CLINICO-THERAPEUTIC STUDIES ON MYCOTIC DERMATITIS OF DOGS

By

VINU DAVID. P.

THESIS

Submitted in partial fulfilment of the requirement for the degree

Master of Veterinary Science

Faculty of Veterinary and Animal Sciences
Kerala Agricultural University

Department of Clinical Medicine
COLLEGE OF VETERINARY AND ANIMAL SCIENCES
MANNUTHY - THRISSUR
KERALA, INDIA

1998

DECLARATION

I hereby declare that this thesis entitled "**CLINICO THERAPEUTIC STUDIES ON MYCOTIC DERMATITIS OF DOGS**" is a bonafide record of research work done by me during the course of research and that this thesis has not previously formed the basis for the award to me of any degree, diploma, associateship, fellowship or other similar title, of any other University or Society.

Mannuthy
17.12.1998

P. VINU DAVID

CERTIFICATE

Certified that this thesis entitled "**CLINICO THERAPEUTIC STUDIES ON MYCOTIC DERMATITIS OF DOGS**" is a record of research work done independently by **Sri. P. Vinu David**, under my guidance and supervision and that it has not previously formed the basis for the award of any degree, fellowship or associateship to him.

Dr. P.G. Baby
(Chairman, Advisory Committee)
Assistant Professor (Sr.Scale)
Department of Clinical Medicine
College of Veterinary & Animal Sciences
Mannuthy

Mannuthy
.12.1998

CERTIFICATE

We, the undersigned members of the Advisory Committee of **Sri. P. Vinu David**, a candidate for the degree of **Master of Veterinary Science** in Clinical Medicine, agree that this thesis entitled "**CLINICO THERAPEUTIC STUDIES ON MYCOTIC DERMATITIS OF DOGS**" may be submitted by Sri. P. Vinu David, in partial fulfilment of the requirement for the degree.

Dr. P.G. Baby
(Chairman, Advisory Committee)
Assistant Professor (Sr.Scale)
Department of Clinical Medicine
College of Veterinary & Animal Sciences
Kerala Agricultural University
Mannuthy

Dr. N.M. Aleyas
Professor & Head
Department of Clinical Medicine
(Member)

Dr. S. Ajith Kumar
Assistant Professor
Department of Clinical Medicine
(Member)

Dr. M. Mini
Assistant Professor
Department of Microbiology
(Member)

External Examiner

ACKNOWLDEGEMENT

I sincerely express my whole hearted gratitude to Dr. P.G. Baby, Assistant Professor (Senior Scale), Department of Clinical Medicine, College of Veterinary and Animal Sciences, Mannuthy, for his expert advice, valuable suggestions, meticulous guidance and for providing me the courage in each step of my research programme, as the chairman of the advisory committee.

I am grateful to Dr. N.M. Aleyas, Professor and Head, Department of Clinical Medicine, Dr. M. Mini, Assistant Professor, Department of Microbiology and Dr. S. Ajithkumar, Assistant Professor, Department of Clinical Medicine, for their creative suggestions and whole hearted help during this study as members of the Advisory Committee.

The encouragement and suggestions extended by Dr. V.S. Balakrishnan, Professor, Dr. P.C. Alex, Associate Professor and Dr. K.M. Jayakumar, Dr. R. Vijayan and Dr. Usha Narayana Pillai, Assistant Professors, Department of Clinical Medicine are gratefully acknowledged.

I am obliged to Dr. Augustine, Assistant Professor (Sel. Grade), Department of Medicinal and Aromatic Plants, College of Horticulture and Dr. J. Thomas and Dr. Samuel Mathew, Associate Professors, Aromatic and Medicinal Plant Research Station, Odakkali for their sincere helping hand extended to me in obtaining the plant extracts.

I also acknowledge the help done by Dr. Luckins C. Babu, Associate Professor, College of Forestry in identifying the plants and to Dr. V.K. Mallika,

Associate Professor, Cocoa Research Project, College of Horticulture for the facilities provided for the photomicrographs.

I am indebted to Dr. S. Sulochana, Dean-in-charge and Dr. A. Rajan, Dean (Retd.), College of Veterinary and Animal Sciences, Mannuthy for all the facilities provided for the research work.

I am very much thankful to Dr. A.M. Chandrasekharan Nair and Dr. Santa E. George, Associate Professors, Department of Pharmacology, Dr. V. Jayaprakasan, Associate Professor, Department of Microbiology, Dr. Syam K. Venugopal and Dr. K.D. John Martin, Assistant Professors, Department of Surgery, Dr. Devada, Assistant Professor, Department of Parasitology and Dr. Mammen J. Abraham, Assistant Professor, Department of Pathology for their remarkable help and cooperation.

I am short of words to acknowledge the help extended to me by Dr. P.T. Dinesh for his moral support and for providing me with a vehicle during the research work and Dr. Reghu Ravindran for his remarkable co-operation, whole hearted help and encouragement extended to me.

I greatly acknowledge the co-operation and help rendered to me by Dr. C.V. Sree Ranjith Kumar and Mrs. Sreekala, Research Associates, Department of Microbiology during the research work.

With great fondness I acknowledge the sincere helping hand extended to me by my friends and colleagues Dr. D. Sanjay, Dr. Biju Chacko, Dr. V.K. Vinod, Dr. Neelakanta Praveen Pillai, Mr. Simon, Mrs. Preetha, Mrs. Bindhu, Miss Shobhy, Dr. Jayakrishnan, Dr. K. Pramod, Dr. P.K. Shihabudeen, Dr. S. Sivaraman, Dr. Manoj Johnson, Dr. Madhu Rajan Mathews, Dr. P. Arun Raphel, Dr. Anil J. Thatchil, Dr. Pame, Dr. Sini Thomas, Dr. K.V. Shibu, Dr. Jomy John,

Dr. P. Mohan, Dr. C.N. Dinesh, Dr. R.D. Padalkar, Dr. Kumaresan, Dr. K.G. Biju, Dr. C. Jayakumar, Dr. K.R. Ajaykumar and to all others who have directly or indirectly helped me in completing this research programme.

I am very much thankful to Mr. Ramesh, Representative, Johnson and Johnson India Ltd., for providing me the ketoconazole ointments (Nizral cream) free of cost for my research work.

No space or words can express my deep sense of gratitude to my beloved father, sister and grandmother for their love, affection and moral support.

The timely help extended by Ramani, Shobana, Ratnam and Sugathan is greatly acknowledged.

I am thankful to Mr. O.K. Ravindran, Peagles, Mannuthy and Mr. George, Platen Printers for their unflagging patience in the preparation of this manuscript.

I am grateful to Kerala Agricultural University for providing financial assistance in the form of K.A.U. junior fellowship.

Above all, I bow my head before God Almighty for the blessings showered on me.

P. VINU DAVID

Dedicated to the loving memory
of my beloved mother

CONTENTS

LIST OF TABLES

LIST OF PLATES

INTRODUCTION

Dogs suffer from innumerable diseases of which those affecting the largest organ of the body, namely skin account for approximately 25 per cent of cases. Moreover, dermatological problem is one of the common and daunting task encountered by a clinician (Chandler, *et al.*, 1991).

Skin serves as an anatomical and physiological barrier between animal and environment. Its sensory components perceive heat, cold, pain, pruritus, touch and pressure. In addition skin is synergistic with internal organ systems and thus reflects underlying pathological processes. So differential diagnoses of dermatological conditions are of utmost importance.

Incidence of cutaneous mycotic infections in dogs varies widely. It is more prevalent in areas where the climate is hot and humid. Ring worm was the first mycotic disease recognized and reported in man and animals. *Microsporum* spp. causing dermatophytosis was reported in dogs as early as 1896 (Jungerman and Schwartzman, 1972).

The majority of cutaneous fungal infections are caused by a homogenous group of keratinophilic fungi, the dermatophytes; which includes three genera namely *Microsporum*, *Trichophyton*

and *Epidermophyton*. The other group comprises of non-dermatophytes which includes a wide variety of soil inhabiting moulds and yeasts that are ubiquitous in nature viz., *Aspergillus* spp., *Penicillium* spp. etc.

Among the dermatological diseases of dogs superficial mycosis is the condition that is most frequently misdiagnosed and overdiagnosed. Here comes the importance of diagnosing fungal infections through culture and microscopic examination of skin scrapings (Muller *et al.*, 1989).

A number of antifungal agents are now available for treating mycotic infections of which topical agents are comparatively less toxic and easy to apply. Eventhough modern topical antimycotic preparations like Ketoconazole are effective, the cost of treatment is very high. A number of indigenous plants available locally have good antifungal properties. Hence this work is taken up to formulate a cheap and effective topical antifungal preparation from locally available indigenous plant materials like cinnamon oil and *Sphaeranthus indicus* Linn. (Malayalam: Adakkamanian; Hindi: Mundi) extract. Though numerous studies on fungal organisms causing mycotic dermatitis have been carried out reports regarding a therapeutic trial involving both *in vivo* and *in vitro* studies against fungal organisms are rare.

On the basis of the above facts it was decided to undertake a study to illustrate the following:

1. Clinical signs in mycotic dermatitis.

2. Isolation and identification of the causative organism

3. Leukogram of the affected animal

4. Comparing the efficacy of indigenous medicinal plant preparations namely cinnamon oil and extract of *S. indicus* with the modern drug ketoconazole in mycotic dermatitis of dogs.

Review of Literature

REVIEW OF LITERATURE

Chandler *et al.* (1991) described two types of mycotic dermatitis in dogs viz. dermatophytosis and dermatomycosis. Dermatophytosis is a fungal infection of the hair, nail or skin caused by a species of *Microsporum*, *Trichophyton* or *Epidermophyton*. Dermatomycosis affects the hair, nail or skin and is caused by a non-dermatophyte like *Candida* spp.

2.1 Incidence of mycotic dermatitis

Incidence is high in tropical countries where the climate is hot and humid (Jungerman and Schwartzman, 1972).

Aho (1980) conducted studies on fungal flora in hair from domestic and laboratory animals suspected for dermatophytosis. Dermatophytes were isolated from 36 of 331 samples which gave an incidence rate of 10.9 per cent.

Chittawar and Rao (1982) reported that 18.48 per cent of canine dermatological disorders in central India were of mycotic origin.

Bohm (1985) reported that out of 6724 clinical specimens examined from dogs, 412 (6.1 per cent) were found to be positive for dermatophytes.

Cutsem *et al.* (1985) found that out of 142 specimens of hair and crusts from canine patients with diffuse hair loss 18.3 per cent were positive for dermatophytosis.

Pintori *et al.* (1986) published the results of examination of 2148 dogs with skin lesions and found that 120 were positive for dermatomycosis.

Philpot and Berry (1987) stated an incidence rate of 10.4 per cent for mycotic dermatitis from clinical examinations made in domestic animals for two and a half year period.

Bernardo *et al.* (1989) on examination of 666 dogs suspected of dermatophytosis found that 142 (21 per cent) were positive for the disease.

Caretta *et al.* (1989) isolated dermatophytes and keratinophilic fungi from 62 out of 168 dogs examined (36.9 per cent).

During routine examination of dogs for cutaneous lesions Jand and Gupta (1989) found that 10.8 per cent of dogs showed the presence of non dermatophytic fungi. They also pointed out that the incidence of these infections was greater in warm and humid climate.

Dermatophytes were cultured from 70 of 1824 (3.8 per cent) canine samples submitted over 10 years by Lewis

et al. (1991). Both male and female dogs were equally affected by dermatophytosis and there was a higher incidence in dogs less than one year of age. They also stated that localized dermatophytosis was more common.

Vokoun and Kucera (1991) reported 18 per cent isolation of dermatophytes from 836 dogs with skin lesions.

Sidhu *et al.* (1993) conducted a survey to find out incidence of mycotic dermatitis in dogs and concluded that maximum incidence was recorded from the month of July to December when the climate was hot and humid.

2.2 Etiology

Muhammed and Mbogwa (1974) isolated *Microsporum nanum* from a dog with clinical dermatophytosis.

Pecheur and Gerin (1978) reported that 85 per cent of dermatomycosis in dogs was caused by *Microsporum canis*, 10 per cent by *Trichophyton mentagrophytes* and eight per cent by *M. gypseum*.

Weiss and Bohm (1978) explained that in routine diagnosis between 1965 and 1976, *Microsporum canis* was found on 79.6 per cent of dogs, *Trichophyton mentagrophytes* on 17.2 per cent and *T. verrucosum* on 3.2 per cent of dogs examined.

Microsporum canis was the main isolate obtained from dogs presented with dermatomycosis during a 13 year period in Kyoto, Japan, followed by *M. gypseum*, *Trichophyton mentogrophytes* and *T. rubrum* (Kushida, 1984).

Bourdeau and Chermette (1987) isolated *Trichophyton mentagrophytes* and *T. erinacei* from a seven year old dog that had been affected for a year with pruritic lesions.

Gambale *et al.* (1987) conducted a mycological investigation involving direct microscopic examination and culture of skin scrapings on 212 dogs with presumed dermatomycosis and the following etiological agents were identified, namely: *Malassezia pachydermatis* (49.5 per cent); *Microsporum canis* (30 per cent); *M. gypseum* (4.7 per cent); *Trichophyton mentagrophytes* (0.9 per cent); *Epidermophyton floccosum* (0.9 per cent); *Candida* spp.(1.9 per cent); *Trichosporon* spp. (0.9 per cent); *Torulopsis* spp. (0.9 per cent); *Geotrichum* spp. (0.9 per cent); *Cephalosporium* spp. (1.9 per cent); *Scopulariopsis brevicaulus* (4.7 per cent) and dermataceous fungi (2.4 per cent).

Caretta *et al.* (1989) found that the most common isolate in dogs with superficial mycosis was *Microsporum canis* followed by *Trichophyton mentagrophytes*.

Komarek (1989) isolated 26 fungal cultures from skin scrapings of 955 dogs and found that 15 of the fungal isolates obtained were *Trichophyton mentagrophytes*, 8 were *Microsporum canis* and one each were *T. terrestre*, *T. gallinae* and *T. rubrum*.

Sagmeister (1989) recovered 35 isolates of *Microsporum spp.* and 10 isolates of *Trichophyton* spp. from 303 animals with skin lesions.

Wright (1989) observed that 65 per cent of ring worm in dogs was caused by *Microsporum canis*.

Aho *et al.* (1993) presented the results of 2956 skin scrapings examined for dermatophytosis; which included 158 positive cases of *Microsporum canis*, 40 cases of *Trichophyton mentagrophytes*, 95 cases of *T. verrucosum*, 13 of *T. equinum* and 3 of *M. equinum*.

Carlotti and Urbini (1993) conducted studies on dermatophytosis caused mainly by two genera of fungi namely Microsporum and Trichophyton of which *Microsporum canis* accounted for 40-80 per cent of dermatophytosis in dogs.

Sidhu *et al.* (1993) found that *Microsporum gypseum* (51.6 per cent) and *Trichophyton* spp. (19.34 per cent) were the main dermatophytes isolated, where as *Aspergillus* and *Alternaria*

spp. were the main non-dermatophytes isolated from dogs with mycotic dermatitis.

Sparkes *et al.* (1993) stated that *Microsporum canis* accounted for 65 per cent of positive cases in dogs and 92 per cent in cats.

2.3 Pathogenesis

Goldston and Wilkes (1982) reported that fungi release metabolic products into tissues causing an inflammatory reaction at the site and the organism spreads to the periphery thereby resulting in a circular pattern of alopecia. The typical appearance of this lesion with a healing centre and erythematous periphery gave the term ring worm to it.

According to Smith (1988) dermatophytes do not invade or survive on living cells or in areas of intense inflammation. They need the keratinized stratum corneum for their growth. He also stated that fungal growth enzymatically weakens the hair shaft and it breaks off leaving a short stubble.

Medleau and Ristic (1992) pointed out that following penetration of hair cuticle the dermatophyte proliferates on the surface of the hair and migrates down to the hair bulb at the same rate that the hair grows upward.

The mechanism by which dermatophytes cause lesions in the host is by a hypersensitivity reaction caused by fungal metabolic products (Quinn *et al.*, 1994).

2.4 Clinical signs

Jungerman and Schwartzman (1972) pointed out that usual routes of transmission of dermatomycosis include direct contact (most common), indirect contact and air borne infections. They also stated that fungal spores remain viable for months to years under normal environmental conditions.

Thomsett (1977) reported considerable variations in the morphology and extent of lesions of ring worm in small domestic animals. He noticed that in some animals single discrete areas of infection may occur while in others there were generalized areas of infection with alopecia and dry scaly skin.

Cottral (1978) examined lesions suspected for dermatomycosis and found that there was hair loss, erythema and scaling. He also found that lesions were usually circular and were most frequently seen on the head of the animal.

Fraser *et al.* (1986) described the clinical signs of ring worm in dogs and this include focal circular alopecia with

scales and crusts and broken hairs. Generalized ring worm was rare in dogs unless accompanied by an immune deficient state.

Thomsett (1986) gave a detailed account of the clinical signs of ring worm in dogs which included small circular areas of scaliness with partial hair loss, covered in dandruff flakes, and the presence of broken hairs with erythematous border.

Medleau and Ristic (1992) pointed out that dermatophytosis was usually non pruritic and clinical signs include alopecia, erythema, scales and crusts. These authors also stated that lesions were ranging from scaly patches of alopecia to raised erythematous nodules called kerions.

2.5 Clinical pathology

Benjamin (1978) observed neutrophilia in mycotic infections in animals and eosinophilia especially in allergic conditions of skin.

Wintrobe et al. (1981) reported that there was leukocytosis, neutrophilia and eosinophilia in fungal infections in man.

Eosinophilia was most commonly associated with hypersensitivity reactions in mycotic dermatitis in animals (Chandler *et al.*, 1991).

Willard *et al.* (1994) stated that most inflammatory processes involve neutrophilia/leukocytosis and it was very common in bacterial infections, but fungal, protozoal and viral infections also results in neutrophilia. They also pointed out eosinophilia in fungal infections.

Tilley and Smith (1997) reported that results of complete blood count and serum biochemistry cannot be used for diagnosing dermatophytosis. They only help to identify an underlying problem which could be a contributing factor in the development of the disease.

2.6 Diagnosis

Thomsett (1977) briefly reviewed the diagnostic techniques employed for diagnosing ring worm infection in small animals which include examination of wet preparations of hair samples treated with potassium hydroxide, Wood's Lamp examination and fungal culture.

Dermatophyte test medium was found to be a useful aid for diagnosing animal ring worm along with other tests. The colour change of the culture medium within a specified period

indicates whether the organism is pathogenic or saprophytic (Dion, 1978).

Goldston and Wilkes (1982) stated various methods for diagnosing superficial fungal infections. This include (a) observing clinical manifestations, (b) examining the ectothrix spores that were visible under direct microscopic examination of skin scrapings and (c) fungal culture.

Bauer (1984) studied the various methods of diagnosing dermatomycosis which include microscopic examination of skin scrapings and fungal culture.

Guaguere *et al.* (1985) reported various techniques including examination with Wood's Lamp, direct examination of skin scrapings, fungal culture and cutaneous biopsy for diagnosing dermatomycosis and yeast infections.

Gravino *et al.* (1987) subjected the skin scrapings to direct microscopical examination and cultured them in Dermatophyte Test Medium and Sabouraud's Dextrose Agar for diagnosing ring worm infections.

Smith (1988) opined that Dermatophyte Test Medium was very helpful in diagnosing pathogenic dermatophytes, which metabolize proteins initially, thereby creating alkaline by-products that turn media deep red, usually in the first

three to ten days. Non-pathogenic saprophytic fungi which initially use dextrose, produces no colour change within 14 days.

Commonly employed diagnostic procedures for dermatophytosis include examination of skin lesions with a Wood's Lamp, direct microscopical examination of scales and hairs, histopathological examination of skin biopsy samples and fungal culture (Medleau, 1990).

Shearer (1991) stated that hair samples required for microscopy or fungal culture should be plucked with forceps especially from the edge of an active lesion and hairs should be mounted in potassium hydroxide, mineral oil or lactophenol cotton blue for microscopical examination.

Medleau and Ristic (1992) reported that positive identification of a dermatophyte can be made by examining the slide preparations of a fungal colony. The authors have also stated the various characteristics of the macroconidia and microconidia of common dermatophytes.

Quinn *et al.* (1994) suggested that gross morphology of the fungal colony and type of pigmentation along with microscopic appearance of the fruiting heads and spores from the mould colonies help in identifying the species of dermatophyte cultured.

2.7 Treatment

2.7.1 Ketoconazole

Minagawa *et al.* (1982) reported that Ketoconazole had minimum inhibitory concentration (MIC) of 71.6 µg/ml of the medium against *Candida albicans*; 0.62 to 0.80 µg/ml against other *Candida* spp.; 1.76 to 7.94 µg/ml against other yeasts; 0.63 to 20 µg/ml against dermatophytes and 1.25 to 20 µg/ml against *Aspergillus* spp.

In experiments on guinea pigs Cauwenbergh *et al.* (1984) noticed that all animals infected with *Trichophyton mentagrophytes* and *Candida albicans* and 50 per cent of those infected with *Microsporum canis* were cured following treatment with 0.5 per cent topical ketoconazole for 14 days.

Mahajan (1986) tested the *in vitro* susceptibility of 18 fungi to natamycin, econazole, ketoconazole and amphotericin-B. Ketoconazole arrested the growth of seven fungi at a concentration of 100 µg/ml. Econazole was the most effective followed by natamycin, ketoconazole and amphotericin-B.

Steinmann *et al.* (1988) conducted studies on the sensitivity of *Microsporum gypseum* to five antifungal agents by the disk diffusion method and indicated that imidazole

compounds are more effective than nystatin and amphotericin-B against this species of dermatophyte.

Medleau and White-Wethers (1992) found that topical application of ketoconazole cream was very effective in treating localized dermatophytosis.

Puccini *et al.* (1992) tested the *in vitro* susceptibility of various antifungal agents against 134 isolates of *Microsporum canis*, obtained from cats. Ketoconazole was susceptible in 50.7 per cent of isolates, whereas clotrimazole had the highest activity of 99.2 per cent. Dermatophytes were classified as susceptible (areas of inhibited growth ≥20 mm for imidazoles), intermediate (areas between 12 and 19 mm for imidazoles) and resistant (areas less than 12 mm for imidazoles) based on the zone of inhibition produced.

Weithers and Medleau (1995) evaluated the antifungal activity of seven commonly used topical antifungal products on *Microsporum canis* infected hairs from dogs and cats by *in vitro* study. Hairs were soaked in each product for five minutes twice a week for four weeks. Of the seven products used in this study lime sulfur and enilconazole solution inhibited fungal growth after two treatments with either product, chlorhexidine and povidone iodine solutions were effective after four treatments, sodium hypochlorite solution

and ketoconazole shampoo inhibited fungal growth after eight treatments.

Hallu *et al.* (1996) reported that a combination of norfloxacin and ketoconazole can be used topically in the treatment of canine otitis caused by *Malassezia* spp. and a variety of bacterial organisms. Results showed 91.66 per cent satisfactory responses at 7 and 14 days of treatment.

2.7.2 *Sphaeranthus indicus* extract

Agharkar (1953) recorded the use of *Sphaeranthus indicus* for treating scabies, ring worm of waist etc. in human.

The paste of the herb made with oil can be applied in itch and for curing various other skin affections (Thacker *et al.*, 1976; Drury, 1978; Nadkarni, 1982, Shekhani *et al.*, 1990, Sivarajan and Indira, 1994 and Warrier *et al.*, 1996).

2.7.3 Cinnamon oil

Dey and Bahadur (1973) reported that the leaves of *Cinnamomum zeylanicum* Blume (Malayalam: Ilavangam; Hindi: Dalchini) yielded a darker coloured oil with an odour resembling that of cloves and cinnamon. They also stated that eugenol was the main constituent (70-80 per cent), the remainder being cinnamic aldehyde.

Bullerman *et al.* (1977) found that cinnamon oil and clove oil inhibited *Aspergillus parasiticus* growth and its subsequent toxin production in yeast sucrose broth medium.

Morozumi (1978) found a new antifungal agent in *Cinnamomum zeylanicum* namely Orthomethoxy cinamaldehyde (OMCA) that inhibited the growth of various dermatophytes at a concentration of 3.17-50.00 µg/ml of the medium.

Yousef *et al.* (1978) stated the fungistatic and fungicidal properties of cinnamaldehyde towards *Microsporum audounii* and *Trichophyton mentagrophytes*.

Saksena (1984) conducted comparative evaluation of some essential oils from the leaves of various plants including *Cinnamomum zeylanicum* against several dermatophytes, *Candida* spp. and *Aspergillus fumigatus*. They were found to possess considerable antifungal activity.

Rao *et al.* (1988) stated that leaf oils obtained from five different *Cinnamomum zeylanicum* plants showed wide variation in eugenol content (from 0 to 89 per cent). Leaf oils which had a low percentage of eugenol were found to contain benzyl benzoate as the major constituent, indicating the existence of a chemical race of *C. zeylanicum*.

Mangiarotti *et al.* (1990) conducted studies on the essential oils of *Cinnamomum zeylanicum* (both bark and leaf) and oil from three other plants, against 113 fungal strains including yeasts, dermatophytes and other moulds. Dermatophytes were the most sensitive to the four essential oils, particularly to cinnamom bark oil.

Lima *et al.* (1993) found that cinnamon oil was active against *Microsporum* and *Trichophyton* spp. of dermatophytes inhibiting 80 per cent of the dermatophyte strains tested and producing zones of inhibition more than 10 mm in diameter.

Mnimh (1993) reported that the essential oil of cinnamomum species distilled from the bark was used in many parts of the world for a wide range of chronic skin infections. Essential oil is antifungal and its application is by diluting 10 ml of cinnamon oil in 25 ml of sunflower oil and by massaging it into the affected parts.

Singh *et al.* (1995) reported the fungitoxic action of the vapours of cinnamic aldehyde, an active constituent of cinnamon bark oil, against *Aspergillus* and *Candida* spp. Hence cinnamon oil vapours could be used in the treatment of respiratory tract mycoses.

Nath *et al.* (1996) found that benzyl benzoate was the main component in both cinnamon leaf and stem bark oils. More

benzyl benzoate was detected in stem bark oil (84.69 per cent) than in leaf oil (65.42 per cent).

Sukumar (1996) conducted *in vitro* drug sensitivity of cinnamon leaf oil against all yeast and yeast like isolates obtained from milk samples of bovine mastitis and reported cent per cent inhibition of fungal growth at a dilution of 1 in 10.

2.7.4 Other antifungal agents

There are five classes of agents used in the treatment of ring worm namely (a) irritants, (b) keratolytics, (c) fungicidal agents, (d) fungistatic agents and (e) agents that convert anagen phase of hairs to telogen phase (Jungerman and Schwartzman, 1972).

Muller *et al.* (1989) reported that iodine preparations were most effective as povidone iodine for dogs. Sulfur, sodium hypochlorite, chlorhexidine, captan etc. are other agents useful for topical antifungal therapy.

Copper sulphate ointments were formerly widely used by farmers as a home remedy for ring worm (Brander *et al.*, 1991). They also pointed out that Whitfield's ointment was another preparation useful for fungal infections.

Einstein *et al.* (1994) stated that some of the older topical formulations containing iodine compounds, dyes (crystal violet), mercurial preparations, sulphur compounds, chlorbutol, phenol and potassium permanganate had only moderate efficacy and they have now been largely superseded by more potent broad spectrum drugs.

Materials and Methods

MATERIALS AND METHODS

3.1 Incidence of mycotic dermatitis

Data on the incidence of mycotic dermatitis in dogs were collected from the records maintained in the University Veterinary Hospitals, Kokkalai and Mannuthy for the period from September 1996 to August 1998. Study was conducted in adult dogs brought with symptoms suggestive of mycotic dermatitis. A complete dermatological history followed by a detailed clinical examination of each case was carried out as suggested by Boddie (1956) and Muller *et al.* (1989) and was recorded in the proforma as given in Appendix-I.

3.2 Collection of clinical materials

Skin scrapings were collected asceptically as described by Jungerman and Schwartzman (1972). Whole blood and blood smears were obtained by the method suggested by Benjamin (1978).

3.3 Laboratory diagnosis

Skin scrapings collected were subjected to direct microscopical examination using 10 per cent potassium hydroxide solution and lactophenol cotton blue for the

presence of fungal spores as described by Jungerman and Schwartzman (1972). Those clinical cases found positive for fungal spores were confirmed by cultural examination in Sabourauds' Dextrose Agar (SDA) and Dermatophyte Test Medium (DTM).

The final identification of the fungi was made by observing the gross colony characters in SDA and by studying the microscopical characters of fungal spores and their mycelial relationships using a cello tape (Quinn *et al*, 1994).

Total and differential leukocytic counts were carried out as per the method described by Schalm (1975).

3.4 Experimental design

For treatment trial positive cases of mycotic dermatitis were randomly grouped into three (Group I, II and III).

In the first group commercially available ketoconazole cream (Nizral) 2 per cent w/w was used. The cream was applied topically twice daily for a period of four weeks.

In Group II *Sphaeranthus indicus* extract was used.

S. indicus is a much branched, annual herb with its stem winged, wings dentate; leaves alternate, 9x2.5 cms long and lacerate; heads globose and purplish pink. The plant is

distributed throughout the plains in India, Sri Lanka, Burma, Malaysia and Australia (Fig.1) (Sivarajan and Indira, 1994).

Crude alkaloid was extracted by using methanol as the solvent in Soxhlet Apparatus. For this 30 g of powdered plant material and 250 ml of methanol were used. The extraction was carried out for 24 hours to yield 2.2 g of the extract. This procedure was repeated several times to get the required quantity of the extract. The extract was dissolved in glycerine to make a 5 per cent solution and was applied topically on dogs twice daily for four weeks.

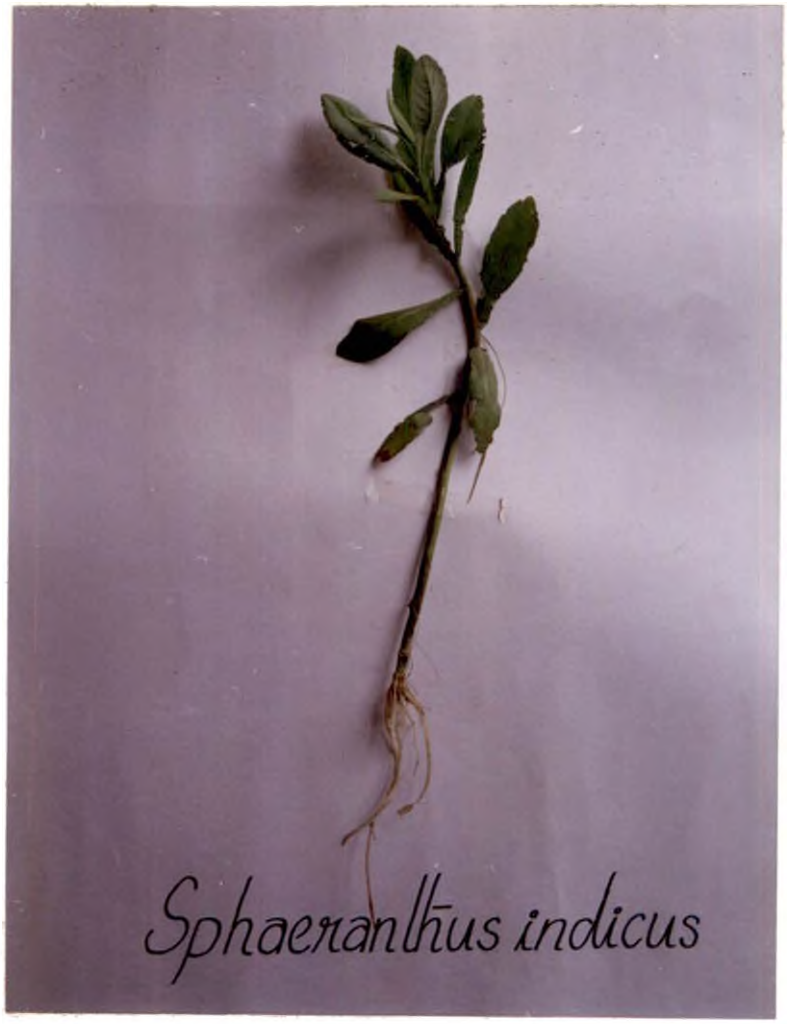
In the third group cinnamon leaf oil prepared at Aromatic and Medicinal Research Station, Odakkali, under Kerala Agricultural University was used for the study.

Cinnamon leaf oil was obtained by the hydrodistillation of the leaves of *Cinnamomum zeylanicum* in a Clevenger Apparatus.

C. zeylanicum is a moderate sized tree with a brown rough bark; light red coloured wood that is moderately hard and mildly scented. Leaves are arranged in opposite direction whereas the berry is ovoid and dark purple. This tree is distributed in the Western Ghats from South Canara southwards (Fig.2) (Gambale, 1967).

Plate 1. ***Sphaeranthus indicus*** **plant**

Plate 2. **Leaves of** ***Cinnamomum zeylanicum***



Sphaeranthus indicus

Leaves of Cinnamomum zeylanicum

Dogs with mycotic dermatitis were treated topically twice daily for four weeks with a 5 per cent solution of cinnamon oil dissolved in glycerine.

The course of the illness and the response of treatment was assessed clinically for each group by examining the clinical materials once in seven days till the end of the treatment trial.

3.5 *In vitro* antifungal susceptibility tests on the fungal isolates obtained

Under asceptic conditions small quantity of fungal colony obtained was suspended in sterile peptone water taken in a sterile test tube and incubated for five hours. This suspension was made visually comparable to half the density of a No.1 MacFarland standard which was prepared by adding 0.5 ml of 0.048 M Barium chloride to 99.5 ml of 0.36 N sulphuric acid. The Petri dish containing SDA was then swabbed with the above suspension using a sterile cotton swab within 15 minutes. Streaking was done in three planes by rotating the Petri dish approximately 60° each time so as to ensure an even distribution of inoculum. After swabbing, three wells of 5 mm diameter were cut on the agar culture medium so that they are at least 15 mm away from the edges of the plate and 24 mm from centre to centre.

Hundred microlitres of ketoconazole, *S. indicus* extract and cinnamon leaf oil diluted in Di Methyl Formamide were added to these wells. Now each of these wells contained 20 μg of ketoconazole, 50 mg of *S. indicus* extract and a 1 in 10 dilution of cinnamon oil, respectively. Petri dishes were sealed with adhesive tape. After an incubation period of five days at room temperature readings were taken by measuring the zone of inhibition.

Results

RESULTS

4.1 Incidence

Data on the incidence of dermatological disorders collected from University Veterinary hospitals at Kokkalai and Mannuthy for the period from September 1996 to August 1998 revealed that out of 12847 dogs presented 659 (5.13 per cent) were having mycotic dermatitis, 840 (6.53 per cent) had ectoparasitic infestation and 796 (6.20 per cent) had other dermatological problems. Thus from a total of 2295 dermatological cases presented 28.72 per cent had mycotic dermatitis, 36.6 per cent had ectoparasitic infestation and 34.68 per cent had other dermatological problems (Table 1).

Out of the 659 dogs with mycotic dermatitis, 230 (34.90 per cent) were German shepherds; 140 (21.24 per cent) were Dachshunds; 60 (9.1 per cent) were Dobermann pinschers; 104 (15.78 per cent) belonged to miscellaneous breeds and the remaining 125 (18.96 per cent) were non-descripts. Three hundred and sixty three (55.08 per cent) dogs presented with mycotic dermatitis during the two year period were above one year of age and 390 (59.18 per cent) dogs were females (Table 2).

4.2 Clinical examination

Twenty one dogs found positive for mycotic dermatitis upon microscopical examination of the skin scrapings formed the basis for this study. Physiological parameters viz. respiration, pulse and temperature were found to be within the normal range for all cases.

Detailed clinical examination of each case revealed that configuration of the lesions were extremely variable in majority of cases (16) whereas it was annular in two and central healing type in three. All the lesions showed scales and alopecia. Pruritus was noticed in 17 cases whereas erythema was observed in 11 cases. Lesions were localized in 18 dogs and diffuse in three. Regarding distribution of lesions: 12 had lesions on head and limbs; four each on ventral abdomen and lateral aspect of the body and one on the dorsal aspect of the body (Tables 3 and 4).

4.3 Laboratory diagnosis

Skin scrapings collected from dogs suspected of mycotic dermatitis revealed 21 positive samples among 75 clinical cases. Under direct microscopical examination fungal spores were found arranged in chains or in irregular masses on the surface of the hair (Ectothrix arrangement) (Fig.3).

The mean total and differential leukocytic count of dogs in each group during the course of the disease were tabulated (Tables 5, 6 and 7).

4.4 Isolation and identification of the organism

Twenty one fungal cultures obtained were identified. Dermatophytes produced a change of colour from yellow to claret red between three and five days after inoculation of skin scrapings in Dermatophyte Test Medium. Non-dermatophytes also produced a change of colour of DTM after 14 days of inoculation of skin scrapings.

Final identification of the fungi from the cultures in Sabourauds' Dextrose Agar revealed two species of dermatophytes; *Microsprorum gypseum* and *Trichophyton mentagrophytes*; and three species of non-dermatophytes viz., *Penicillium*, *Aspergillus* amd *Rhizopus* spp.

In Group I, one dog was found to be infected by *M. gypseum* and three each by *Aspergillus* and *Penicillium* spp.

From dogs of Group II, one *M. gypseum*, three *Rhizopus* and three *Aspergillus* spp were isolated.

In Group III, *M. gypseum* and *T. mentagrophytes* were detected in one dog each and the rest of the five dogs in this group were affected by *Penicillium* spp.

Thus a total of four dermatophytes (three *M. gypseum* and one *T. mentagrophytes*) and 17 non-dermatophytes (eight *Penicillium*, six *Aspergillus* and three *Rhizopus* spp) were isolated. The gross colony and microscopic characters of the fungal isolates are depicted in Fig.4 to 13 and in Table 8.

4.5 *In vitro* antifungal susceptibility tests on the fungal isolates obtained

The zone of inhibition produced by the three therapeutic agents against the fungal isolates obtained are given in Table 9. All the fungal isolates obtained were highly sensitive to cinnamon oil at a dilution of 1 in 10, followed by ketoconazole at 20 µg concentration and *Sphaeranthus indicus* extract at 50 mg concentration (Fig.14).

4.6 Response to treatment

Five dogs in Group I, which were treated with ketoconazole ointment showed complete recovery (Fig.15 and 16). Animals showed signs of improvement from first week onwards. Among the recovered animals, four dogs recovered by 21st day whereas one responded by 28th day. The lesions

persisted even after the course of treatment for the remaining two dogs and *Aspergillus* spp. of fungi was isolated from both these dogs that have not responded to therapy. No fungal spores could be demonstrated microscopically in the recovered animals and there was no growth upon fungal culture.

All the seven dogs in Group II showed no improvement even after the 28th day of treatment with a five per cent solution of *S. indicus* extract in glycerine (Fig.17 and 18). Skin scrapings were positive for fungal spores on microscopical examination and fungal cultures were isolated even after the 28th day of treatment.

All the dogs in Group III that were treated with 5 per cent cinnamon oil diluted in glycerine showed complete recovery (Fig.19 and 20). Animals showed signs of recovery from the fifth day onwards. Five animals responded to treatment by the 14th day whereas two responded by the 21st day. Fungal spores could not be observed on microscopical examination of skin scrapings and no fungal cultures were obtained from animals in this group after recovery.

Table 1. Incidence of mycotic dermatitis from September 1996 to August 1998

Total canine cases	Total dermato-logical cases	Number of dermatological cases = 2295		
		Fungal etiology	Ectoparasites	Other etiologies
12847	2295 (17.86)	659 (28.72)	840 (36.60)	796 (34.68)

Table 2. Age, sex and breed wise incidence of mycotic dermatitis from September 1996 to August 1998

		Cases with fungal infection
Age	> than 1 year	363 (55.08)
	< than 1 year	296 (44.92)
Sex	Female	390 (59.18)
	Male	269 (40.82)
Breed	German shepherd	230 (34.90)
	Dachshund	140 (21.24)
	Dobermann pinscher	60 (9.10)
	Miscellaneous breeds	104 (15.78)
	Non-descript	125 (18.96)

The values given in the parentheses denotes the percentage of incidence

Table 3. Salient clinical features of mycotic dermatitis

1.	Nature of lesions	Number of dogs
	a. Localized	18
	b. Diffuse	3
2.	Configuration of lesions	
	a. Extremely variable	16
	b. Annular	2
	c. Central healing	3
3.	Distribution of lesions	
	a. Head and limbs	12
	b. Ventral abdomen	4
	c. Lateral aspect of the body	4
	d. Dorsal aspect of the body	1
4.	Alopecia and scaly lesions	21
5.	Pruritus	17
6.	Erythema	11

Table 4. Clinical signs observed in mycotic dermatitis associated with different fungal etiologies

	Microsporum gypseum	*Trichophyton mentagrophyles*	*Penicillium* spp.	*Aspergillus* spp.	*Rhizopus* spp.	Total number of dogs
1. Nature of lesions						
a. Localized	3	Nil	7	5	3	18
b. Diffuse	Nil	1	1	1	Nil	3
2. Configuration of lesions						
a. Extremely variable	1	1	7	5	2	16
b. Annular	2	Nil	Nil	Nil	Nil	2
c. Central healing	Nil	Nil	1	1	1	3
3. Distribution of lesions						
a. Head and limbs	3	Nil	5	2	2	12
b. Ventral abdomen	Nil	1	Nil	2	1	4
c. Lateral aspect of the body	Nil	Nil	2	2	Nil	4
d. Dorsal aspect of the body	Nil	Nil	1	Nil	Nil	1
4. Alopecia and scaly lesions	3	1	8	6	3	21
5. Pruritus	3	1	6	5	2	17
6. Erythema	1	1	4	3	2	11

Table 5. Mean $\pm$ SE values of leukogram in Group I

Days	Total leukocytes $x10^3/\mu l$	Differential leukocytes				
		Neutrophils (%)	Lymphocytes (%)	Eosinophils (%)	Monocytes (%)	Basophils (%)
0	11.99± 0.52	69.14± 1.30	29.57± 1.53	0.86± 0.34	0.43± 0.30	-
7	12.31± 0.34	69.29± 0.36	28.86± 0.70	1.14± 0.46	0.71± 0.36	-
14	11.94± 0.38	69.00± 1.20	28.71± 1.19	1.43± 0.48	0.86± 0.34	-
21	11.89± 0.27	69.14± 0.77	28.86± 0.74	1.00± 0.31	1.00± 0.31	-
28	11.91± 0.55	68.71± 0.60	29.71± 0.75	0.86± 0.34	0.71± 0.29	-

Table 6. Mean ± SE values of leukogram in Group II

Days	Total leukocytes $x10^3/\mu l$	Differential leukocytes				
		Neutrophils (%)	Lymphocytes (%)	Eosinophils (%)	Monocytes (%)	Basophils (%)
0	10.28± 0.95	66.57± 0.92	32.29± 1.04	0.86± 0.26	0.29± 0.29	-
7	9.91± 1.03	67.43± 1.41	31.29± 1.60	0.71± 0.29	0.59± 0.43	-
14	10.12± 0.80	68.29± 1.43	29.29± 0.92	1.14± 0.51	1.29± 0.36	-
21	10.40± 0.85	69.29± 1.60	28.86± 1.42	1.00± 0.31	0.86± 0.40	-
28	10.29± 0.93	67.43± 1.66	30.86± 1.22	1.00± 0.38	0.71± 0.47	-

Table 7. Mean ± SE values of leukogram in Group III

Days	Total leukocytes $x10^3/\mu l$	Differential leukocytes				
		Neutrophils (%)	Lymphocytes (%)	Eosinophils (%)	Monocytes (%)	Basophils (%)
0	11.06± 0.51	68.43± 0.95	29.43± 0.99	1.57± 0.48	0.57± 0.29	-
7	11.30± 0.48	69.29± 0.71	29.29± 0.81	0.86± 0.40	0.57± 0.43	-
14	11.66± 0.58	71.00± 0.79	28.14± 0.91	0.43± 0.20	0.43± 0.29	-
21	11.02± 0.59	70.29± 0.92	28.14± 0.79	0.86± 0.34	0.71± 0.36	-
28	11.17± 0.66	69.57± 1.43	29.43± 1.46	0.57± 0.29	0.43± 0.29	-

Table 8. Gross colony and microscopic characters of the fungal organisms isolated

Organisms isolated	Gross colony characters	Microscopic characters
1. *Microsporum gypseum*	Rapid growth. Colony is flat and powdery with a fringed border. Buff to cinnamon brown in colour and has an odour similar to that of a mouse colony.	Macroconidia are abundant, boat shaped with rounded ends and walls are thick and rough, 4-6 celled. Microconidia few in number, tear shaped and borne singly on the hyphae.
2. *Trichophyton mentagrophytes*	Colony is woolly and white with older colonies becoming cream tan	Macroconidia few in number, elongated and cigar shaped. Walls are thin and smooth and divided by septa to 3-8 cells. Microcondia numerous and borne singly along the hyphae and in grape like clusters.
3. *Penicillium* spp.	Rapid growth - Bluish green and velvetty colony	Brush like arrangement of fruiting head. Conidiophores have secondary branches (metulae) bearing whorls of phialides from which the smooth or rough and round conidia (2.5-5.0 μm) are borne.
4. *Aspergillus* spp.	Moderately rapid growth. Surface has spreading white, cottony aerial mycelium, later turning grey	Conidiophore unbranched and rising from a foot cell. A swollen vesicle is produced at the tip of the conidiophore and from this arise the phialides, or metulae and then phialides. The latter produce chains of round conidia (2-5 μm)
5. *Rhizopus* spp.	Rapid growth. Dense grey, woolly mycelium	Rhizoids are nodal. Sporangiophores are long, usually branched and terminate in dark round sporangia (60-350 μm). Stolons connect the groups of sporangiophore)

Table 9. Sensitivity pattern of the fungal isolates against the therapeutic agents (Diameter of the zone of inhibition is given in mm)

	Organism	Ketoconazole (20 µg)	Extract of *S. indicus* (50 mg)	Cinnamon oil (1 in 10 dilution)
1.	*Microsporum gypseum*	15 mm	12 mm	22 mm
2.	*Trichophyton mentagrophytes*	17 mm	10 mm	25 mm
3.	*Penicillium* spp.	20 mm	17 mm	35 mm
4.	*Aspergillus* spp.	16 mm	10 mm	24 mm
5.	*Rhizopus* spp.	17 mm	12 mm	22 mm

Plate 3. **Ectothrix arrangement of fungal spores on hair**

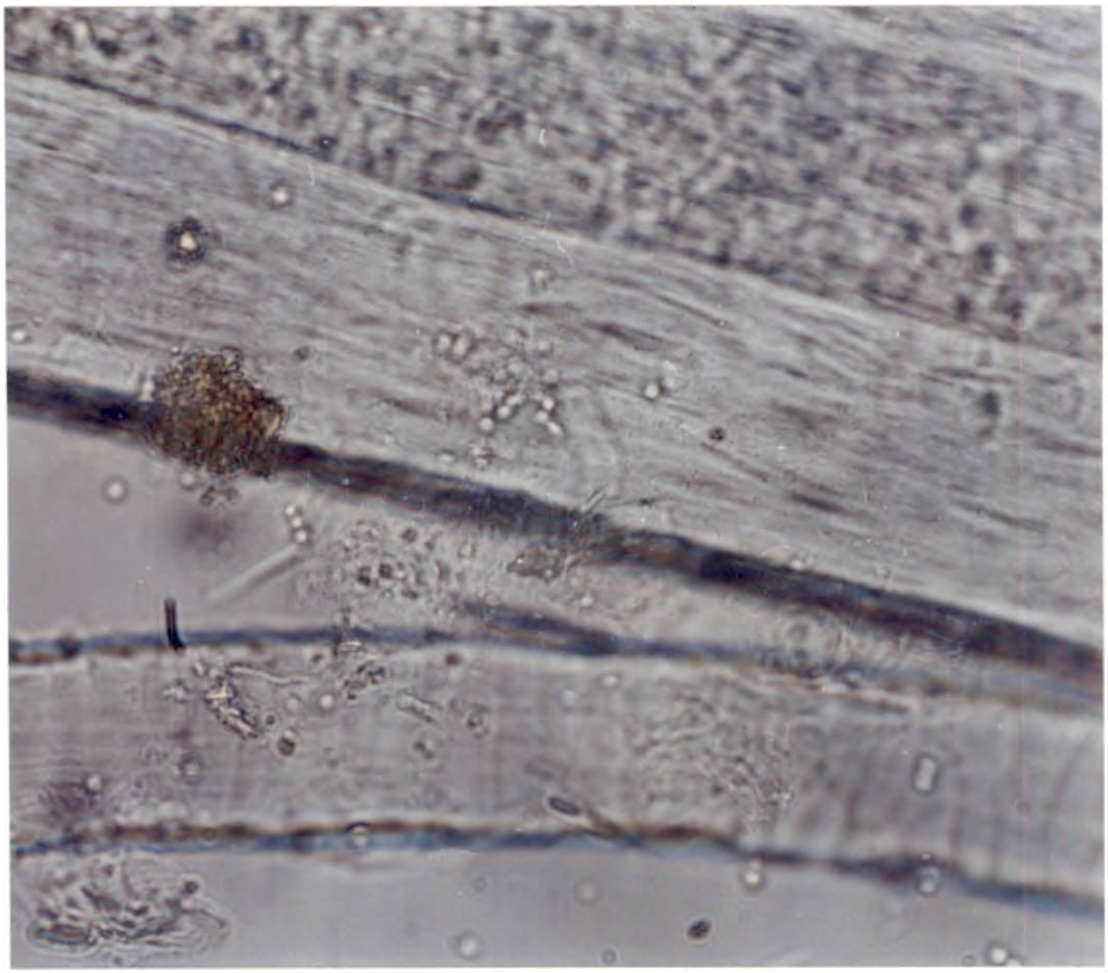


Plate 4. Colony characters of *Microsporum gypseum*

Plate 5. Microscopic characters of *Microsporum gypseum*

Plate 6. Colony characters of *Trichophyton mentagrophytes*

Plate 7. Microscopic characters of *Trichophyton mentagrophytes*

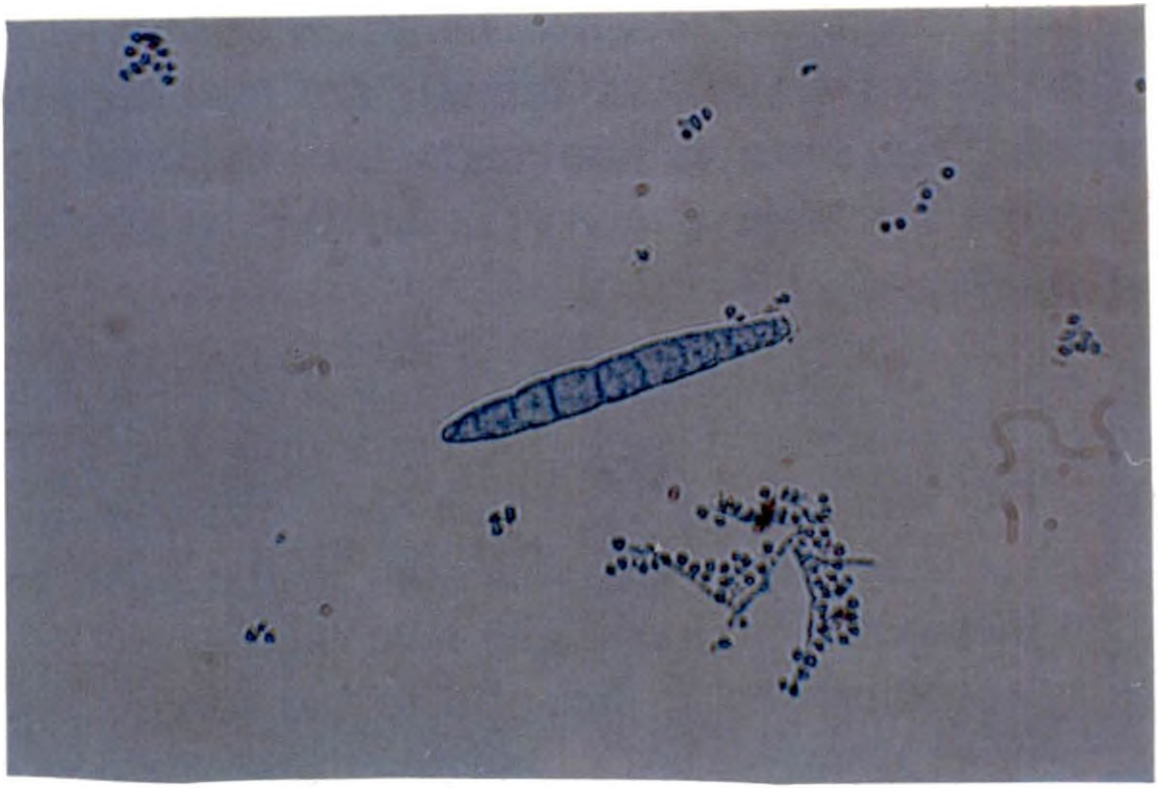
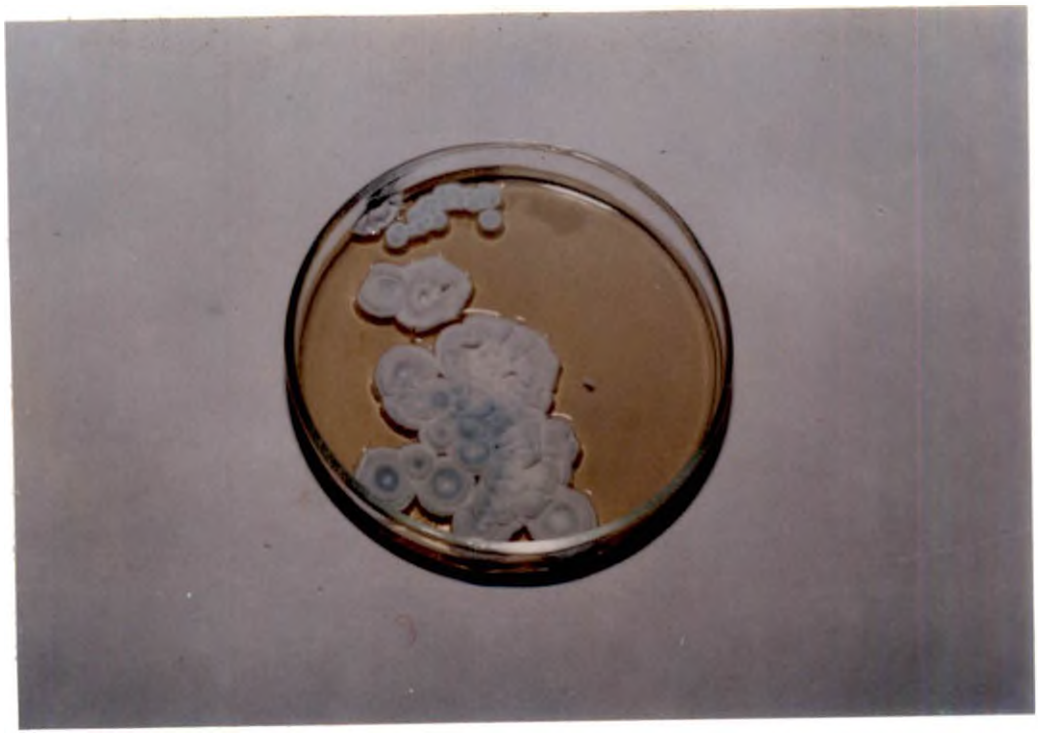


Plate 8. Colony characters of *Penicillium* spp.

Plate 9. Microscopic characters of *Penicillium* spp.



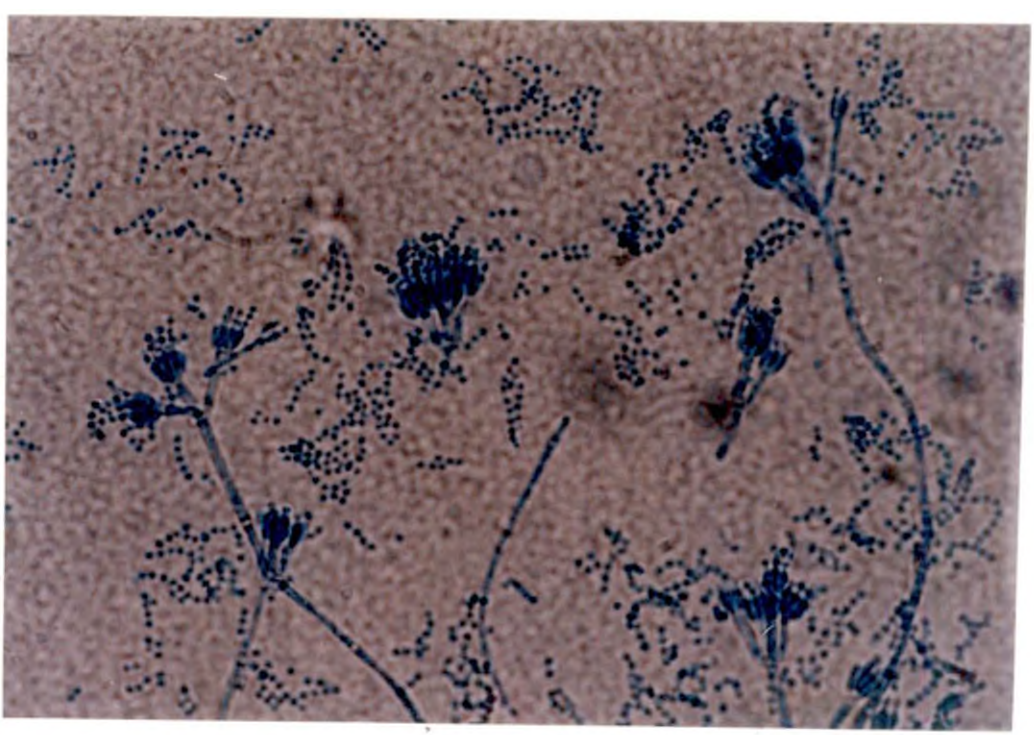
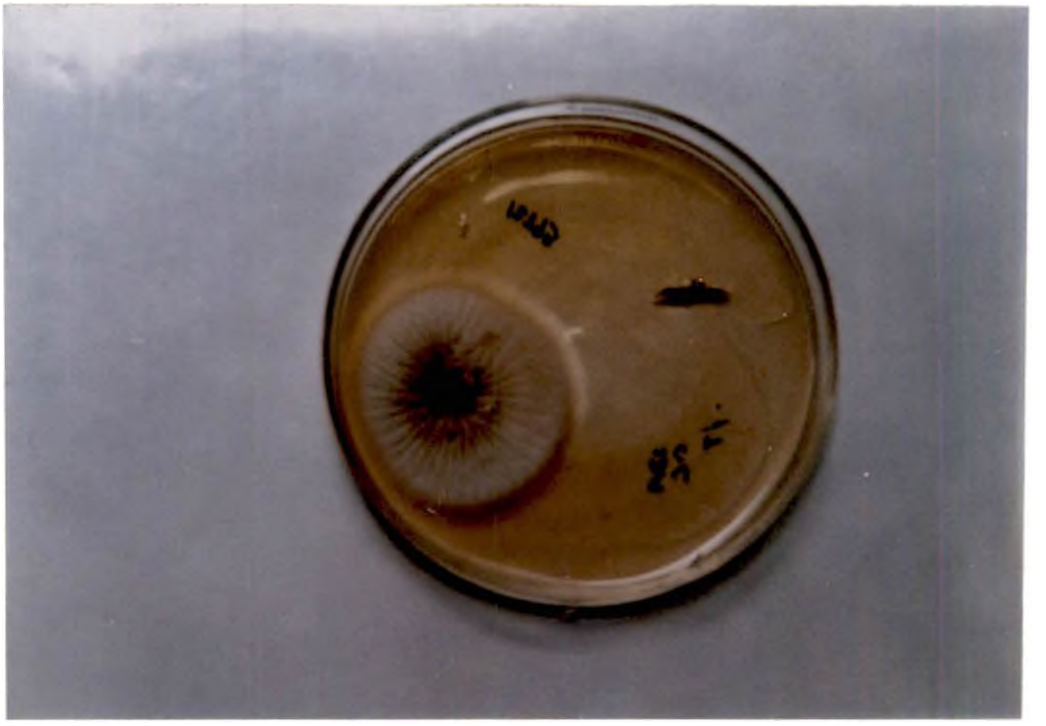


Plate 10. Colony characters of *Aspergillus* spp.

Plate 11. Microscopic characters of *Aspergillus* spp.



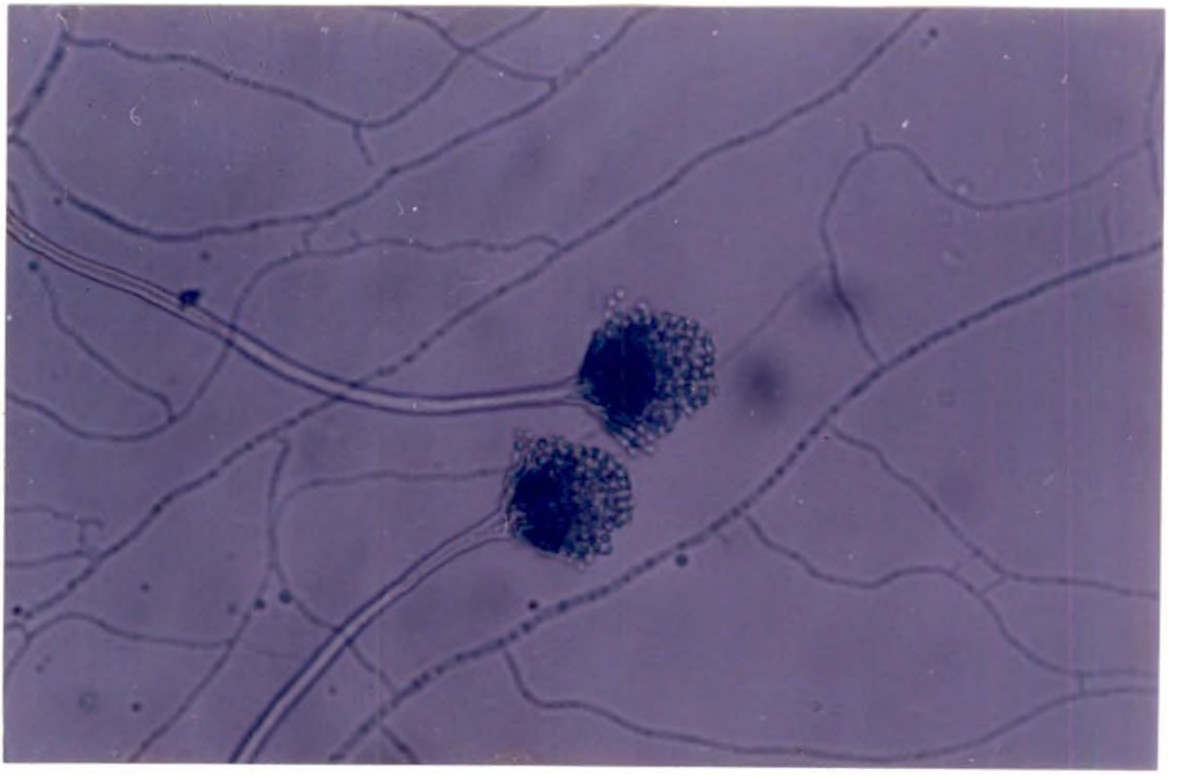


Plate 12. Colony characters of *Rhizopus* spp.

Plate 13. Microscopic characters of *Rhizopus* spp.

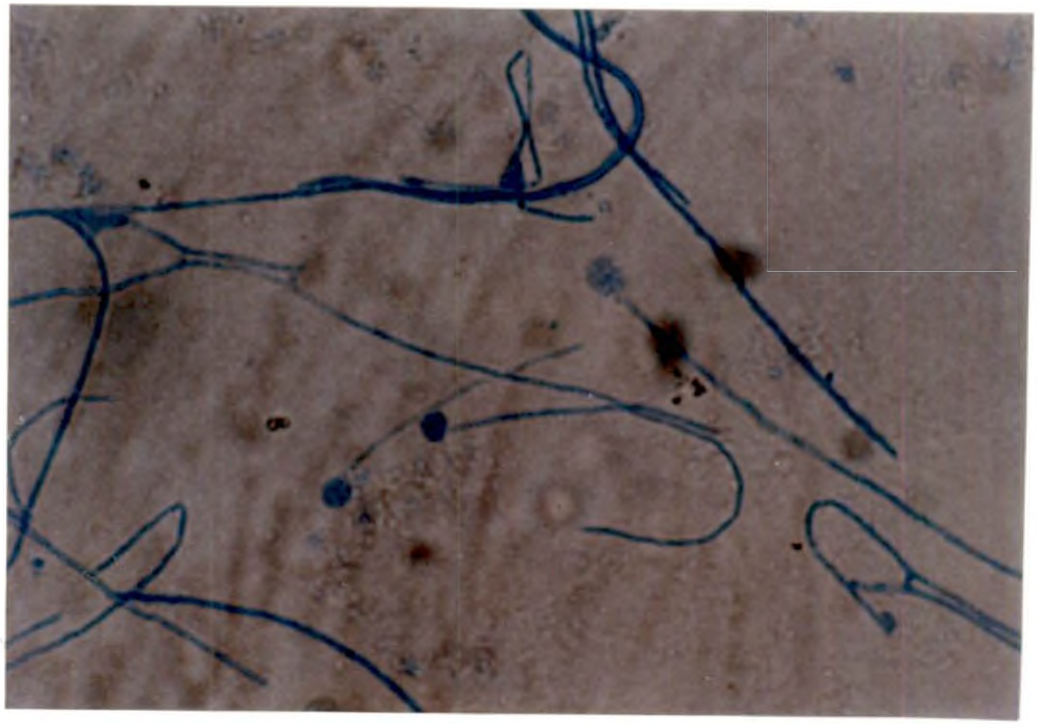
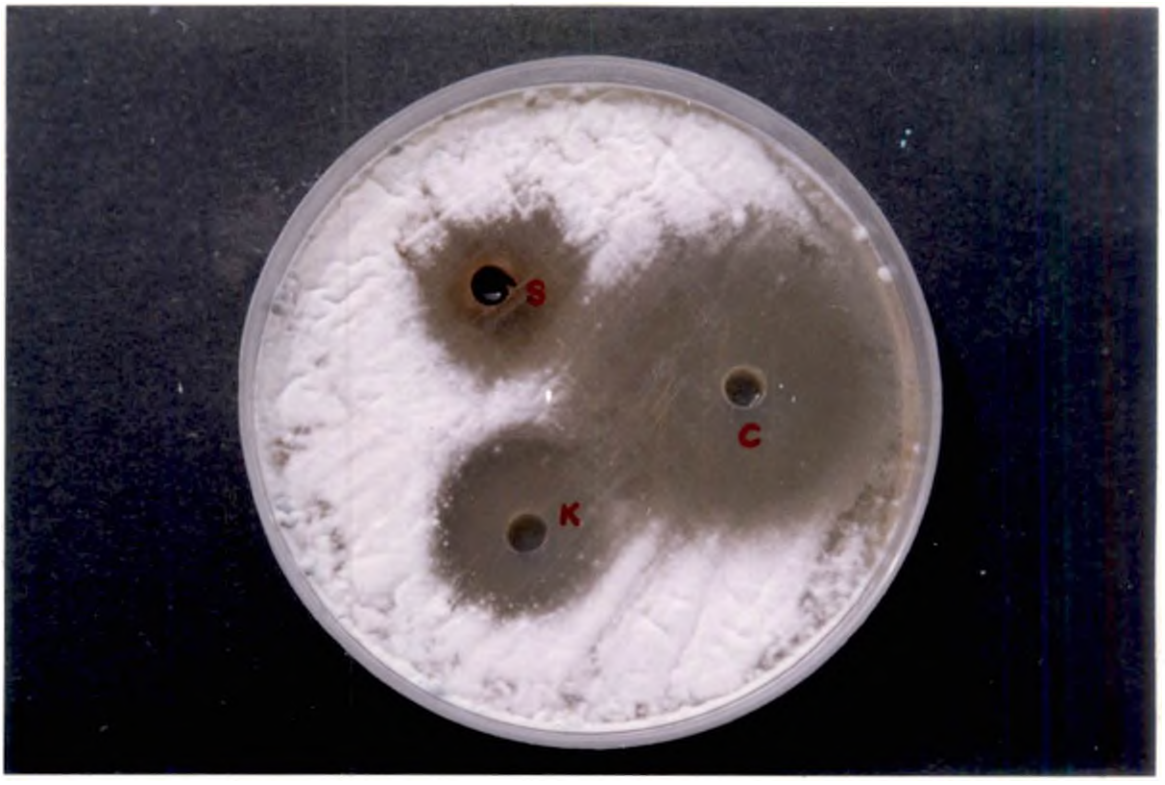


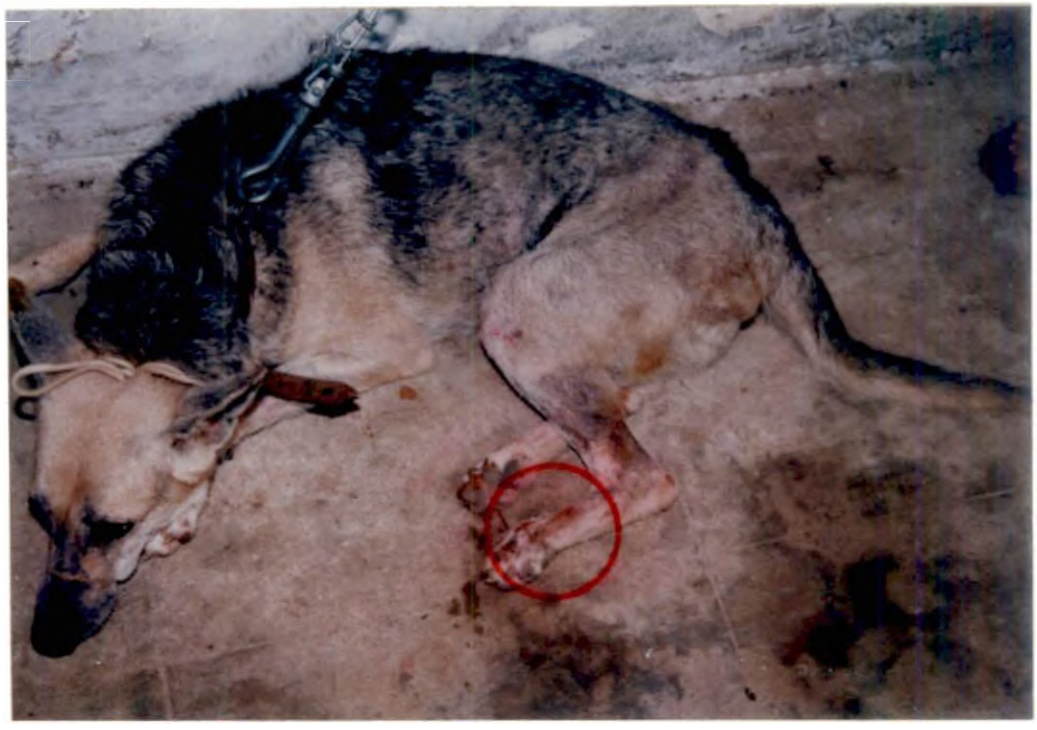
Plate 14. ***In vitro*** **antifungal susceptibility test of** ***Penicillium*** **spp.**



S_ Sphaeranthus indicus extract
K_ Ketoconazole.
C_ Cinnamon oil.

Plate 15. Group I (Ketoconazole) pre-treatment

Plate 16. Group I (Ketoconazole) post-treatment



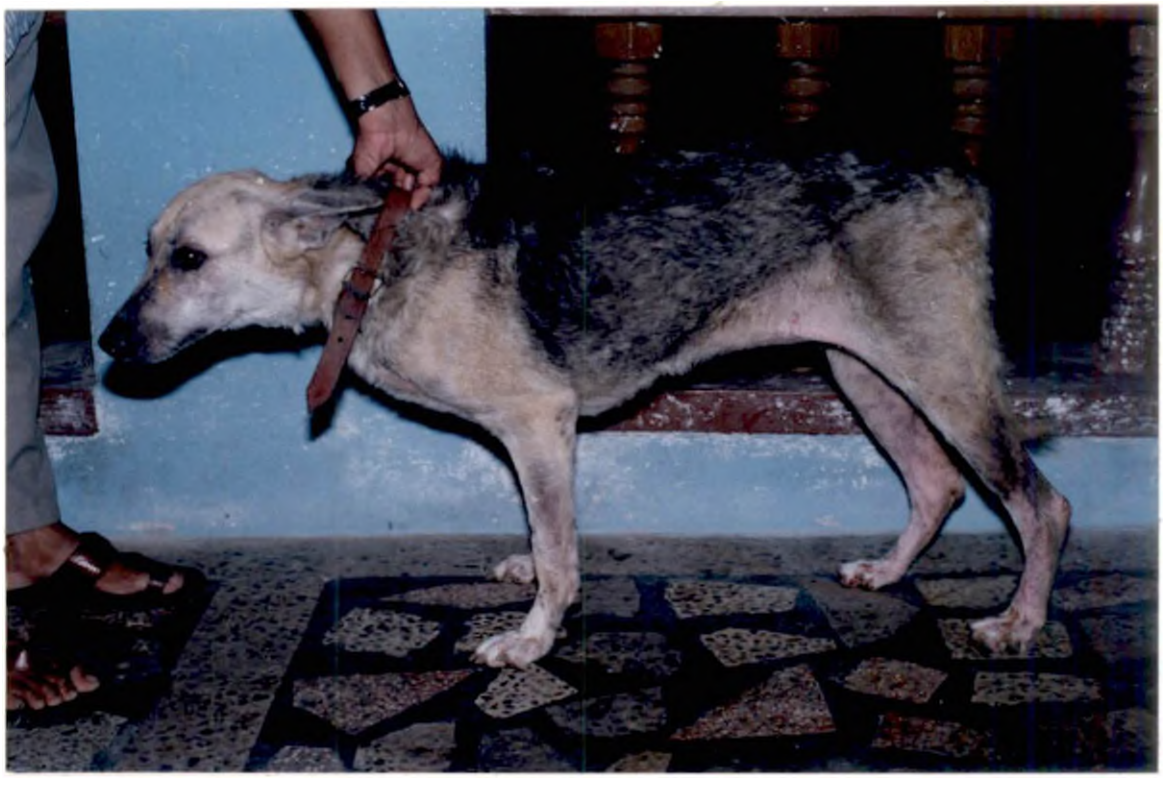


Plate 17. Group II (*Sphaeranthus indicus* extract) pre-treatment

Plate 18. Group II (*Sphaeranthus indicus* extract) post-treatment

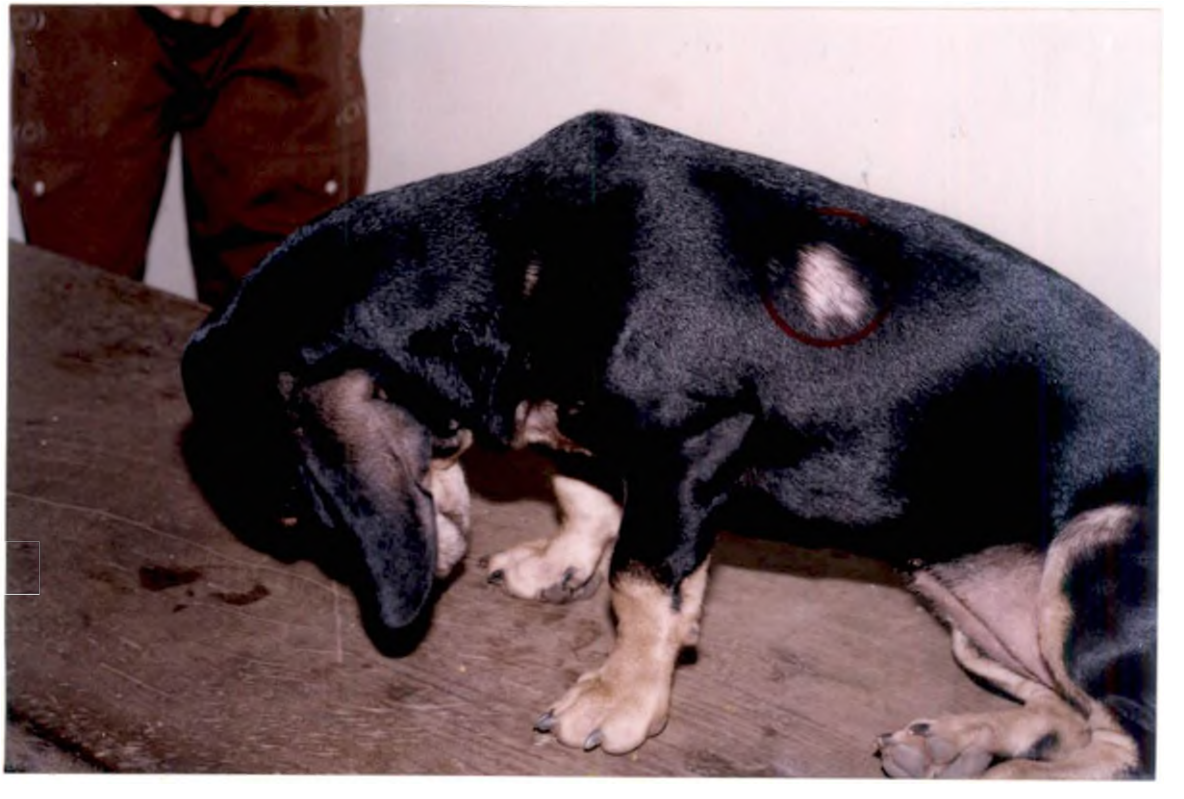
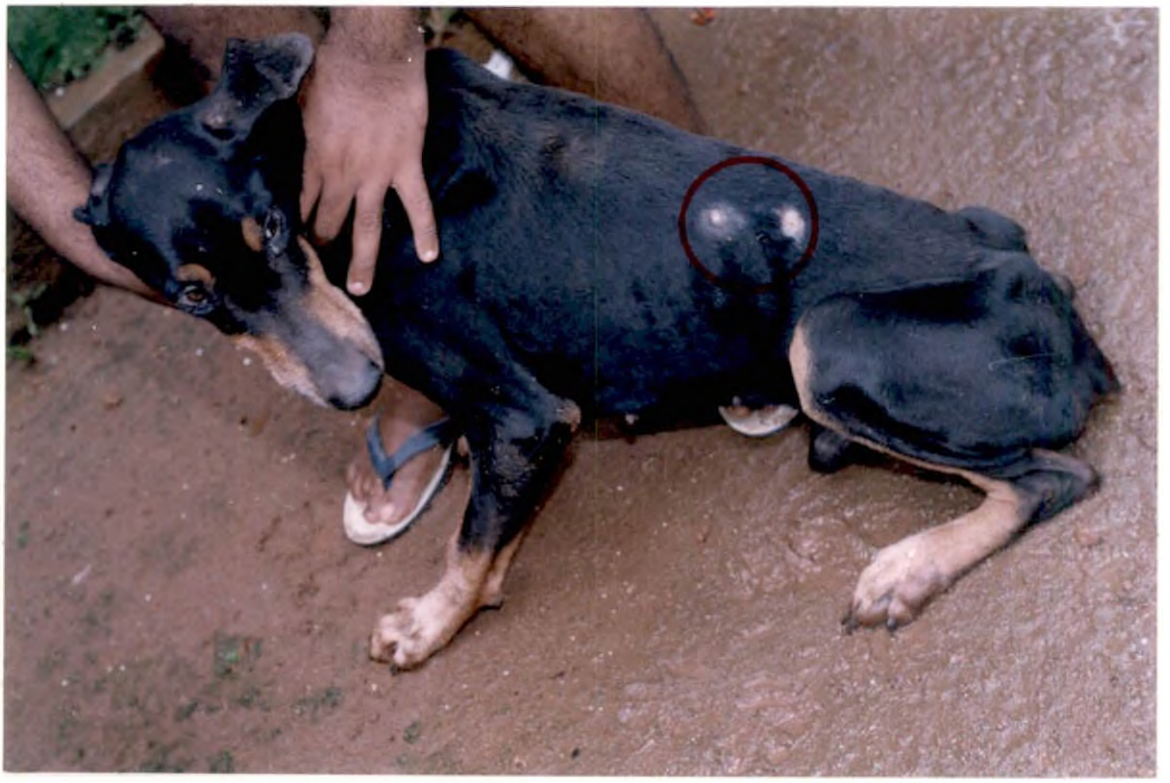
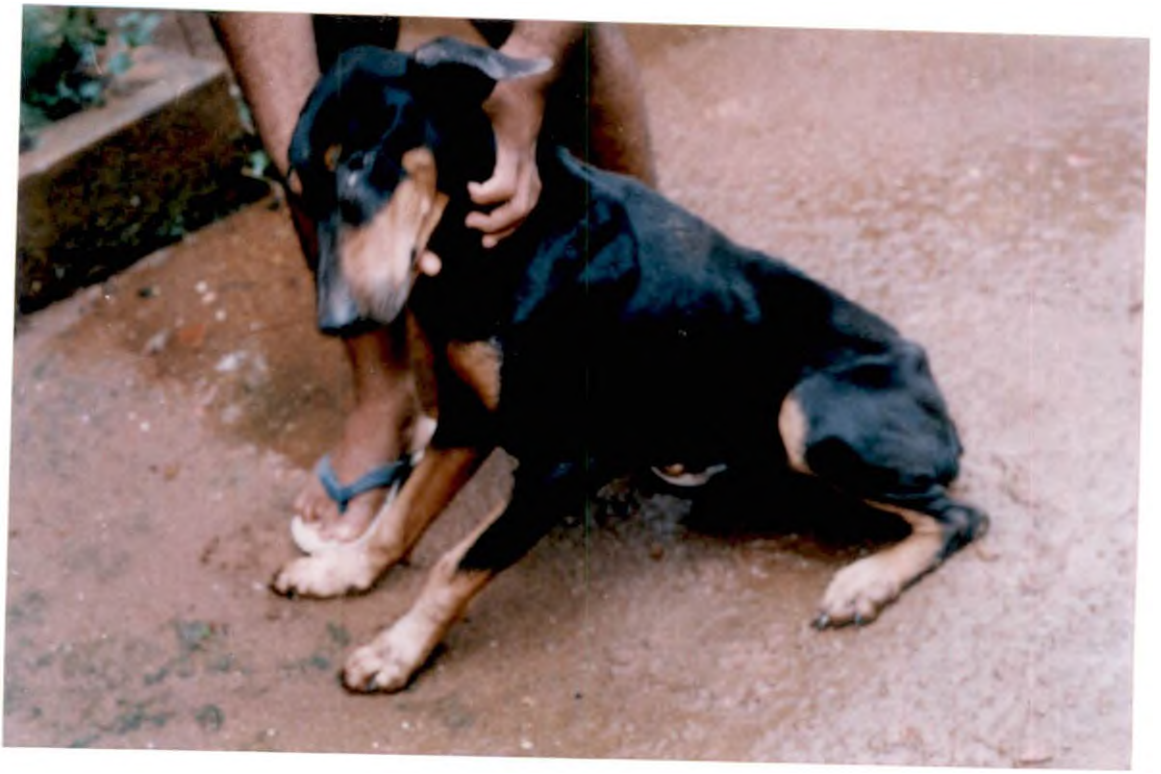


Plate 19. Group III (Cinnamon oil) pre-treatment

Plate 20. Group III (Cinnamon oil) post-treatment





Discussion

DISCUSSION

5.1 Incidence

Incidence of mycotic dermatitis among the total canine dermatological cases was recorded as 28.8 per cent. A wide variation in the rate of incidence has been reported by many authors. A higher rate of incidence of 47.92 per cent was reported by Sidhu *et al.* (1993) as against a lower rate of incidence of 6.5 per cent by Bohm (1985). Sidhu *et al.* (1993) also found that the hot and humid climate favoured the growth of fungi in cutaneous mycosis of dogs. In the present study the moderate rate of incidence of 28.8 per cent can be attributed to the hot and humid climate prevailing in this locality.

German Shepherd breed accounted for 34.90 per cent of mycotic dermatitis. Thomsett (1986) found that there is no breed predisposition for dermatomycosis. Sparkes *et al.* (1993) reported a higher incidence of mycotic dermatitis in Jack Russel and Yorkshire Terrier dogs. The high percentage of incidence documented in this study may be due to the fact that the number of German Shepherds were more when compared to other breeds in this locality.

Regarding the sex, Lewis *et al.* (1991) and Sparkes *et al.* (1993) reported an equal incidence in both male and female dogs, but in the present study incidence in female dogs was more compared to male dogs.

Dogs above one year of age were found to be more affected (55.8 per cent) in the present study. This is in contrary to the findings of Lewis *et al.* (1991) and Sparkes *et al.* (1993) that young animals are more affected. Thomsett (1986) reported an equal incidence in both young and adult animals.

5.2 Clinical signs

Important clinical signs observed in the present study were scaly and alopecic lesions in all the 21 dogs. Pruritus was present in 17 cases and erythema in 11 cases. Lesions were localized in 18 dogs and diffuse in three. Configuration of the lesions were extremely variable in 16 cases whereas it was annular in two and centrally healing type in three cases. Twelve dogs had lesions distributed on head and limbs; four each had lesions on ventral abdomen and on lateral aspect of the body and one had lesions on the dorsal aspect of the body.

Scaliness, erythema, pruritus and hair loss of varying degree noticed in these dogs with mycotic dermatitis were also reported by several research workers like Goldston and Wilkes (1982), Thomsett (1986) and Smith (1988). Medleau and Ristic

(1992) observed pruritus only in occasional cases of dermatomycosis whereas pruritus was a constant finding in majority of the cases in this study.

Majority of the lesions observed in this study were multifocal and localized and this observation concurs with the reports of Wright (1989) who found discrete multifocal lesions in adult dogs suffering from cutaneous mycoses.

Lesions caused by *Microsporum gypseum* were localized while that by *Trichophyton mentagrophytes* were diffused. This is in agreement with the findings of Lewis *et al.* (1991) who found that *M. gypseum* caused localized lesions and Thomsett (1977) noticed extensive lesions with erythema and total hair loss in dogs with *T. mentagrophytes* infection.

Configuration of lesions were extremely variable in most cases and similar findings were noticed by Smith (1988) and Medleau (1990). Muller *et al.* (1989) reported the occurrence of annular and central healing type of lesions in dermatophytosis.

Majority of the lesions in the study were distributed on head and limbs. Similar observations were made by Muller *et al.* (1989); Wright (1989); Lewis *et al.* (1991) and Medleau and Ristic (1992) in cases of dermatophytosis. Lesions on the dorsal aspect of the body was found in one case. This is in

agreement with the fact that dorsal aspect of the body has no predisposition to dermatomycosis (Muller *et al.*, 1989).

5.3 Laboratory diagnosis

Ectothrix arrangement of fungal spores on hairs were noticed in all cases of mycotic dermatitis and similar arrangement was observed by Jungerman and Schwartzman (1972); Goldston and Wilkes (1982); Smith (1988) and Quinn *et al.* (1994) in cases of dermatophytoses. Benjamin (1978); Wintrobe *et al.* (1981) and Chandler *et al.* (1991) stated the occurrence of neutrophilia and eosinophilia in fungal infections in animals and man.

But in the present study the leukogram of all the animals were within the normal range.

5.4 Isolation and identification of the organism

Twenty one fungal cultures isolated in this study constituted four dermatophytes and 17 non-dermatophytes. Dermatophytes were *Microsporum gypseum* (3) and *Trichophyton mentagrophytes* (1) and non dermatophytes were *Penicillium* spp. (8), *Aspergillus* spp. (6) and *Rhizopus* spp. (3).

Sidhu *et al.* (1993) reported a similar observation where the author had isolated 93 dermatophytes and 414

non-dermatophytes from a total of 507 fungal isolates. Main dermatophytes isolated were *M. gypseum* (51.61%) followed by *Trichophyton* spp. (19.34%) and important non-dermatophytes identified include *Aspergillus*, *Penicillium* and *Rhizopus* spp.

Pecheur and Gerin (1978), Kushida (1984), Cutsem *et al.* (1985), Gambale *et al.* (1987) and Sparkes *et al.* (1993) conducted mycological investigation and isolated *M. gypseum* and *T. mentagrophytes* along with a variety of non-dermatophytes.

Jand and Gupta (1989) and Muller *et al.* (1989) isolated non-dermatophytes like *Aspergillus*, *Penicillium* spp. etc. from cutaneous mycotic lesions in animals.

Dermatophytes produced a change of colour from yellow to claret red between three to five days after inoculation of skin scrapings in Dermatophyte Test Medium whereas non-dermatophytes also produced the colour change after 14 days of inoculation of skin scrapings.

This is because dermatophytes initially use proteins and release metabolic products that turns the media red whereas non-dermatophytes initially use carbohydrates and switch over to protein only after its depletion. Phenol red present in the medium changes the colour from yellow to red above pH 7 and this occurs when fungi digests proteins, releasing ammonia

which makes the medium alkaline (Dion, 1978; Goldston and Wilkes, 1982; Thomsett, 1986; Smith, 1988 and Medleau and Ristic, 1992).

5.5 Antibiogram against fungi

In vitro studies conducted on the fungal isolates obtained (both dermatophytes and non-dermatophytes) revealed that all isolates were moderately sensitive to ketoconazole at 20 μg concentration.

Minagawa *et al.* (1982) and Steinmann *et al.* (1988) reported a similar observation that Ketoconazole was effective against both dermatophytes and non-dermatophytes like *Aspergillus* spp.

Puccini *et al.* (1992) stated that dermatophytes were susceptible to imidazoles when the zone of inhibition was greater than or equal to 20 mm, intermediately susceptible when its between 12 and 19 mm, and resistant when less than 12 mm in diameter.

Thus in this study ketoconazole was found to be moderately sensitive to the dermatophytes isolated.

Sphaeranthus indicus extract at 50 mg concentration produced a zone of inhibition ranging from 10 to 17 mm for the various fungal cultures isolated.

No literature regarding the *in vitro* studies of *S. indicus* against the fungi could be obtained.

All dermatophytes isolated were highly sensitive to cinnamon oil at 1 in 10 dilution. These findings concurs with the studies conducted by Morozumi (1978); Yousef *et al.* (1978); Saksena (1984); Mangiarotti *et al.* (1990) and Lima *et al.* (1993). Among these authors Lima *et al.* (1993) also noticed a zone of inhibition of more than 10 mm diameter in 80 per cent of the dermatophyte strains tested.

All the non-dermatophyte isolates also showed a very high sensitivity to cinnamon oil at 1 in 10 dilution. This finding agrees with the reports of Singh *et al.* (1995) where they stated that cinnamon oil prevents the growth of non-dermatophytes like *Aspergillus* spp. in the culture medium.

5.6 Treatment

In vivo studies with the three therapeutic agents produced varying results. Among the Group I animals which were treated with ketoconazole, five recovered completely whereas two were non responsive. Among the recovered animals,

four responded by 21st day of treatment while one recovered by 28th day of treatment. The Group II animals which were treated with *S. indicus* extract did not show any therapeutic response whereas in Group III all the animals that were treated with cinnamon oil recovered completely during the period of trial. Among the recovered animals, five responded by 14th day of treatment, while two recovered by 21st day of treatment.

Medleau and White-Wethers (1992) found that Ketoconazole cream was very effective in treating localized dermatophytosis. Cauwenbergh *et al.* (1984) noticed that all experimental animals infected with *Trichophyton mentagrophytes* and 50 per cent infected with *Microsporum canis* were recovered following treatment with 0.5 per cent topical ketoconazole for 14 days. Similar results were obtained in the study, where majority of the dogs (5) responded with ketoconazole therapy. *Aspergillus* spp. of fungi was isolated from two dogs that have not responded to therapy. This observation agrees with the findings of Sukumar (1996) who reported that *Aspergillus* spp. of fungi was resistant to ketoconazole even at 100 µg concentration.

Agharkar (1953) recorded the use of *Sphaeranthus indicus* for treating ring worm of waist in humans.

However, in the present study, no clinical response was found when dogs with mycotic dermatitis were treated with a five per cent solution of *S. indicus* extract.

Mnimh (1993) found that the essential oil of *Cinnamomum* spp. after diluting in a suitable vehicle and applying topically showed good antifungal property. Similar results were obtained with a five per cent solution of cinnamon oil in this study.

Considering the cost of treatment, cinnamon oil is the cheapest. Each ml of five per cent cinnamon oil and *Sphaeranthus indicus* solution in glycerine cost 45 paise and one rupee 20 paise respectively whereas one gram of two per cent Ketoconazole ointment costs four rupees.

Cost of the treatment with cinnamon oil can be further reduced by replacing glycerine as the vehicle with any vegetable oils like coconut oil, sunflower oil etc.

Summary

SUMMARY

Incidence of mycotic dermatitis among the total canine cases presented at the University Veterinary Hospitals, Kokkalai and Mannuthy for a period from September 1996 to August 1998 was found to be 5.13 per cent. From a total of 2295 dermatological cases presented 28.72 per cent had mycotic dermatitis whereas 36.6 per cent had ectoparasitic infestation and 34.68 per cent suffered from other dermatological problems.

German Shepherd breed accounted for 34.9 per cent of mycotic dermatitis. Female dogs had a higher rate of incidence (59.18 per cent) than male dogs. The percentage of dogs above one year of age with cutaneous mycosis was 55.08.

Clinical examination of the dogs with mycotic dermatitis revealed scaliness and alopecia for all cases. Pruritus was noticed in majority of cases. Erythema was observed in 11 cases. Configuration of the lesions were extremely variable in majority of cases. Lesions were localized in most of the dogs and were distributed mainly on head and limbs.

Skin scrapings collected and examined under microscope revealed ectothrix arrangement of fungal spores in all cases.

Mean total and differential count of leukocytes were within the normal range for all dogs.

Twenty one fungal cultures isolated constitute four dermatophytes and 17 non-dermatophytes. The dermatophytes isolated were three *Microsporum gypseum* and one *Trichophyton mentagrophytes* spp. Non-dermatophytes isolated were eight *Penicillium*, six *Aspergillus* and three *Rhizopus* spp. Dermatophytes were distinguished from non-dermatophytes by noting the change of colour from yellow to claret red produced by the dermatophytes in the Dermatophyte Test Medium within three to five days after inoculation of clinical materials. Final identification of the fungus was done by observing the gross colony characters and by examining the microscopic characters of the fungal isolates.

In vitro antifungal susceptibility tests on the fungal isolates obtained revealed that cinnamon oil at a dilution of 1 in 10 was highly sensitive followed by ketoconazole at 20 µg and *Sphaeranthus indicus* extract at 50 mg concentrations.

Treatment trials conducted on dogs with mycotic dermatitis using ketoconazole ointment showed therapeutic response in five out of seven cases. No favourable response was noticed in dogs treated with a five per cent solution of *S. indicus* extract in glycerine. Complete recovery was

noticed in all dogs treated with cinnamon oil diluted at a rate of 1 in 20 in glycerine.

Thus it can be concluded that cinnamon oil is a very effective and cheap medicinal preparation for cutaneous mycotic infections.

References

REFERENCES

Agharkar, S.P. (1953). Medicinal plants of Bombay Presidency. Scientific Publishers, Jodhpur. pp.200-202.

Aho, R. (1980). Studies on fungal flora in hair from domestic and laboratory animals suspected of dermatomycosis. *Actapath. microbiol. scand.* 88(B)(2): 79-83.

Aho, R., Oksanen, A. and Pihlaja, O. (1993). Direct microscopical examination of hair samples. *Suomen elainlaakarilehti.* 99(3): 165-168.

Bauer, J. (1984). Diagnosis of infectious dermatomycoses (dermatophytoses). *Tierarztl. Umsch.* 39(): 389-390.

Benjamin, M.M. (1978). Outline of veterinary clinical pathology. The Iowa State University Press, USA. pp.86-87.

Bernardo, F.M., Martins, H.M. and Mendes, A.M. (1989). Survey of dermatophytes in companion animals in Portugal *Repos. Trab. Lab. Patol. vet. LN.IV.* 21: 83-87.

Boddie, G.F. (1956). Diagnostic Methods in Veterinary Medicine (4th ed). Lippincott Company. Philadelphia. pp.200-227.

Bohm, K.H. (1985). Fungal diseases of the skin in dogs and cats. *Effem Forschung fur Kleinteirnahrung Report.* (21): 25-29.

Bourdeau, P. and Chermette, R. (1987). Rare forms of dermatomycosis in dogs and cats. III. Localized dermatitis in a dog due to mixed infection with *Trichophyton mentagrophytes* and *T. erinacei*. *Point veterinaire*. **19**(109): 619-625.

Brander, G.C., Pugh, D.M., Bywater, R.J. and Jenkins, W.L. (1991). Veterinary Applied Pharmacology and Therapeutics (5th ed). Bailliere Tindall, London. pp.574-576.

Bullerman, L.B., Lieu, F.Y. and Sally Seier, A. (1977). Inhibition of growth and aflatoxin production by Cinnamon and clove oils. cinnamic aldehyde and eugenol. *J. Fd. Sci.*, **42**(4): 1107-1109.

Caretta, G., Mancianti, F. and Ajello, L. (1989). Dermatophytes and keratinophilic fungi in cats and dogs. *Mycoses*. 32(12): 620-626.

Carlotti, D.N. and Urbini, R. (1993). Dermatophytoses in dogs and cats. *Pratique-Medicale and Chirurgicale-de-l' Animal-de-Compagnie*. **28**(2): 9.

Cauwenbergh, G.F.M.J., Degreef, H. and Verhoere, LSGC. (1984). Topical ketoconazole in dermatology: a pharmacological and clinical review. *Mykosen*. 27(8): 395-401.

Chandler, E.A., Thompson, D.J., Sutton, J.B. and Price, C.J. (1991). Canine Medicine and Therapeutics (3rd ed.). Blackwell scientific publications. Oxford. pp.382-383, 438.

Chittawar, D.R. and Rao, K.N.P. (1982). Incidence of canine dermatomycotic origin in Central India. *Indian vet. J.*, 59(9): 675-677.

Cottral, G.E. (1978). Manual of standardized methods for veterinary microbiology. Cornell University Press Ltd., London. pp.622-624.

Cutsem, J. Van., Keyser, H.De., Rochette, F., Flaes, M. Vander (1985). Survey of fungal isolates from alopecic and asymptomatic dogs. *Vet. Rec.* **116**(21): 568-569.

Dey, K.L. and Bahadur, R. (1973). The indigenous drugs of India. 2nd ed. Pama Primlane, New Delhi. pp.83.

Dion, W.M. (1978). Use of Fungassay medium in the diagnosis of ring worm. *Can. vet. J.* 19(7): 203-204.

Drury, H. (1978). The useful plants of India. (2nd ed.), Periodical Experts Book Agency, New Delhi. p.402.

Einstein, R., Jones, R.S., Knifton, A. and Starmer, G.A. (1994). Principles of Veterinary Therapeutics. Longman Singapore Publishers, Singapore. pp.473-481.

Fraser, C.M., Mays, A., Amstutz, H.E., Archibald, J., Armour, J., Blood, D.C., Newberne, P.M., Snoeyenbos, G.H. and Huebner, R.A. (Ed) (1986). The Merck Veterinary Manual (6th ed.). Merck and Co. Incorporation, USA. pp.790-791.

Gambale, J.S. (1967). Flora of the Presidency of Madras. Vol.II. Botanical Survey of India, Calcutta. p.857.

Gambale, W., Correa, B., Paula, C.R., Purchio, A. and Larsson, C.C. (1987). Occurrence of fungi in superficial lesions in dogs in the city of Sao Paulo, Brazil. *Revta Fac. Med. vet. Univ. Spaulo.* **24**(2): 187-191.

Goldston, R.T. and Wilkes, R.D. (1982). Veterinary medical mycology. *Vet. Med.* **77**(10): 1447-1451.

Gravino, A.E., D'-Ambrosio, G., Giglio, M., Capraris-D-de, Tiscione, R. and De-Capraris, D. (1987). Use of Fungassay in the diagnosis of cutaneous mycoses in dogs. *Acta med. vet.* **33**(1-2): 101-107.

Guaguere, E., Carlotti, D., Cadot, P. and Harmotte, G. (1985). Experimental diagnosis of dermatomycoses of dogs and cats. *Pratique Medicale and Chirurgicale de l'Animal de Compagnie.* **20**(1): 24-26, 28-30.

Hallu, R.E., Gentilini, E., Rebuelto, M., Albarellos, G.A. and Otero, P.E. (1996). The combination of norfloxacin and Ketoconazole in the treatment of canine otitis. *Canine Pract.* **21**(2): 26-28.

Jand, S.K. and Gupta, M.P. (1989). Dermatomycosis in dogs. *Mycoses.* **32**(2): 104-105.

Jungerman, P.F. and Schwartzman, R.M. (1972). Veterinary Medical Mycology, Lea and Febiger, Philadelphia. p.25.

Komarek, J. (1989). Laboratory diagnosis of dermatomycoses in animals in the period 1979-1988. *Veterinarstvi.* **39**(12): 539.

Kushida, T. (1984). Studies on dermatophytosis in dogs. *Bulletin of the Nippon veterinary and Zootechnical College*. 1(33): 209-212.

Lewis, D.T., Foil, C.S. and Hasgood, G. (1991). Epidemiology and clinical features of dermatophytosis in dogs and cats at Louisiana State University. 1981-1990. *Veterinary Dermatology*. 2(2): 53-58.

Lima, E.O., Gompertz, O.F., Giesbrecht, A.M. and Paulo, M.Q. (1993). *In vitro* antifungal activity of essential oils obtained from officinal plants against dermatophytes. *Mycoses*. 36(9-10): 333-336.

Mahajan, V.M. (1986). Further studies on antimycotic agents. *Mykosen*. 29(9): 407-412.

Mangiarotti, A.M., Del, F.G., Caretta, G. and Frate, D.G. (1990). Note on the action of some essential oils *on fungi*. *Boletin Micologico*. 5(1-2): 1-4.

Medleau, L. (1990). Managing cases of chronic pruritus that have not responded to steroids. *Vet. Med.* 85(3): 241-258.

Medleau, L. and Ristic, Z. (1992). Diagnosing dermatophytosis in dogs and cats. *Vet. Med.* 87(11): 1086-1091.

Medleau, L. and White-Wethers. (1992). Treating and preventing the various forms of dermatophytosis. *Vet. Med.* 87(11): 1096-1100.

Minagawa, H., Kitaura, K., Mineura, K. and Marumo, H. (1982). Studies on antifungal activity of ketoconazole (KW-1414). I. *In vitro* antifungal activity. *Jap. J. Med. Mycol.*, **23**(2): 171-180.

Mnimh, P.O. (1993). The Herb Soceity's Complete Medicinal Herbal Dorling Kindersley, London. p.48.

Morozumi, S. (1978). A new antifungal agent in Cinnamon. *Jap. J. Med. Mycol.*, **19**(2): 172-180.

Muhammed, S.I. and Mbogwa, S. (1974). The isolation of *Microsporum nanum* from a dog with skin lesions. *Vet. Rec.* **95**(25/26): 573.

Muller, G.H., Kirk, R.W. and Scott, D.W. (1989). Small Animal *Dermatology (4th ed.)*. W.B. Saunders Company. Philadelphia. pp.164-166.

Nadkarni, K.M. (1982). Indian Materia Medica. (3rd ed.) Popular Prakashan Pvt. Ltd., Bombay, Vol.1, pp.1163.

Nath, S.C., Pathak, M.G., Baruah, A. and Baruah, A. (1996). Benzyl benzoate, the major component of the leaf and stem bark oil of *Cinnamonum zeylnicum*, Blume. *J. Ess. Oil Res.* **8**(3): 327-328.

Pecheur, M. and Gerin, G. (1978). Dermatomycoses of small animals. *Annls Med. vet.* 122(5): 411-413.

Philpot, C.M. and Berry, A.P. (1987). Parasitic and fungal skin infections in general practice. *Veterinary Times.* 17(2): 8-9.

Pintori, G., Cubeddu, G.M., Giola, L. and Pellegrini, M. (1986). Dermatomycoses of dog and cat. *Balletino Associazione Italiana. Veterinari per piccoli Animali*. 25(4): 307-312.

Puccini, S., Valdre, A., Papini, R. and Mancianti, F. (1992). *In vitro* susceptibility to antimycotics of *Microsporum canis* isolates from cats. *JAVMA*. 201(9): 1375-1377.

Quinn, P.J., Carter, M.E., Markey, B. and Carter, G.R. (1994). Clinical Veterinary Microbiology. Wolfe Publishing Ltd. Spain. pp.367-390.

Rao, Y.R., Paul, S.C. and Dutta, P.K. (1988). Major constituents of essential oils of *Cinnamomum zeylanicum* Blume. *Indian Perfumer*. 32(1): 86-89.

Sagmiester, H. (1989). Diagnoses of dermatomycoses. *Weiner Tierarztliche Monatsschrift*. 76(6): 196-200.

Saksena, N.K. (1984). Comparative evaluation of some essential oils for their antifungal activity against some dermatophytes. *Indian Perfumer*. 28(1): 35-37.

Schalm, O.W., Jain, N.C. and Carroll, E.J. (1975). Veterinary Haematology (3rd ed.). Lea and Febiger, Philadelphia.

Shearer, D. (1991). Laboratory diagnosis of skin disease. *In Pract*. 13(4): 151-156.

Shekhani, M.S., Shah, P.M., Yasmin, A., Siddiqui, R., Perveen, S., Khan, K.M., Kazmi, S.U. and Rahman, A. (1990). An immunostimulant sesquiterpene glycoside from *Sphaeranthus indicus*. *Phytochemistry*. **29**(8): 2573-2576.

Sidhu, R.K., Singh, K.B., Gupta, M.P. and Jand, S.K. (1993). Incidence of mycotic dermatitis in dogs. *Indian vet. J.* **70**(10): 885-888.

Singh, H.B., Srivastava, M., Singh, A.B. and Srivastava, A.K. (1995). Cinnamon bark oil, a potent fungitoxicant against fungi causing respiratory tract mycoses. *Allergy - Copenhagen*. **50**(12): 995-999.

Sivarajan, V.V. and Indira, B. (1994). Ayurvedic drugs and their plant sources. Oxford and IBH Publishing Company Private Company, New Delhi. pp.166-167.

Smith, E.K. (1988). Dermatophytosis in pets: Avoiding misdiagnosis. *Vet. Med.* **83**(6): pp.554-565.

Sparkes, A.H., Gruffyod-Jones, T.J., Shaw, S.E., Wright, A.I. and Strokes, C.R. (1993). Epidemiological and diagnostic features of canine and feline dermatophytosis in the United Kingdom from 1956 to 1991. *Vet. Rec.* **133**(3): 57-61.

Steinmann, R., Murandi, S. and Sage, L. (1988). The antifungigram of dermatophytes. *Annls Inst. Pasteur Microbiology*. **139**(4): 485-491.

Sukumar, K. (1996). Prevalence of yeast and yeast like fungi in bovine mastitis and their *in vitro* drug sensitivity, M.V.Sc. thesis. Submitted to Kerala Agricultural University.

Thacker, M.S., Ram, L.S., Knshnan, M.S., Prashad, B., Chopra, R.N., Santapari, H. and Sastri, B.N. (1976). The wealth of India. Council of scientific and Industrial Research, New Delhi. Vol.X. pp.4-5.

Thomsett, L.R. (1977). The diagnosis of ring worm infection in small animals. *J. small Anim. Pract.* 18(12): 803-814.

Thomsett, L.R. (1986). Fungal diseases of the skin of small animals. *Br. vet. J.*, **142**(4): 317-325.

Tilley, F.P. and Smith, F.W.K. (1997). The 5 Minute Veterinary Consult. Canine and Feline. Williams and Wilkins, USA. pp.506-507.

Vokoun, P. and Kucera, K. (1991). Study of dermatomycoses of dogs and cats in an urban area. *Veterinarstvi.* **41**(11-12): 250-254.

Warrier, P.K., Nambiar, V.P.K. and Ramankutty, C. (Ed) (1996). Indian Medicinal Plants. A Compendium of 500 species. Orient Longman Limited, Madras, Vol.5, p.180.

Weiss, R. and Bohm, K.H. (1978). The most important dermatophytes and dermatomycoses of domestic animals. *Tierarztl. Prax.* 6(4): 421-433.

Weithers, W.N. and Medleau, L. (1995). Evaluation of topical therapies for the treatment of dermatophyte infected hairs from dogs and cats. *Journal of the American Animal Hospital Assocition*. 31(3): 250-253.

Willard, M.D., Tredten, H. and Turnwald, G.H. (1994). Small Animal Clinical Diagnosis by Laboratory Methods (2nd ed). W.B. Saunders Company, Philadelphia. pp.56, 65.

Wintrobe, M.M., Lee, G.R., Boggs, D.R., Bitchell, T.C., Fuerster, J., Athens, J.W. and Lukens, J.N. (1981). Clinical Haematology (8th ed). Lea and Febiger, Philadelphia. pp.1285, 1298.

Wright, A.I. (1989). Ring worm in dogs and cats. *J. small Anim. Pract.* 30(4): 242-249.

Yousef, R.T., Aggag, M.E. and Tawil, G.C. (1978). Evaluation of the antifungal activity of some compounds of volatile oils against dermatophytes. *Mykosen*. 21(6): 190-193.

Record of investigations on mycotic dermatitis in dogs
M.V.Sc. Project by Dr. Vinu David. P

1. Serial no. ..... Case No. ..... Date.....
2. Owner's name and address with Phone No. .....

....

3. **Patient data**

   a. Breed ..... Sex ..... Colour ..... Age .....

4. **History**

   a. What is the skin problem ?

   Itching ☐ Loss of hair ☐ Redness ☐ Scale ☐ Crust ☐

   Dry skin ☐ Oily skin ☐ Sore ☐ Others ☐

   b. At what age/time did you first notice the problem ? .....

   c. What did problem look like when it first started ?

   Itching ☐ Redness ☐ Hair loss ☐ Pimple ☐ Rash ☐ Others ☐

   d. Has it spread ? Yes ☐ No ☐. If yes, where ? .....

   e. Are the symptoms seasonal ? Yes ☐ No ☐. If yes , at which season ? .....

   f. Do You groom the dog daily ? Yes ☐ No ☐. If yes, is there any chance of acquiring skin infection from the equipments due to its use on other infected dogs ? Yes ☐ No ☐

   g. Do you have other pets in the house ? Yes ☐ No ☐. If yes, list .....

   h. Do any have skin problem ? Yes ☐ No ☐. If yes, explain .....

   i. Do any people in your house have a skin problem ? Yes ☐ No ☐. If yes, explain .....

   j. Whether the animal is dewormed ? Yes ☐ No ☐. If yes, date and drug of last deworming.....

   ....

   k. Whether there is ectoparasite infestation ? Yes ☐ No ☐. If yes, mention whether lice ☐ flea ☐ tick ☐ others ☐.

   l. Type of bedding and mode of disinfecting the kennel .....

   m. Dietary details .....

   n. History of previous dermatological problem and treatment, if any.....

   ....

Clinical observations

Respiration....., pulse ....., temperature .....

Type of lesion

1. Primary : (a) Macule ☐ (b) Papule ☐ (c) Nodule ☐ (d) Tumour ☐
   (e) Vesicle ☐ (f) Pustule ☐ (g) Wheal ☐
2. Secondary (a) Scale ☐ (b) Scar ☐ (c) Crust ☐ (d) Excoriation ☐
   (e) Ulcer ☐ (f) Comedo ☐ (g) Hyperkeratosis ☐ (k) Crack ☐

Configuration of lesion

Annular ☐, Linear ☐, Grouped ☐, Arciform ☐,
Polycyclic ☐, Serpiginous ☐, Central healing. ☐

Colour of lesion

Yellow ☐, Brown ☐, White ☐, Grey ☐, Black ☐, Erythematous ☐

Depth of lesion : *Superficial* ☐ *Deep* ☐

Hair Loss : Present ☐ Absent ☐

If present whether : Localised ☐ Multifocal ☐ Diffused ☐

Pruritus:- Present ☐ Absent ☐

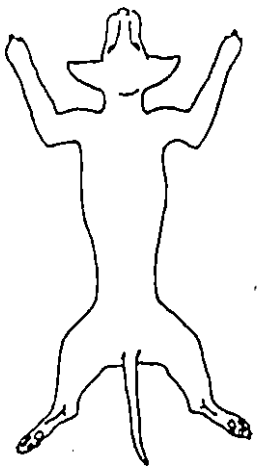
Quality of hair coat:- Good ☐ Poor ☐ Others (broken easily) ☐

Whether there is any sign of systemic disease ? Yes ☐ No ☐ If yes, list .....

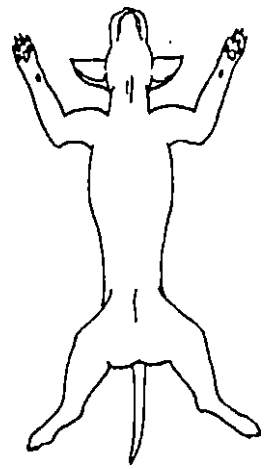
....

DISTRIBUTION OF LESIONS

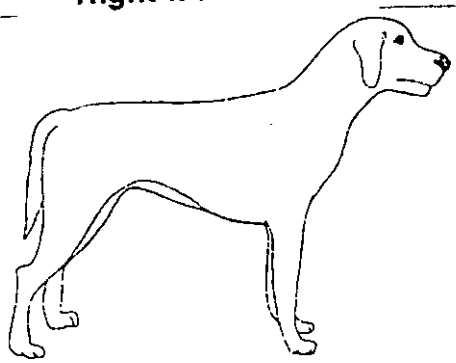
Dorsal view



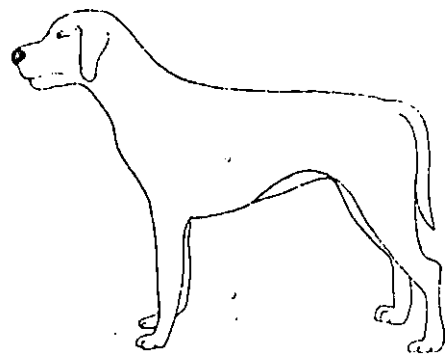
Ventral view



Right lateral view



Left lateral view



Laboratory observations

Total leukocyte count : .....

Differential Count : N..... L..... M..... E..... B.....

Result of Microscopical examination of skin scrapings .....

.....

Treatment pattern adopted

Ketoconazole ointment ☐ Cinnamon Oil ☐ Extract of Sphaeranthus indicus ☐

Data obtained from fungal Culture

	Gross Morphology	Microscopic characters	Fungal identity
On SDA			
On SDA with C.C			
On D.T.M			

Sensitivity pattern

	Conc.	Agar Used	Area inhibited	Remarks
a. Ketoconazole				
b. Cinnamon oil				
c. Sphaeranthus indicus extract				

Response to therapy

7th day

14th day

21st day

28th day

Follow up

Signature

CLINICO-THERAPEUTIC STUDIES ON MYCOTIC DERMATITIS OF DOGS

By

VINU DAVID. P.

ABSTRACT OF A THESIS

Submitted in partial fulfilment of the requirement for the degree

Master of Veterinary Science

Faculty of Veterinary and Animal Sciences
Kerala Agricultural University

Department of Clinical Medicine
COLLEGE OF VETERINARY AND ANIMAL SCIENCES
MANNUTHY - THRISSUR
KERALA, INDIA

1998

ABSTRACT

Incidence of mycotic dermatitis among the total canine cases presented at the University Veterinary Hospitals, Kokkalai and Mannuthy for a period from September 1996 to August 1998 was found to be 5.13 per cent. Among the total dermatological disorders 28.72 per cent had mycotic dermatitis. Age, breed and sex wise incidence were collected. This showed an increased incidence in adult dogs, mostly in German Shepherds and that too in females.

Detailed clinical examination revealed scaliness, alopecia, pruritus and erythema in all cases. Lesions were mainly localized, extremely variable in configuration and majority were distributed on head and limbs.

Skin scrapings collected and examined under microscope showed the presence of ectothrix arrangement of fungal spores. Mean total and differential count of leukocytes were found to be within the normal range for all cases.

A total of four dermatophytes and 17 non-dermatophytes were isolated by fungal culture. Dermatophytes isolated were three *Microsporum gypseum* and one *Trichophyton mentagrophytes* spp. Non-dermatophytes isolated were eight *Penicillium*, six *Aspergillus* and three *Rhizopus* spp.

In vitro antifungal susceptibility tests on the fungal isolates obtained showed a high sensitivity to cinnamon oil at a dilution of 1 in 10, followed by ketoconazole at 20 µg and *Sphaeranthus indicus* extract at 50 mg concentrations.

Response to treatment trials conducted on dogs with mycotic dermatitis using ketoconazole ointment showed therapeutic response in five out of seven cases. No response was noticed in dogs even after the course of treatment with *S. indicus* extract. Complete recovery was noticed in all animals treated with cinnamon oil.