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Comparative efficacy of ivermectin and fipronil spot on against *Knemidocoptes pilae* in budgerigars

Serug Akhtar[1], Uzma Farid Durrani[1], Asim Khalid Mahmood[1], Haroon Akbar[2], Rashid Hussain[1], Khizar Matloob[1], Raheela Akhtar[3], Waseem Yaqub[1], Abid Hussain[1]

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ABSTRACT

In Pakistan, *Knemidocoptes pilae* (scaly face mite) mite infestation is a frequently seen parasitic issue in budgerigars. This mite specifically causes extensive damage to featherless areas of cere and legs. This study was conducted to evaluate the topical efficacy of 1% ivermectin and 10% fipronil against two groups of *Knemidocoptes pilae* infested budgerigars. Fipronil and ivermectin spot on were topically administered on days 0, 7 and 14, on dorsal surface of neck in their respective group. It was concluded that ivermectin readily initiates the healing response after first application as compared to the fipronil and both drugs clear the *Knemidocoptic* infestation and lesions by 21 days following first treatment.

Key words: Budgerigar, Fipronil, Ivermectin, *Knemidocoptes pilae*, Scaly face mite.

INTRODUCTION

Budgerigars are the most common, easily manageable and economical pet parakeets informally named budgies or Australian parrots. The scientific name of budgerigar is *Melopsittacus undulatus*, first documented by John Gould (Olsen, 2003).

During routine veterinary clinical practice in Lahore, Pakistan, parakeets especially budgerigars are frequently received with mild to severe scaly face problem. *Knemidocoptes* mite infestation is a common parasitic problem of parakeets. This mite belongs to class Arachnida and it is a deep burrowing and viviparous mite of un-feathered areas of skin (Dabert *et al*., 2011). There are 3 main species of *Knemidocoptes i.e*. *K. pilae* (budgerigars), *K. mutans* (domesticated poultry), *K. gallinae* (poultry, pheasant and geese). *K. pilae* is a mite of parakeets that mostly infests and mutilate areas of cere and legs. *Knemidocoptes* feed on keratin of the cornified epithelium and forms pouch-like cavities in the skin (Georgi and Georgi, 1991). It causes proliferative, typical spongy lesions around cere, beak and eyes (Hossain *et al.,* 2012). In budgerigars mite infestation mostly occurs between 6-12 months age (Georgi and Georgi, 1991) and mites spend their entire life on their host.

Transmission of the *Knemidocoptes* occurs only during the nesting phase of featherless, baby birds or occasionally following prolonged contact between healthy and infected birds ultimately leading to hyperkeratosis of cere and adjacent tissues. Occasionally beak deformities with overgrowth or shortening of the maxilla, affected vent and legs of budgerigars are also observed. Deformed beak limits self-grooming, that is the first line of defense against ectoparasites.

Adult *Knemidocoptes* females are short, round in shape (approx. 600×500 µm), with eight legs. The legs of the female mites are short segmented and lack suckers in contrast to those of male. Prominent features of adult female *K. pilae* include an anal slit positioned on the dorsal aspect and two short setae at the terminus of the idiosoma. Adult males are oval in shape, (approx. 350×250 µm), with six segmented legs longer than those of females and having non articulating pedicels with suckers. *Knemidocoptese* larvae also possess long, non-jointed pedicels with suckers at the end of each leg, similar to those of adult males (Abou-Alsoud and Karrouf, 2016).

Various drugs recommended against *K. pilae* include moxidectin, sulphur solution, sodium fluoride, ivermectin, mineral oil, fipronil and mushroom calvatia craniiformis powder (Abou-Alsoud and Karrouf, 2016), Jameel, 2016, Elbal *et al*., 2014, Beck, 2000, Zwart,1995). Ivermectin is a commonly used endecticide that acts by potentiating glutamate-gated chloride channels, ultimately causing paralysis and death of the parasite by increased permeability to chloride ions and hyperpolarization of nerve cells (Kalbe and Hansen, 2012). Fipronil belongs to the class

[1]Pet Centre, University of Veterinary and Animal Sciences, Lahore, Pakistan.
[2]Department of Parasitology, University of Veterinary and Animal Sciences, Lahore, Pakistan.
[3]Department of Pathology, University of Veterinary and Animal Sciences, Lahore, Pakistan.

Corresponding Author: Uzma Farid Durrani, Pet Centre, University of Veterinary and Animal Sciences, Lahore, Pakistan.
Email: ufdurrani@uvas.edu.pk

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Phenylpyrazole and it works by interfering the passage of chloride ions through GABA regulated chloride channel and disrupts the CNS activity of parasite (Gant *et al*., 1998).

In Pakistan, there is high number of *Knemidocoptes pilae* affected cases in budgerigars whereas safe and effective drug options are very limited. Keeping in view the need for a safe and effective treatment, the present study was designed to evaluate the efficacy of ivermectin and fipronil spot on against clinical cases of *Knemidocoptes pilae* in budgerigars.

MATERIALS AND METHODS

Plan of study

This study was conducted on the clinical cases of *Knemidocoptes pilae* in budgerigars (*Melopsittacus undulates*) received at Pet Centre clinic, University of Veterinary and Animal Sciences, Lahore, Pakistan. Most of the *Knemidocoptes* suspected cases were presented with severe skin lesions on face, legs occasionally associated with beak deformity. Maximum cases were recorded during months April to June. *Knemidocoptes* suspected cases were investigated at Pet Centre Diagnostic Laboratory for confirmation through skin scraping as per following protocol:

i. Skin scraping

Skin scraping was collected from lesions on un-feathered areas of face (cere) using a blunt surgical blade till mild oozing of blood. Skin scraping (keratinized debris, scales and crusts) was collected in a Petri dish and treated with few drops of 10% KOH for 20-30 minutes to digest the debris (Toparlak *et al*, 1999).

ii. Slide preparation

KOH treated skin scraping was placed on a glass slide pre-moistened with a drop of cider wood oil and covered with a cover slip. The cover slip was secured in its position by applying transparent nail enamel at its margins (Sangvaranond *et al*. 2007).

Microscopic examination

Slides were microscopically examined under different magnifications *i.e.* 4X, 10X, 40X (Fig 1). Adult mite identification was performed under 4X whereas anatomical details of mite were studied under 10X. Different developmental stages and species were identified under 40X (Abou-Alsoud and Karrouf, 2016).

Selection and grouping of birds

After confirmation of 50 cases positive for *Knemidocoptes pilae*; 20 cases were randomly selected for this study and divided into two groups *i.e*. A and B, 10 birds each**.**

Therapeutic trials

Group A

Group A was topically treated with 1% ivermectin (Ivomec spot on, Merial Pvt. Limited) on dorsum of the neck on days 0, 7 and 14 @ 1 drop per bird (Hossain *et al*., 2012).

Group B

Group B was topically treated with 10% fipronil (Frontline spot on, Merial Pvt. Limited) on dorsum of the neck on days 0, 7 and 14 @ 1 drop per bird (Beck, 2000).

Effect of both drug trials was studied on the basis of following pre and post treatment parameters.

- Body weight
- Feed intake
- Body itching
- Activity
- Skin condition

Results of this study, obtained in form of grades, were statistically analyzed in form of graphical representations.

RESULTS AND DISCUSSION

The study was based on identification of *Knemidocoptes pilae* and comparative effect of ivermectin and fipronil spot on against *Knemidocoptes pilae* in budgerigars. Before initiation of drug trials, all *K. pilae* suspected cases were microscopically confirmed through deep skin scrapping (Sangvaranond *et al*., 2007; Hochleitner, 1992; Kim *et al*., 2016). Microscopic examination revealed adult *Knemidocoptes* females as short and round body with eight short, segmented legs without suckers. Adult males were oval in shape having six segmented legs longer than those of females and accompanied by non-articulating pedicels with suckers

A B C

Fig 1: A: showing microscopic appearance of *K. pilae* at 4X. B, C showing microscopic appearance at 10X.

(Abou-Alsoud and Karrouf, 2016). After confirmation and drug trials following were the post treatment findings against different parameters of this study.

Body weight

In groups A and B average body weight was 30g prior to initiation of drug trials. After starting the drug trials body weight was recorded on days 7, 14 and 21 in both groups. Statistical analysis revealed that both groups did not show any significant difference of body weight between days 0-14 but on day 21 there was gain of body weight upto 1g in 70% birds in group A and 20% birds in group B. No such data is reported earlier.

Feed intake

Both groups were offered a balanced commercial parrot feed. In group A birds showed significant increase in fed intake after day 14 post treatment. Statistical analysis revealed a significant difference of feed intake between days 0 to 14 but no significant difference was recorded from days 14 to 21. In group B, increase in feed intake was observed on day 14 following fipronil treatment. Rate of feed intake was significantly different before and after drug trials in both groups that was indication of improvement in general health status.

Body Itch

In group A, itching behaviour disappeared in all birds on day 7 following first treatment of ivermectin spot on that persisted beyond end of this study *i.e*. day 21 (Hossain *et al.,* 2012). In group B, birds showed itching behavior till day 14 after fipronil treatment initiation followed by disappearance of itching on day 21 post third treatment (Beck, 2000, Gant *et al*., 1998). Degree of recovery from itch was not significantly different between groups A and B but pre and post treatment itching response was significant for both groups.

Activity

All birds in groups A and B were dull and listless prior to treatment. Quality of life and activity level improved by day 7 post drug trials. All birds in groups A and B showed complete recovery and returned to their normal activity level by day 14 after third treatment. Findings of this study proved that topical use of ivermectin as spot on is very safe and effective for the treatment and control of *K. pila* followed by healthy recovery of budgerigars (Hossain *et al*., 2012).

Skin condition

In group A, healing of lesions started by day 7 after first treatment. On day 14, scaly and pruritic lesions had cleared in 80% birds and all birds showed complete recovery from mites and disappearance of the scaly lesions by day 21 (Fig 1 and 2). Earlier, Hossain *et al*. (2012) have also documented that ivermectin formulation is well tolerated by budgerigars with no systemic signs or local reactions. In group B, birds showed healing of skin lesions by day 14 following second treatment. On day 21, there was complete recovery of lesions in 90% birds (Fig 2 and 4). Same findings have also been reported earlier after the effective use of firpronil against the *K. pilae* in parakeets suffering severe pruritic lesions on face and legs (Beck 2000, Gant *et al*., 1998). No mortality was recorded in any group (Abou-Alsoud and Karrouf, 2016, Hossain *et al*., 2012). Statistical analysis revealed no significant difference among both groups but

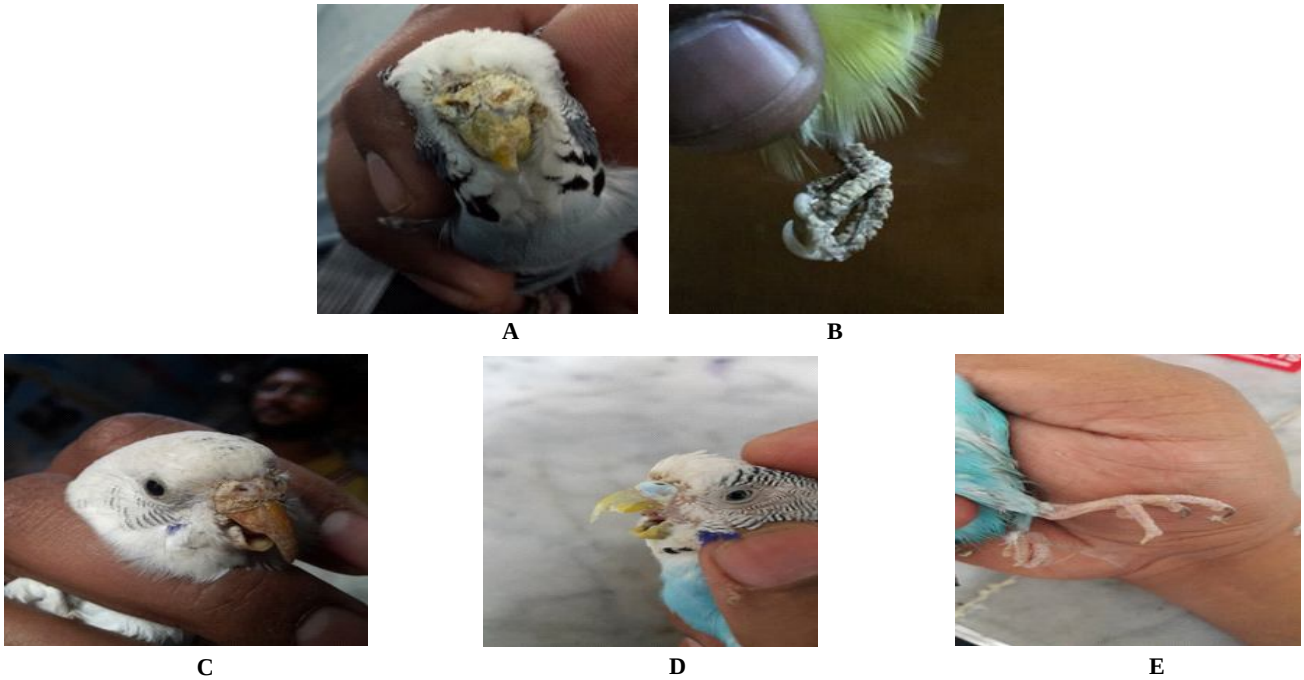

Fig 2: A and B showing the *K. pilae* infected budgerigar before treatment. C showing 1% fipronil treated case on day 21 post treatment. D and E showing 1% ivermectin treated case on day 21 post treatment.

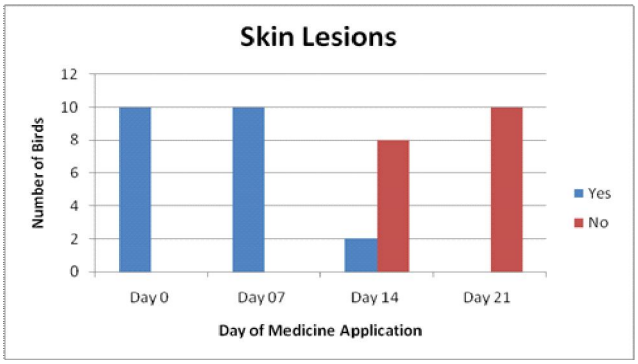

Fig 3: Comparative presentation of *K. pilae* induced skin lesions at various intervals on days 0-21 in 1% ivermectin treated group A.

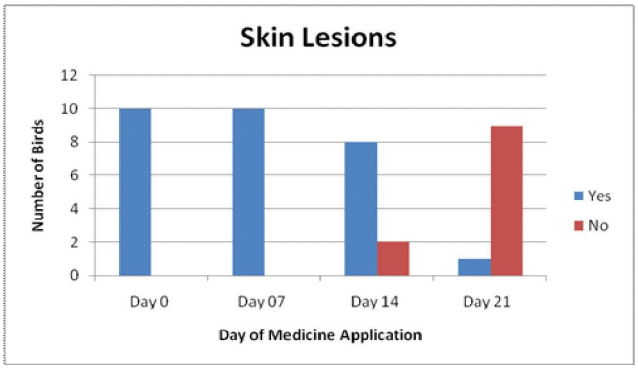

Fig 4: Comparative presentation of *K. pilae* induced skin lesions at various intervals on days 0-21 in 1% fipronil treated group B.

ivermectin was found to be associated with speedy onset healing response after first treatment as compared to the fipronil. All birds in both groups recovered completely till day 21 after first treatment.

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CONFLICT OF INTEREST

This study confers no conflict of interest.

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