine trypanosomiasis in South Eastern Sudan.Sud.J.Vet.Sc.Anim.Hsb.Vol.٣٤(١,٢)١٩٩٥ pp٢٢-٢٧

Karib,E.A.(١٩٦٢). Fascioliasis in cattle and sheep in the sudan. *Bull of Int .epiz*-٥٨،٣٣٧-٣٤٦, cited by El-Tahir Mohmad Haroun ١٩٧٥

Kelly,W.R.(١٩٨٤). Veterinary clinical diagnosis ٣ed

Kennedy ,D.C.; Biberstein ,EL.; Howarth , J.A. and Dongwarth .D .L(١٩٦٠) Infectious Meningo- Encephalitis in cattle caused by Haemophilus like organism *Am.J.Vet.Res*. ٥ -٢١: ٤٠٣ -٤٠٩.

Khan.A.Q. (١٩٦٩). Animal Salmonellosis in the cattle.Ph.D Thsis University of Khrtoum

Khawad S.N. K. Slepnev & Amin M. Esia (١٩٧٦): Sudan j.vet.sci. and Anim. Hsb. ١٧،٨٦-٩٠.

Kheir, S.M, Abdalla ,H.S. and, Rahman A.H,A. (١٩٩٥) Bovine Trypanosomiasis in South Eastern Sudan .*Sud .J.Vet . Sc. Anim . Husb. Vol* ٣٤(١,٢)١٩٩٥ PP ٢٢- ٢٨.

King.J. O.L. (١٩٧٤) clinical abnormalities of mammary quarters of cows caused by mastitis and their effects on milk composition Br. Vet.J., ١٣٠,١٦٩ - ١٧٣.

Kleinbaum, D.G,L.Lkupper, and ١١.Morgenstern . ١٩٨٢.Epidemiiological research :principles and quantitative Methode -Belmont, calif:Wads worth. .

Latif ,A.A (١٩٩٤). Economic losses in exotic breeds of cattle due to theilerosis in Sdan .proceeding of awork shop on Bovine Tropical theilerosis Ed,S.M ,Kheir and Atta El-Manan ٤ - ٥ Mayh,١٩٩٤,Khartoum Sudan.

Lucey, and B, Rowlands ,J.G (١٩٨٤) The association between clinical mastatitis and milk yield in dairy *cows J. anim .Prod.* **٣٩,** ١٦٥ – ١٧٥

Majok A.A;Zessin,K.H;Paumann,M.P.O. and Farver,T.P.(١٩٩١).Analysis of baseline survey data on rinderpest in Bahr ElGazal province with proposal of an improved vaccination strategy against rinderpest for Southern Sudan.Trop.Anim.Hlth.prod.٢٣:١٨٦-١٩٦.

Malek,E.A.(١٩٥٩) Acheck list of helminth parasites of domasticated animals in the sudan, *India .Vet.J.*٣٦/٢٨١

Malek,E.A.(١٩٦٩). Studies on bovine Schistosomiasis in the sudan Ann.Trop.Med. parasite.,٦٣,٥٠١

Malek.E.A.(١٩٨٠). Snail Transmitted parasitic diseases. Text book ,Vol.I.(CkC press,٢٠٠٠) N.W.٢٤th street,Florida ٣٣٤٣

Martin, s.Wayne.١٩٨٧. Veterinary Epidemiology

Mcfadden , T.B,Alers,A,M, and Capuce. A,V, (١٩٨٨) Relationship of milk protein in B.with scc in milk of dairy cows *J. Dairy Sc.*,٧١; ٨٢٦

Meyer. B. (١٩٨٠) production losses due to s/c mastitis measured using impluse cytophotometer . thesis cited from Vet Bulletin , ١٩٨٠, ٤٩ - ٥١٣٩.

Mustafa,I.E (١٩٦٧) Studies on bovine farcy in sudan .١. pathology of the disease *Journal of camparative pathology*.

Moulton .J.E, A.G. Bordin and E.A. Rhode (١٩٥٦). Apathogenic pleuro pneomonia like organis from calf . *J.Amer.Vet.Med.Assoc*., ١٢٩,٣٦٤,٣٩٧..

Musa M.T. (١٩٨٦). The effect of alumminium and zinc hydroxides complete freunds adjuvants on immunogenicity of Pastreulla multocida *M.V.Sc* . thesis, University Of Surry , U.K

Musa, M.T.,K.L.Jahans and M.E.Fdlalla (١٩٩٠). Clinical manifestation of Brucellosi in cattle of Southern Darfour province, Western Sudan. *J.com. path.,vol.* ١٠٣(١):٩٥-٩٩

Musa,M.T and Mitchell, M.B.(١٩٨٥). Afield case of contagious abortion in Darfur , Western Sudan. *Sud. J.vet.sc.Anim.Husb.,* ٢٥،١١.

Nocard; E. (١٨٨٨). Note sur la maladie de bceufas de la Guadeloupe connue Sous le nom de farcin, Annales de Institue Pasteur. Paris ٢, ٢٩٣-٣٠٢.

O'leary, J. and Leavitt, B.(١٩٨٣). Influence of mastits on milk production,milk quality and cheese yield ,cited fom D.S.A ١٩٨٣ , ٤٥،٨٨٠٩,

OIEclassificationofdiseases,(٢٠٠٤).http://www.aquapoland.pro.onet.pl/OIE.htm

Osman O,M.(١٩٧٢) Areprot on the Ethidium bromide Campaign , South Darfour province , Centeral Veterinary Research Laboratory, Khartoum

Osman o. M(١٩٩٠) Theileria annulata in Sudan in recent developments in research and control of T. annulata. Proceeding of

aworkshop held at ILRAD. Nairobi, Kenya, ١٧ - ١٩ september,١٩٩٠ pp٢١ -٢٢

Osman O.M,El-Hussien, A.M.Ahmed,N and Abdulla ,H.S (١٩٨٢). Ecological studies on ticks (A carina. Ixodidae) of Kordofan Region, Sudan ,*Bull , Anim ,Hlth , prod .Afr;*٣٠;٤٥ -٥٣.

Osman. O. M ,Ibrahim, A .M .and Osman A. G (١٩٧٧).Some observation on ticks of sedentary cattle in Southern Darfur province . proc ٨th Vet , Ass. Conf. Khartuom Sudan, pp٨٢ -٩٢

Pantelouris,E.M.(١٩٦٥) The common liver fluke,*Fasciola hepatica*. L., pergamon press,oxford.

Rahman .A. h.A, and abdoon A.M.O.(١٩٨٤) Tsetse and Trypanosomiasis Survey of south Kordofan Sudan , Report at the centeral veterinary Research Laboratory. Khartoum

Rossiter,P.B. (١٩٩٥): Assessment of rinderpest endemcicity in Eastern Africa Consultancy Report of amission to Kenya,Sudan and Ethiopia, FAO, November/December ١٩٩٤

Rossiter.P.B;Jessett,D.M;Wafula,J.S;Karstad,L;Chema,S;Taylor,W. P;RoweL.W;Nyange,J.C;Otaru,M;MumbalaM.and

Scott,G.R.(١٩٨٣). Re-emergence of rinderpest as a threat in East Africa since١٩٧٩.Vet.Rec.١١٣:٤٥٩ -٤٦١.

Saad.A.A.and Magzoub.M.(١٩٨٩)An outbreak of schistosomiasis monsoni among an eurppean community in Darfour Western Sudan.Annals trop.Med parasite (in press) Sudan.J,vet.&Anim,Hsb.vol.١٥ No١

Saad M.B. and Zein Eldin (١٩٨٣): the survival rate of protoscolices from hydatid flud kept at constant temperatures Sud. J.Vet Sci vol ٤,١٥٧-١٥٨.

Salih, M.S. (١٩٧٢). Studies on bacteriological quality of fresh meat. Ph.D. Thesis, University of Khartoum.

Scott, G.R. (١٩٦٤): Rinderpest .Adv. vet Sci., ١١٣-٢٠٥

Scott, G.R. (١٩٨١): Rinderpest.In:Infectious Disease of wild Mammals.٢and ed.Ed. Ames .I A. USA. Iowa state University press ١٨-٣٠

Sheikh Eldin ,A.M. ,Mohamed.M.E.F.H. and ElAmin.M.A.G. ;(١٩٩٥))Assessment of Levels of immunity against rinderpest virus in ruminants in some Provinces of Darfour,*Sud.j.Sc.Anim.Husb.Vol.*٣٤(١،٢)١٩٩٥ p٧٢-٧٧

Shigide .M.T.A. and Mustafa A.A,(١٩٧٩). Biochemical and serological Studies on *Pasturella Multocida* isolated from cattle in the the Sudan. *Coronell Vet.,*٦٩،٧٧- ٨٤.

Shigidi, M.A. and Razig,S.A.(١٩٧١). Isolation of *Br.Abortus* from Knee hygroma in Abull. *Sud.J.vet . Sc. Anim.Hsb*.,١٤،٣٣-٣٥.

Shuster ,D.E (١٩٨٨) pathophysiological causes of suppression in milk synthesis during endotoxin refractory state in bovine mammary gland, cited from D.S.A١٩٨٩ ,٥١ .٧٩٠.

Simmons, G and A.Y.Johnston (١٩٦٣). Artheritis in calves caused by *Mycoplasma sp., Aust. Vet.J.*٣٩,١١,١٤.

Soliman, K .N.(١٩٥٦). The occurrence of *Schistosomiasis bovis* sansino.١٨٧٦, in Camelus dromedaries in Egypt .*J. Egypt. Med.Ass.*٣٩,١٧١

Soliman,K.N.and Khan, A.Q.(١٩٥٩). A note on salmonella infection of livestock in Upper Nile Province Sudan, *Bull. Epiz. Dis. Afr.*٧, ٣٧١- ٣٧٦.

Soulsby ,E.J.E(١٩٨٢). ٧edition Helmonthes , arthrpodes and protoza of domosticated animal

Sterne,H. and Batty,I.(١٩٧٥). Pathogenic Clostridia Ist., Ed. Butteworth, London and Boston.

Stock.P.(١٩٣٩). Distribution in England and Wales of Cancer of various organs.British Emire Cancer Campain-١٦th annual report,pp.٣٠٨-٤٣.

Tatchell . R,J.(١٩٨٣),Ticks ecology and Tick control, FAO,Rome,Techical Reporte no ١,*AG:Gcp/SUD/*٠٢٤ *DEN,*٣٣p

Taylor,W.P;(١٩٨٦). Epidemiology and control of rinderpest. Revue Scientifique et Technique *O.I.E.* ٥:٤٠٧ -٤١٠.

Terrestrial Animal Health Code ١١th edition (٢٠٠٣b).http://.www.oie.int/eng/ norms/ mcode/ A-٠٠٠٠٣.htm.page ٥of٩

Terrestrial Animal Health Code ١١th edtion(٢٠٠٣c).http://.www.oie.int/eng/ norms/ mcode/ A-٠٠٠٠٣.htm.page ٦ of ٩

Terrestrial Animal Health Code ١١th edtion(٢٠٠٣c).http://.www.oie.int/eng/norms/ mcode/ A-٠٠٠٠٣.htm.page ٧of ٩

Timms , L.L. and Schultze, L.H .(١٩٨٧) Dynamics and Significant of coagluase -ve staphylococal intra mammary infections *J. Dairy .Sc* ,٧٠،٢٦٤٨.

Wagner, T.N.and Stull , J.W. (١٩٧٨) Relationship between mastitis test score mineral compisition of milk and blood electrolytes profiles in holsteine cows . *J. Dairy Sc.* ٦١,١٧٥٥ -١٧٥٩.

Webside-file://F:\HEMORRAGIC٪٢٠SEPTICEMIA.htm (٢٠٠٤) page ١of ٧- ٦of ٧.

Webside-file://F:\ Trypanosomiasis% ٢٠nutrition% ٢٠ in % ٢٠ Africa. Htm s(٢٠٠٤). Page ١ of ٣- ٢of ٤.

World Health Organization.,(١٩٨٥). The control of Schistosomiasis. *W.H.O.Tech.Rep.Ser*.No,٧٢٨.

Yagi ,A.I. and Razig. T.A.(١٩٧٢) The horse flies of Southern Darfour .Sudan *s*