RESEARCH ARTICLE

# Clinical Response to Anti-Fungal Therapy in Dogs Affected with Malasseziasis

Swethasri Paduvarahalli Thammanna[1]*, Srikala Devarakonda[1], Shobha Mani Bollam[1], Raghunath Mulinti[2]

## Abstract

Canine malassezia is an important opportunistic yeast dermatitis commonly associated with underlying dermatological and systemic disorders. The present investigation was undertaken to know the prevalence, epidemiological factors, clinical manifestations, diagnostic techniques, haemato-biochemical alterations and therapeutic response in dogs affected with malasseziasis. During a six-month study period, 2764 dogs presented with dermatological conditions were screened, of which 515 dogs (18.63%) were confirmed positive for *Malassezia pachydermatis*. Higher prevalence was recorded in dogs aged 4-8 years (31.36%), males (62.91%) and Labrador Retrievers (13.98%). Malasseziasis was frequently associated with ectoparasitic infestation (33.3%), pyoderma (23.8%) and demodicosis (20.0%). Predominant clinical signs included pruritus, alopecia, erythema, hyperpigmentation and offensive odour. Tape impression cytology proved to be the most sensitive diagnostic method (86.79%). Twenty affected dogs were divided into two equal groups and were subjected to antifungal therapy tablet ketoconazole (Gr I) and itraconazole (Gr II) @ 5 mg/kg b.wt. for 30 days along with tablet cephalexin @ 15 mg/kg b.wt., liver protectant and haematinic syrup for three weeks, and evaluated for haemato-biochemical changes. The improvement was seen in both the groups, but the liver enzymes were elevated in the group I with ketoconazole. Significant improvement in clinical signs and normalization of haematological parameters were observed following treatment. The study emphasizes the importance of early diagnosis and appropriate antifungal therapy for effective management of canine malasseziasis.

**Key words:** Antifungal therapy, Canine malasseziasis, Cytology, Epidemiology, *Malassezia pachydermatis*.

*Ind J Vet Sci and Biotech* (2026): 10.48165/ijvsbt.22.3.10

## Introduction

Malasseziasis is a common superficial fungal dermatitis in dogs caused predominantly by *Malassezia pachydermatis*, a commensal yeast of canine skin. Under normal conditions, the organism exists in small numbers; however, alterations in the cutaneous microenvironment such as increased humidity, seborrhoea, skin folds, allergic dermatitis, endocrine disorders and immunosuppression favour its proliferation and pathogenicity. Several authors have reported malasseziasis as a secondary complication to allergic dermatitis, pyoderma, demodicosis and endocrinopathies, particularly hypothyroidism. Clinically, canine malasseziasis is characterized by pruritus, erythema, alopecia, hyperpigmentation, lichenification and malodour, with lesions commonly distributed over axillae, ventral neck, groin, interdigital spaces and external ear canals. Cytological examination remains the cornerstone of diagnosis, with tape impression smears being rapid, inexpensive and reliable. Despite the frequent occurrence of the disease, comprehensive studies integrating epidemiology, clinical presentation, diagnostic efficacy, haemato-biochemical alterations and therapeutic evaluation are limited. Hence, the present study was undertaken to evaluate these aspects in canine malasseziasis including its prevalence in dogs of Visakhapatnam, Andhra Pradesh.

[1]Department of Veterinary Medicine, College of Veterinary Science, Sri Venkateswara Veterinary University, Tirupati-517501, Andhra Pradesh, India

[2]Department of Veterinary Clinical Complex, College of Veterinary Science, Sri Venkateswara Veterinary University, Tirupati-517501, Andhra Pradesh, India

**Corresponding Author:** Dr. Swethasri P.T., Ph.D. Scholar, Department of Veterinary Medicine, College of Veterinary Sciences, GADVASU, Ludhiana, Punjab-141001, India. e-mail: ptswethasri@gmail.com

**How to cite this article:** Swethasri, P. T., Srikala, D., Shobha Mani, B., & Raghunath, M. (2026). Clinical Response to Anti-Fungal Therapy in Dogs Affected with Malasseziasis. Ind J Vet Sci and Biotech, 22(3), 51-56.

**Source of support:** Nil

**Conflict of interest:** None

**Submitted** 14/02/2026 **Accepted** 06/03/2026 **Published** 10/05/2026

## Materials and Methods

The study was conducted in Visakhapatnam, Andhra Pradesh, India (30°54′ N, 75°51′ E), situated between the Eastern Ghats and the Bay of Bengal. Visakhapatnam has a typical coastal climate. The study was conducted over a period of six months at a Super Speciality Veterinary Hospital. A total of 2764 dogs presented with dermatological disorders were screened for malasseziasis. Detailed dermatological

examination was performed in all dogs, recording age, sex, breed, clinical signs and distribution of lesions. Diagnosis of malasseziasis was based on Tape impression smear, Direct slide impression smear, and Sterile swab technique. Samples were stained using new methylene blue and examined under oil immersion (100×). Fungal culture was carried out on Sabouraud dextrose agar (Fig. 3a) for confirmation.

### Therapeutic Trial

Out of 515 positive cases, 20 dogs were randomly selected and divided into two groups (Group I and II) of 10 animals each. Ten apparently healthy dogs served as control (Group III), while in Group I and II, oral ketoconazole (SAVA Healthcare, Wadhwan, Gujarat, India) and oral itraconazole (SAVA Healthcare, Wadhwan, Gujarat, India), respectively, were administered @ 5 mg/kg b.wt. PO SID for 30 days. Both the groups were aided with antibiotic tablet cephalexin (Virbac, Mumbai, India) @ 15 mg/ kg b.wt. PO BID for 21 days. Hepatoprotective agent S-Adenosyl methionine (SAMe; SAVA Healt care, Wadhwan, India) and Silybin-Phosphatidyl choline complex chewable tablet (SAVA Healthcare, Wadhwan, India) was given to aid the functional capacity of liver in conjunction with anti-fungal therapy. Coat supplement syrup (Virbac, Mumbai, India) rich in linoleic acid, linolenic acid, oleic acid, zinc, vitamin A, vitamin D3, selenium, biotin, lecithin and Vitamin B6, and haematinic syrup (Vetoquinol, Lure, France) @ 5-10 mL each daily PO SID for 30 days were administered and topical shampooing with ketoconazole (2%), chlorhexidine gluconate (2%) and cetrimide base shampoo (Ahmedabad, Gujarat, India ) found effective in the management of *Malasseziasis* in dogs was also used weekly twice for four weeks at least and until resolution of clinical signs.

### Haemato-Biochemical Evaluation

Blood samples were collected on day 0, 15 and 30 of treatment for estimation of Hb, TEC, PCV, TLC and differential leukocyte count. Serum ALT, AST and total protein were also analyzed using autoanalysers.

### Statistical Analysis

Data were expressed as mean ± SE and analyzed statistically. Differences were considered significant at $p < 0.05$.

## Results and Discussion

### Prevalence and Clinical Signs of Canine Malasseziasis

Out of 2764 dogs screened, 515 dogs (18.63%) were confirmed positive for malasseziasis. The overall prevalence of *Malasseziasis* was observed to be 18.63 %. The occurrence of *Malasseziasis* cases in the study area could be attributed to poor hygienic conditions of pets and higher skin pH of canines, all of which make canines more susceptible to ectoparasitic infestations. *Malasseziasis* was more prevalent in 4-8 year old dogs (31.36 %, 161/515) followed by >8 yrs (28.83 %, 148/515), 1-4 years (24.46 %, 126/515) and the least in dogs aged less than 1 year (15.53 %, 80/515). On the contrary, Paterson (2008) stated that there was no age effect on incidence of *Malasseziasis*.

Higher prevalence of *Malasseziasis* was noticed in male (62.91%, 324/515) than in female dogs (37.08%, 191/515). This could be due to the preference of rearing male dogs than female dogs. On the contrary, Paterson (2008) and Rhodes and Werner (2018) stated that there is no gender predilection for *Malasseziasis*. It was observed from the present study (Table 1) that majority of the dogs affected were Labrador Retriever (13.98%), followed by German Shepherd (13.2%), Golden Retriever (11.84%), Pug (9.70%), Spitz (9.51%), Boxer (7.37%), Maltese Terrier (5.82%), Pomeranian (5.43%), Doberman Pinscher (4.07%), Lhasa Apso (4.07%), Dachshund (3.88%), Great Dane (3.68%), Neapolian Mastiff (3.30%), Rottweiler (2.52%) and non-descriptive (1.55%). These findings were in close agreement with Kumar *et al.* (2002), who reported Labrador Retriever as one of the most often affected breeds with *Malasseziasis*. On the contrary, Rhodes and Werner (2018) stated that the predisposed breeds for *Malassezia pachydermatis* are West Highland White Terrier, Miniature or Toy Poodle, Basset Hound, Shih Tzu, American Cocker and Cavalier King Charles spaniel, German Shepherd, English Setter, Australian and Silky Terriers and Dachshund.

**Table 1:** Breed wise occurrence of canine *Malasseziasis* (n=515)

| Breed | No. of cases | Percent |
|---|---|---|
| Labrador Retriever | 72 | 13.98 |
| German Shepherd | 68 | 13.20 |
| Golden Retriever | 61 | 11.84 |
| Pug | 50 | 9.70 |
| Spitz | 49 | 9.51 |
| Boxer | 38 | 7.37 |
| Maltese Terrier | 30 | 5.82 |
| Pomeranian | 28 | 5.43 |
| Doberman Pinscher | 21 | 4.07 |
| Lhasa Apso | 21 | 4.07 |
| Dachshund | 20 | 3.88 |
| Great Dane | 19 | 3.68 |
| Neapolitan Mastiff | 17 | 3.30 |
| Rottweiler | 13 | 2.52 |
| Non-descriptive | 8 | 1.55 |

In the present study (Table 2), most prominent clinical signs observed in *Malasseziasis* dogs were pruritus, alopecia, erythema, hyperpigmentation (Fig.1b), offensive odour, lichenification (Fig. 1c), foul odour, excoriation, epidermal collarettes, ceruminous otitis externa, paronychia, crusts and hyperkeratosis. These findings were in accordance with earlier works of Anju *et al.* (2021). It was observed (Table 3) that axillae (79.8%) were the most affected site in *Malasseziasis* dogs in the present study. It was in accordance with Lewis (2016), Ashwini (2018), and Rhodes and Werner (2018). This could be due to areas on body where skin folds-over itself or rubs against itself frequently or even may be due to physical characteristics like humidity and warmth. The other regions affected were ventral abdomen (70.87%), ventral neck

(62.91%), medial thigh (44.07%), interdigital skin (35.72%), ear canals (32.42%), anal sacs (16.89%), perioral areas (16.11%) and peri-orbital areas (9.32%). It was in accordance with Joyce (2011) and Nuttall (2012).

**Table 2:** Clinical signs of canine *Malasseziasis* (n=515)

| Dermatological Disorders | No. of cases | Percent |
|---|---|---|
| Pruritus | 463 | 89.9 |
| Alopecia | 456 | 88.54 |
| Erythema | 427 | 82.91 |
| Hyperpigmentation | 412 | 80 |
| Offensive odour | 398 | 77.28 |
| Lichenification | 241 | 46.79 |
| Excoriations | 184 | 35.72 |
| Epidermal collarettes | 83 | 16.11 |
| Ceruminous otitis externa | 80 | 15.53 |
| Paronychia | 74 | 14.36 |
| Crusts | 63 | 12.23 |
| Hyperkeratosis | 61 | 11.84 |

**Table 3:** Area of lesions in canine *Malasseziasis* (n=515)

| Area of lesion | No. of cases | Percent |
|---|---|---|
| Axillae | 411 | 79.8 |
| Ventral abdomen | 365 | 70.87 |
| Ventral neck | 324 | 62.91 |
| Medial thighs | 227 | 44.07 |
| Interdigital skin | 184 | 35.72 |
| Ear canals | 167 | 32.42 |
| Anal sacs | 87 | 16.89 |
| Perioral areas | 83 | 16.11 |
| Periorbital area | 48 | 9.32 |

## Haemato-Biochemical Alterations

In the present study (Table 4) there was significant decrease in mean ±SE values of haemoglobin, TEC and PCV in *Malasseziasis* affected dogs of Group-I and Group-II when compared to apparently healthy adult dogs (Group-III). There was significant increase in mean ±SE values of total leukocyte count and lymphocytes in *Malasseziasis* affected dogs of Group-I and Group-II when compared to apparently healthy Group-III and there was no significant difference in mean ±SE values of neutrophils, eosinophils, monocytes in *Malasseziasis* affected dogs of Group-I and Group-II. Serum biochemical parameters (Table 4) showed no significant difference in the mean ±SE values of ALT, AST and total protein on day 30 in *Malasseziasis* affected dogs when compared with day zero in Group-II, whereas in Group-I, dogs showed a significant increase in AST and ALT from day zero to day 30.

## Diagnostic Efficacy

Tape impression smears (Fig.1a) were used to collect sample from dry lesions, glass slide impression smears from wet greasy lesions and roll swab method was used to collect samples. These techniques were inexpensive and less time consuming. This was in accordance with Eluk *et al.* (2003). Another advantage was that the tape preparation does not

**Table 4**: Pre- and post-therapeutic mean haemato-biochemical profile of Group-I & II dogs against healthy control dogs (Mean ± SE, n=10 each)

| Haemato-biochemical Parameters | Group-III | Group-I | | | Group-II | | |
|---|---|---|---|---|---|---|---|
| | Control | Day zero | Day 15 | Day 30 | Day zero | Day 15 | Day 30 |
| Hemoglobin (g/dL) | 14.61±0.46$^{a}$ | 11.83±0.54$^{c}$ | 12.25±0.28$^{bc}$ | 13.45±0.20$^{ab}$ | 12.64±0.73$^{bc}$ | 13.21±0.59$^{abc}$ | 13.36±0.20$^{abc}$ |
| Total erythrocyte count ($\times10^{6}$/µL) | 8.84 ± 0.12$^{a}$ | 7.47 ± 0.32$^{c}$ | 7.68 ±0.21$^{bc}$ | 8.24 ±0.17$^{b}$ | 7.69 ±0.21$^{bc}$ | 7.68 ±0.21$^{bc}$ | 8.16 ±0.17$^{b}$ |
| PCV (%) | 43.66±1.38$^{a}$ | 45.49±1.63$^{b}$ | 36.75±0.83$^{bc}$ | 40.35±0.60$^{ab}$ | 37.92±2.20$^{bc}$ | 39.63±1.78$^{abc}$ | 39.33±0.62$^{abc}$ |
| Total leucocyte count ($\times10^{3}$µL) | 9.86 ± 0.43$^{a}$ | 21.88±1.48$^{c}$ | 13.52±0.75$^{b}$ | 9.99 ± 0.27$^{a}$ | 23.01±1.35$^{c}$ | 15.34±0.88$^{b}$ | 9.97 ± 0.31$^{a}$ |
| Neutrophils (%) | 74.50±3.07 | 71.30±2.58 | 69.60±1.20 | 73.40±1.31 | 70.00±2.85 | 69.60±1.20 | 72.90±1.27 |
| Lymphocytes (%) | 22.60±1.30$^{a}$ | 34.90±2.47$^{b}$ | 26.70±1.16$^{a}$ | 22.40±0.70$^{a}$ | 36.30±2.77$^{b}$ | 26.70±1.16$^{a}$ | 23.40±1.19$^{a}$ |
| Eosinophils (%) | 1.18 ± 0.21 | 1.08 ± 0.04 | 1.11 ± 0.05 | 1.23 ± 0.10 | 1.16 ± 0.06 | 1.22 ± 0.08 | 1.32 ± 0.09 |
| Monocytes (%) | 2.10 ± 0.23 | 2.70 ± 0.21 | 2.60 ± 0.22 | 2.30 ± 0.15 | 2.60 ± 0.16 | 2.50 ± 0.17 | 2.40 ± 0.16 |
| ALT (U/L) | 45.50 ± 3.58$^{a}$ | 46.40 ± 3.74$^{a}$ | 54.10 ± 1.89$^{ab}$ | 56.30 ± 1.33$^{b}$ | 46.40 ± 3.74$^{a}$ | 45.80 ± 3.59$^{a}$ | 45.40 ± 2.13$^{a}$ |
| AST (U/L) | 34.50 ± 2.68$^{a}$ | 36.60 ± 2.76$^{a}$ | 38.30 ± 1.45$^{ab}$ | 40.80 ± 1.30$^{b}$ | 36.60 ± 2.76$^{a}$ | 37.00 ± 2.44$^{a}$ | 36.60 ± 2.81$^{a}$ |
| Total protein (g/dL) | 6.63 ± 0.11 | 6.81 ± 0.12 | 6.65±0.11 | 6.61 ± 0.12 | 6.71 ± 0.14 | 7.05 ± 0.16 | 6.71 ± 0.14 |

Values within the same row having different superscripts differ significantly ($p<0.05$).

require any heat fixation as mentioned by Matousek and Campbell (2002). Presence of at least 10 yeasts per field (Fig. 2a) from the skin samples were considered positive and the average number of malassezia yeasts present in ten microscopic fields was taken based on findings of earlier investigators (Nobre *et al.,* 2001; Bensignor, 2008). In this study, *Malasseziasis* alone was seen in 17.6 % dogs and mixed infections like malassezia with pyoderma was seen in 23.8 %, malassezia with ticks in 33.3 %, malassezia with demodicosis seen in 20 %. *Malasseziasis* and bacterial dermatitis often occur concurrently in dogs (Rosales *et al.,* 2005; Sickafoose *et al.,* 2010). Presence of *Staphylococci* favours the growth of *Malassezia pachydermatis* and probably these two organisms mutually benefit through utilization of products formed by bacterial and yeast lipases (Craig, 2008).

## Isolation and Identification of *Malassezia pachydermatis*

In the current study, samples with positive cytology results underwent a mycological culture examination. After 48 h, regular spherical colonies were seen, which were sand-coloured, friable in consistency, and easily peeled off their bases (Fig. 3a). Likewise, similar colony traits were noted by Kumar *et al*. (2008). This result corresponded with Jain *et al*. (2007) and George *et al.* (2012), who stated that *Malasseziasis* in dogs could be identified using cytological testing independent of culture. In fact, Girao *et al*. (2006) and Prado *et al*. (2008) argued that although a diagnosis could be made immediately by a direct microscopic inspection, a fungal culture (Fig. 3b) was necessary to provide more precise results and to identify the species of *Malasseziasis*. The antifungal

**Fig. 1a:** Collection of tape impression

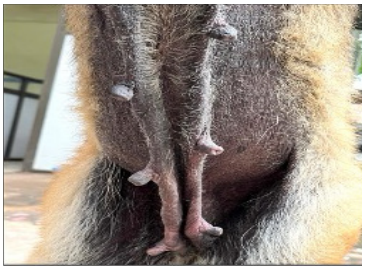

**Fig. 1b:** Typical characteristic of hyperpigmentation on ventral abdomen in German Shepherd breed infected with *Malasseziasis*

**Fig. 1c:** Charaterstic lichenification in 10 year old mixed breed suffering with chronic *Malasseziasis*

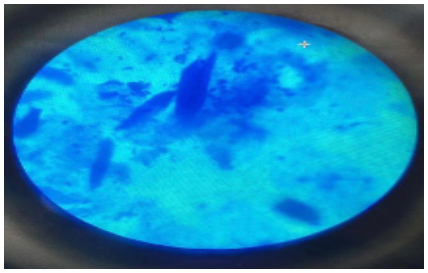

**Fig. 2a:** Tape impressions revealing blue coloured footprint shaped *Malassezia pachydermatis* on day zero

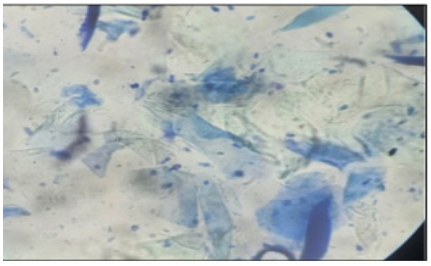

**Fig. 2b:** Tape impressions revealing blue coloured footprint shaped *Malassezia pachydermatis* on day 15

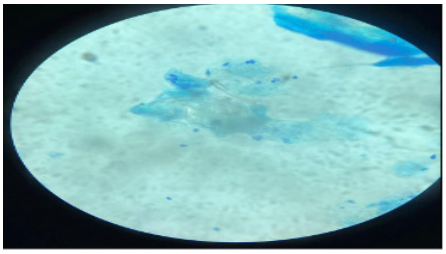

**Fig. 2c:** Tape impressions revealing blue coloured footprint shaped *Malassezia pachydermatis* on day 30

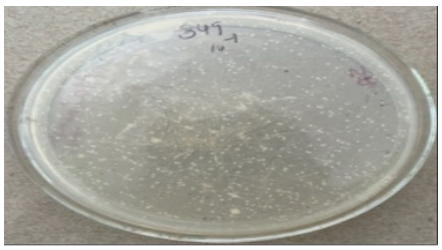

**Fig. 3a:** Creamy, wrinkled, shrinky colonies of *M. pachydermatis* after 48 h on SDA agar.

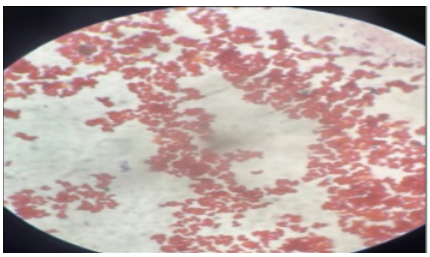

**Fig. 3b:** Photomicrograph of culture smear showing *Malassezia pachydermatis* colonies.

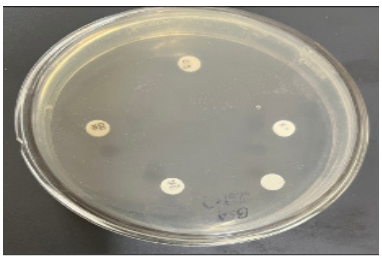

**Fig. 3c:** *In vitro* antifungal sensitivity test, zone of inhibition for ketoconazole was 21 mm

sensitivity test (Fig. 3c) conducted in the present study revealed that the *Malassezia pachydermatis* isolates were more sensitive to itraconazole followed by ketoconazole. This was in accordance with Brito *et al.* (2009), who noted all isolates sensitive to itraconazole and ketoconazole. Fluconazole, clotrimazole and miconazole were found comparatively less sensitive in the present study.

### Efficacy of Treatment

A treatment trial was undertaken to study the efficacy of ketoconazole and itraconazole in the resolution of *Malasseziasis* in dogs. Group-I that, was on trial with ketoconazole showed significant elevation of liver enzymes above the accepted physiological range, which was not observed with itraconazole Group-II. Ketoconazole resulted in gastrointestinal upset, masked signs of hyperadrenocorticism and interfered with adrenal function tests by blocking cortisol production, strong inhibitor of cytochrome p450 enzymes, whereas itraconazole was often well tolerated specific for fungal cytochrome p450 enzymes, mild inhibitor of mammalian cytochrome p450 enzymes (Rhodes and Werner, 2018). Earlier, the hepatoprotective agent S-Adenosyl methionine and Silybin-Phosphatidyl choline complex chewable tablet given in conjunction with anti-fungal therapy to aid the functional capacity of liver (Kirk, 2020), Nutritional coat supplement syrup (Kirby, 2007) with haematinic syrup (Marchegiani, 2020) and topical shampooing with ketoconazole (2%), chlorhexidine gluconate (2%) and cetrimide base shampoo (Paterson, 2008) were reported to be effective in the management of *Malasseziasis* in dogs with resolution of clinical signs.

Topical therapy in the form of shampoo consisting of ketoconazole (2%), chlorhexidine gluconate (2%) and cetrimide lipid included hasten the recovery process and in the remission of clinical signs. It is preferable to use a combination of topical and systemic therapy to achieve rapid and complete remission of clinical signs in *Malasseziasis* in dogs (Bajwa, 2017). Prognosis was monitored on 15$^{th}$ day and 30$^{th}$ day from the onset of medication. Post-therapeutic tape impressions revealed lesser elephant foot shaped organisms microscopically (Fig 2b, 2c). In clinical cases of dermatitis in dogs, secondary yeast and bacterial infections often co-exist and therefore, broad spectrum antibiotic, cephalexin was employed along with anti-fungal drugs in line with an earlier study (Sickafoose *et al*., 2010). An excellent clinical response along with quick recovery was noticed in all the dogs treated with oral itraconazole and cephalexin along with supportive therapy, which included coat supplement, hepatoprotective agent and haematinic.

## Conclusion

Canine malasseziasis cases with classical clinical signs were most frequently presented and diagnosed in SVVU Super Specialty Veterinary Hospital, Vishakhapatnam. Labrador Retriever were most commonly affected followed by German Shepherd in age group of 4-8 years. Most of the isolates were susceptible to itraconazole followed by ketoconazole. Haematological findings of *Malasseziasis* dogs revealed a significant increase in TEC, PCV and haemoglobin and significant decrease in leucocytes and lymphocytes after treatment. Serum biochemical findings revealed a significant increase in the liver enzymes in Group-I kept under ketoconazole, whereas no significant changes observed in the Group-II kept under itraconazole. *Malasseziasis* can be treated preferably by a combination of topical and systemic therapy to achieve rapid and complete remission of clinical signs. Diversified management and preventive techniques are required to control canine *Malasseziasis* throughout the geographical area of study.

## Acknowledgement

We are grateful to the Heads of SVVU Super-Specialty Veterinary Hospital, Visakhapatnam, and Department of Veterinary Medicine, College of Veterinary Sciences, Tirupati, Andhra Pradesh for the facilities and cooperation extended in this study

## References

Anju, K.D., David, P.V., Ravishankar, C., Sindhu, O.K., & Ajithkumar, S. (2021). Diagnosis and therapeutic management of Malasseziosis in dogs. *Journal of Veterinary and Animal Sciences, 52*(3), 262-266.

Ashwini, M. (2018). Malasseziosis infection in a dog. *Journal of Dairy and Veterinary Sciences, 7*(1), 1-2.

Bajwa, J. (2017). Canine malassezia dermatitis. *The Canadian Veterinary Journal, 58*(10), 1119.

Bensignor, E. (2008). Oral itraconazole as a pulse therapy for the treatment of canine malassezia dermatitis: A randomised, blinded, comparative trial. *European Journal of Companion Animal Practice, 18,* 69-72.

Brito, E.H.S., Fontenelle, R.O.S., Brilliante, R.S., Cordeiro, R.A., Monteiro, A.J., Sidrim, J.J., & Rocha, M.F. (2009). The anatomical distribution and antimicrobial susceptibility of yeast species isolated from healthy dogs. *The Veterinary Journal, 182*(2), 320-326.

Craig, M. (2008). Disease facts: Malassezia (yeast) dermatitis. UK *Veterinary Journal, 13,* 1-3.

Eluk, O.A.J., Baker, K.P., & Fuller, H. (2003). Comparison of two sampling technique for the detection of *Malassezia pachydermatis* on the skin of dogs with chronic dermatitis. The *Veterinary Journal, 165,* 119-124.

George, S., Yathiraj, S., & Bhat, N.M. (2012). Occurrence of *malasseziosis* in dogs. *Indian Veterinary Journal, 89*(6), 119-120.

Girao, M.D., Prado, M.R., Brilhante, R.S.N., Cordeiro, R.A., Monteiro, A.J., Sidram, J.J.C., & Rocha, M.F.G. (2006). *Malassezia pachydermatis* isolated from normal and diseased external ear canals in dogs: A comparative analysis. *The Veterinary Journal, 172,* 544-548.

Jain, S., Suresh, R.V., Balachandran, C., & Srinivasan, S. (2007). Cytological and cultural examination of malassezia dermatitis in dogs. *Indian Veterinary Journal, 84,* 182-183.

Joyce, J. (2011). *Notes on Small Animal Dermatology*. John Wiley & Sons, pp. 134-136.

Kirby, N.A., Hester, S.L., & Bauer, J.E. (2007). Dietary fats and the skin and coat of dogs. *Journal of the American Veterinary Medical Association*, *230*(11), 1641-1644.

Kirk, N.M. (2020). The use of glutathione in canine itraconazole-associated hepatotoxicity. *Doctoral Dissertation*, University of Illinois at Urbana-Champaign, USA.

Kumar, A., Singh, K., & Sharma, A. (2002). Incidence of *Malassezia pachydermatis* and other organisms in healthy and infected dog's ears. *Israel Journal of Veterinary Medicine, 57*(4), 145-148.

Kumar, K.S., Latha, S.M., Prasanna, J.S., Dhanalakshmi, K., & Sarma, B.J.R. (2008). A cultural and electron microscopic studies of *Malassezia pachydermatis*. *Indian Veterinary Journal*, *85,* 371-374.

Lewis, D.T. (2016). *Malassezia* dermatitis. In: Schaer, M., Gaschen, F., & Walton, S. (Eds.). *Clinical Medicine of the Dog and Cat*. CRC Press, pp. 785-786.

Marchegiani, A., Fruganti, A., Spaterna, A., Dalle Vedove, E., Bachetti, B., Massimini, M., Di Pierro, F., Gavazza, A., & Cerquetella, M. (2020). Impact of nutritional supplementation on canine dermatological disorders. *Veterinary Sciences, 7*(2), 38.

Matousek, J.L., & Campbell, K.L. (2002) Malassezia dermatitis. *Compendium, 24*(3), 224-232.

Nobre, M.O., Castro, A.P., Nascente, P.S., Ferreiro, L., & Meireles, M.C.A. (2001). Occurrence of *Malassezia pachydermatis* and other infectious agents as cause of external otitis in dogs. *Brazilian Journal Microbiology, 32.* 245-249.

Nuttall, T. (2012). Malassezia dermatitis. In: *BSAVA Manual of Canine and Feline Dermatology*, BSAVA Library, pp. 198-205.

Paterson, S. (2008). Malasseziasis. *Manual of Skin Diseases of the Dog and Cat.* John Wiley & Sons, pp. 67-69.

Prado, M.R., Brilhante, R.S.N., Cordeiro, R.A., Monteiro, A.J., Sidrim, J.J.C., & Rocha, M.F.G. (2008). Frequency of yeasts and dermatophytes from healthy and diseased dogs. *Journal of Veterinary Diagnostic Investigation, 20,* 197-202.

Rhodes, K.H., & Werner, A.H. (2018). *Blackwell's Five-Minute Veterinary Consult Clinical Companion Small Animal Dermatology.* Wiley-Blackwell, New Jersey, USA. pp 480-493.

Rosales, M.S., Marsella, R., Kunkle, G., Harris, B.L., Nicklin, C.F., & Lopez, J. (2005). Comparison of clinical efficacy of oral terbinafine and ketoconazole combined with cephalexin in the treatment of *Malassezia* dermatitis in dogs. *Veterinary Dermatology, 16,* 171-176.

Sickafoose, L., Hosgood, G., Snook,T., Westermeyer, R., & Merchant, S. (2010). A non-inferiority clinical trial comparing fluconazole and ketoconazole in combination with cephalexin for the treatment of dogs with *Malassezia* dermatitis. *Research in Applied Veterinary Medicine, 11*(2), E1-1.