RE# MJVR - 0038-2014

EFFICACY OF NEEM LEAF POWDER FOR TREATMENT OF COCCIDIOSIS IN YOUNG GOATS

PREMAALATHA B.[1],PRISCILLA F.X.[2],CHANDRAWATHANI P.[1]*,JAMNAH O.[1], RAMLAN M.[1], AHMAD RASUL R.[3] AND JULAILIYANI K.[3]

1 Veterinary Research Institute, 59 Jalan Sultan Azlan Shah, 31400 Ipoh, Perak .

2 Faculty of Agro Based Industry, University Malaysia Kelantan, Kelantan.

3 Faculty of Veterinary Medicine, Universiti Putra Malaysia, Serdang, Selangor.

* Correspondence address: chandra1959@gmail.com

ABSTRACT. A study was carried out to analyse the efficacy of neem leaf powder, administered in a capsule against coccidiosis in young goats as well as to identify the species of coccidia found in a selected private farm in Sungai Siput, Perak. A total of seven *Eimeria* spp were found, in faecal samples from the experimental goats, namely; *E. arloingi, E. hirci, E. alijevi, E. christenseni, E. jolchijevi, E. ninakohlyakimovae* and *E. caprina* at a rate of 40%, 23%, 14%, 7%, 5% and 2% respectively. Two types of treatment for coccidiosis, herbal and synthetic, were given to 24 young goats for a period of 8 weeks to evaluate the effectiveness of a herbal product, that is the neem leaf powder capsule, a product of the Veterinary Research Institute. Results show that there is no significant differences ($p>0.01$) between neem capsule treatment and a synthetic drug (sulphur based) treatment in treating coccidiosis infection. This study shows that neem leaf powder can be an effective substitute for controlling coccidiosis in goats.

Keywords: *Eimeria* spp., *Azadirachta indica,* sporulation

INTRODUCTION

The Malaysian livestock industry is comprised of two major sectors, a highly commercialised pig and poultry sector and a comparatively lagging ruminant sector. Currently, the ruminant industry is dominated by cattle for meat production which has recorded a steady growth largely due to the participation of government land development agencies in cattle, but has continued to lag in meeting local consumer demand. A total of 80% of the Malaysian goat population is kept on traditional, smallholder farms which are lacking in basic amenities such as piped water and has nutritional deficiencies due to lack of animal husbandry knowledge (Mukherjee *et al*.,1991). For higher productivity, farmers need to have the latest knowledgeable on time and cost saving husbandry methods as well as the ability to treat minor conditions to save

their animals from mortality and morbidity. In the last three decades, there has been a sharp increase in demand for animal-based protein sources in Malaysia (Kaur, 2006). This increase has been attributed to rapid economic and population growth with the resultant effects of urbanisation income growth and changing consumer preferences fuelling a strong demand for animal proteins (Devendra, 2006). This increased demand opens doors of opportunity for entrepreneurs to venture into animal production. Goat meat could be a nutritious alternative to other red meat consumption and its suitability as an additional income source to small farmers should be explored further. Globally, there is an increasing need and demand in goat meat production for agricultural diversification and meeting the requirements for healthier meat by health-conscious consumers.

According to Chandrawathani *et al.* (2013), sustainable feeds and economical control of diseases using fewer drugs would be one of the ways of improving productivity in the livestock industry. This is because prolonged drug usage may lead to residues and a change for the worse in food safety. Moreover a rising concern in livestock industry is the residue and toxicity levels of synthetic anthelmintics and drugs being used. More smallholders are turning to herbal remedies for solutions since these anthelmintics are generally more expensive and are losing their strength against the resistances of parasitic worms (Priscilla *et al*., 2014). A better education among producers is also an important step towards higher food safety on farm level. Besides that, worm control by local farmers using naturally occurring plants with minimal cost as compared to drugs, could increase returns and provide mutton free of drug residues for human consumption. *Azadirachta indica* was found to be one of the herbs used to expel parasitic worms from the gastro-intestinal system in goats (Chandrawathani *et al*., 2013). Preliminary studies conducted by the Veterinary Research Institute in Ipoh showed that feeding neem foliage is safe, eco-friendly, cheap and most importantly palatable to small ruminants.

However, apart from helminthiasis, coccidiosis among young goats is gradually causing a detrimental effect on the local goat industry's productivity. Coccidiosis is an opportunistic disease which is significant in affecting the productivity of goats. It can become an infection of serious economic importance in small ruminants pertaining to clinical diseases like diarrhoea and poor weight gain in particular for subclinical infections. In intensive breeding conditions characterised by high animal density for high productivity, these diseases result in reduced production. The causative agent is a protozoan that has the ability to multiply rapidly and they vary tremendously in virulence.

The objective of this study is to determine the effectiveness of a locally produced neem leaf powder capsule to palliate the coccidiosis problem in young goats and also to identify the species of

coccidia currently occurring in local farm animals used in this study site.

MATERIALS AND METHODS

Study Site, Animals and Management

This study was carried out between February and May 2014, in a private, traditional, smallholder farm at Sungai Siput, Perak. The climate was hot (30-34 ^{o}C) and humid (>80%) during the study, with frequent rain showers. This study comprised of 24 young goats, weighing between 10 to 12 kg, between the ages 4-6 months old based on the dentition. The breeds involved were mixed breed of Katjang, Jamnapari and Boer. The goats were randomly allocated into 3 groups with eight animals in each group, including one control group. The goats were kept in a semi-intensive management system where they were allowed to graze for 5-6 hours in the afternoon by the road side and on nearby uncultivated land. At other times, they were penned in wooden sheds with raised, slatted flooring. Oil palm fronds were provided in the shed and concentrates based on animal live body weight were given daily by the owner, as well as *ad lib* water. Salt blocks were also provided in this farm and basic health management was practiced during the study period. At the start of the study, all the selected animals were ear tagged and FAMACHA (FAMACHA© Information Guide) for each animal was recorded in the first and last week of the study period. No treatment is required for FAMACHA scores of 1 and 2 (dark pink) indicating that the animal is healthy. A score of 3 to 5 (pale pink to off-white colour) shows progressive anaemia. A score of 5 indicates poor condition and requires treatment. The experimental animals were treated with neem leaf powder capsules and triple sulphur-based drugs respectively. The animals were observed weekly for eight weeks during which their health condition was observed and recorded, and rectal faecal samples collected to monitor coccidial oocyst counts.

Parasitology Analysis

The McMaster method to enumerate oocyst per gram (OPG) of faeces, was the diagnostic test conducted to estimate the number of oocysts in each individual goat's faeces (Coles *et al*., 2006). Besides that, strongyle egg count (EPG) was also recorded. Oocysts were identified after sporulation at room temperature (26-33 °C) in 2.5% potassium dichromate solution following the Manual of Veterinary Parasitological Laboratory Techniques (1986). Oocysts were concentrated by centrifugal floatation using saturated sodium chloride solution. Measurements of oocysts were done with compound microscope (Motic Pro BA310 Microscope) under a 40× objective. The species of the oocysts were identified based on morphology of oocysts (shape, presence or absence of micropyle and its colour) and sporulation time (Manual of

Veterinary Parasitological Laboratory Techniques, 1986).

Preparation of neem leaf powder capsules and administration in goats

Fresh neem leaves were dried under the shade for 3 days and were finely ground to a powder form, in a grinder (Panasonic Blender MX337) and encapsulated in gelatine capsules of 0.3 grams of neem leave powder per capsule. It was stored in room temperature till used. In the first four weeks, each of the 8 goats in group 1 were fed orally at a dose rate of 0.1 gm per kg body weight, that is, 4 capsules (1.2 gm) per goat once a day. At the same time, each of the 8 goats in group 2 were given drug therapy (one treatment only) consisting of commercial sulphur-based coccidiostat at a rate of 0.5 mg/kg body weight, kaolin-pectin and electrolytes (5 ml per animal). The control goats of group 3 were not given any treatment but were observed for any signs of serious illness which if found, would be treated accordingly and removed from the experiment based on Animal Ethics Protocol.

RESULTS

A total of seven *Eimeria* species were identified from the faecal samples of the goats. The most prevalent were *E. arloingi* found in 40% of the goats, followed by *E. hirci* (23%), *E. alijevi* (14%) and *E. christenseni*. Other species found were *E. jolchijevi, E. ninakohlyakimovae* and *E. caprina*, present in 7%, 5%, and 2% of the goats respectively. High oocysts counts were mainly due to less pathogenic species such as *E. hirci, E. alijevi, E. jolchijevi, E. ninakohlyakimovae* and *E. caprina* whereas the pathogenic oocysts counts were still low such as *E. arloingi* and *E. christenseni*. Quantitative faecal examination performed weekly by McMaster technique to determine the number of oocysts per gram of faeces (OPG) as per standard procedure showed effectiveness in neem leaf powder capsule treated group. Its mean OPG count dropped by 84% compared to mean OPG count of drug treated gropu which decreased by 61% and mean OPG count of control group which increased by 59%.

Generally, the results show a trend towards a lower oocyst count after treatment with neem capsule and commercial drug. Figure 1 shows neem capsule treated group mean OPG count declined at a steady pace from week one (5462 OPG) up to week four (262 OPG). However from week five onwards its mean OPG count increased (1050 OPG) slightly due to the start of the rainy season beginning at week five. Mean OPG count of the drug-treated group showed a similar pattern. An obvious peak (10125 OPG) in mean oocysts was observed at week six of the study and this coincided with the rainy season which might have lowered the goats' immunity level further. Likewise, the mean strongyle egg count of the neem-treated group was between 2275 EPG and 1375 EPG whereas for the drug-treated group was 1612 EPG

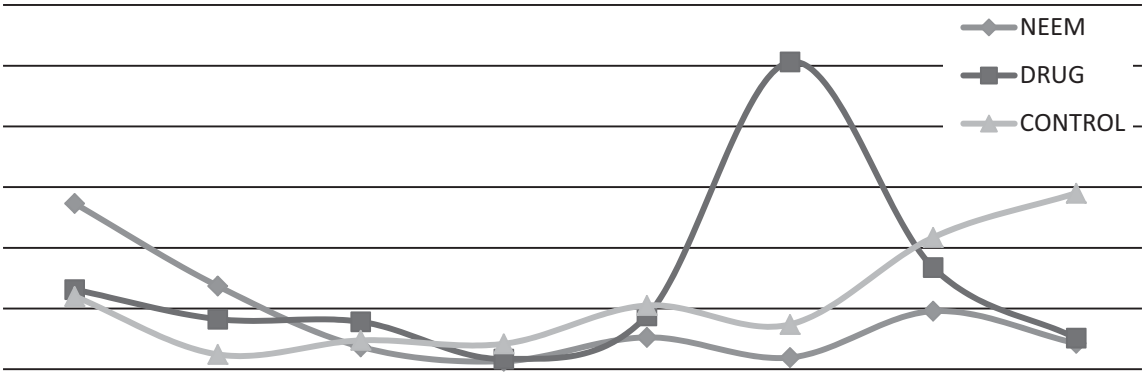

Figure 1. The average OPG count over 8 week period for 3 groups of goats for various treatments

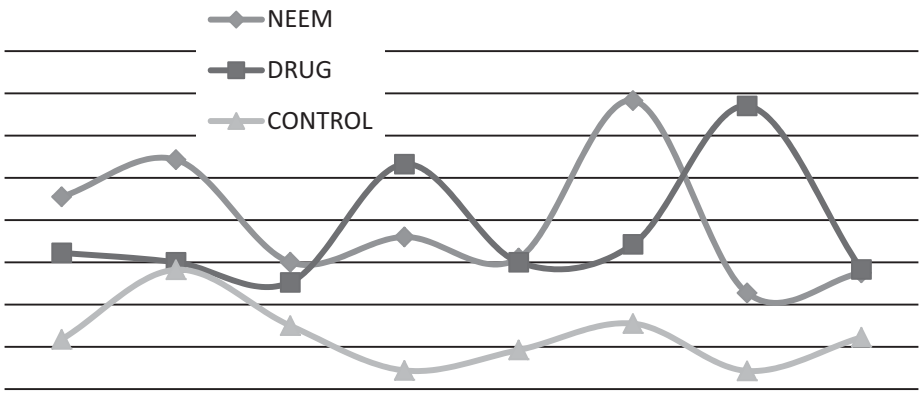

Figure 2. The average EPG count over 8 week period for 3 groups of goats for various treatments

and 1416 EPG. The mean egg count of the control group was between 587 and 612 as shown in Figure 2.

FAMACHA readings recorded at the start and end of the study remains almost constant for all the treatment groups throughout the project. It has been observed that the range of FAMACHA scores for the farm on the first week of the study was 1 to 4, where a few animals were anaemic. However, at week eight there was an improvement in the anaemia status as seen by the FAMACHA score with a range of 1 to 3 in all groups. There was no significant difference between the treated animals and control animals.

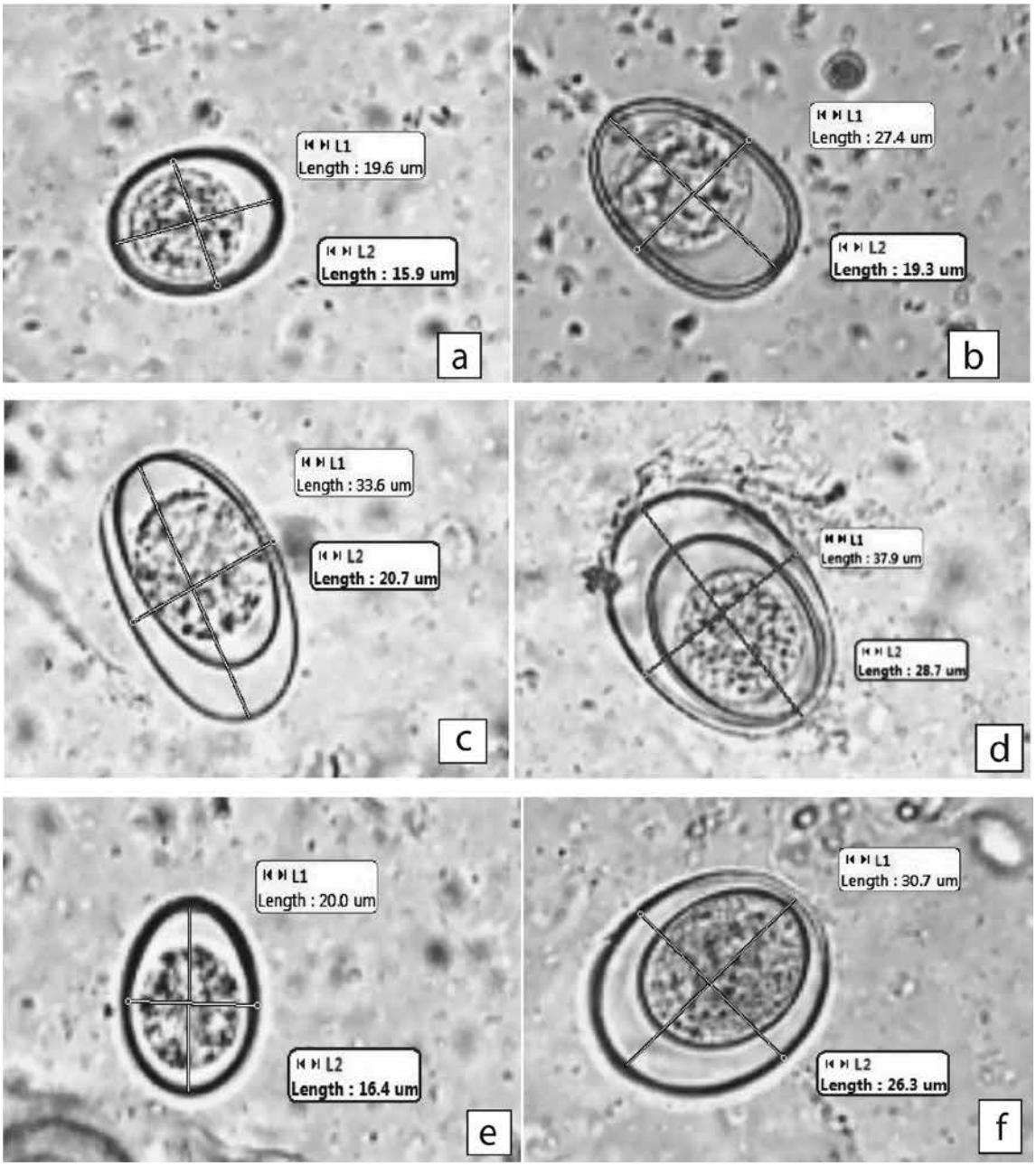

Figure 3.
a) *E. alijevi,* b) *E.arloingi,* c)*E. caprina,* d) *Echristenseni,* e) *E. hirci,* f) *E. jolchijevi*

DISCUSSION

The findings of high prevalence of coccidial infections in young goats in this study is in agreement with observations made by an earlier study conducted in 10 smallholder farms in the state of Selangor (Peninsular Malaysia) where oocysts count were significantly higher in kids than in adults. In this study, seven species of Eimeria (Figure 2a-f) were identified in this traditional smallholder farm. *E. aspheronica* and *E. caprovina* which was described in Malaysia by Fatimah *et al.,* (1989) and Jalila *et al*., (1998) respectively, was not found in this study.

Overall, it can be easily deduced that, both the herbal treatment and commercial drug managed to bring down the mean OPG count by more than 50%. However, the reduction differences between neem capsules and the drug was 23%, proving that neem capsules has a far better efficacy in keeping down coccidial infections in young goats. Furthermore, the neem capsule is a natural product with no drug residues making it safe for food animals. Since the selected young goats have no previous usage of synthetic drugs in them, there was no evidence of drug resistance. Even so, prolonged period of synthetic drug usage will evidently result in resistance (Basripuzi *et al.,* 2012). With the advent of drug resistance, there is a scarcity in the alternative availability of natural herbal remedies to curb coccidial infections and hence loss of opportunity to supply a better quality of local goat meat and improve on productivity. Smallholder farmers may find it hard to purchase anthelmintic drugs due to its high cost and lack of supply in rural areas. Ethnoveterinary medicine mainly on herbal products is a good alternative (Chandrawathani *et al.,* 2013). In addition, the neem product has been found to reduce strongyle egg count and could be used to curb helminthiasis which is also rampant in goat herds.

Clinical signs like diarrhoea was observed. Studies correlating high oocyst counts with diarrhoea are rarely found, and in these samples, it is suggested to be due to the Eimeria species. One of the most common agents that precipitate coccidiosis is heavily contaminated environment. Most of the Malaysian smallholder farmers have a shed for small ruminants which presents opportunities for low level of oocysts contamination through its elevated slatted floor enabling easy clearing faeces on the floor (Jalila *et al*., 1998). Even so, due to poor husbandry practice in smallholders, accumulation of faeces between the floor gaps and irregular removal of faeces from under the shed heightens transmission of coccidia.

Other factors contributing to the intensity of coccidial infection could be related to the number of kids in the herd, the feeding system, intensity of rainfall and poor nutritional status. The livestock industry in Malaysia needs to put more emphasis on improving hygiene in smallholder farms since it has a major impact on the infection level on farms. At the same time, introducing these

herbal anthelmintics like neem capsules to rural farmers to further ameliorate the productivity of local prime goat meat. This is in line with the National Key Economic Area (2014), NKEA, of agriculture sector whereby its focus is on transforming traditional small-scale production-based sector into a large-scale agribusiness industry that contributes to the Malaysian economic growth and sustainability. Economic transformation through NKEA is vital in providing more job opportunities, increasing the gross income of rural farmers and also to safeguard national food security.

REFERENCES

1. Basripuzi H.B., Sani R.A. and Ariff O.M. (2012). Anthelmintic resistance in selected goat farms in Kelantan. *Malaysian Society of Animal Production,* **15:**47-56
2. Chandrawathani P., Zary Shariman Y., Premaalatha B., Norhafiza N.H., Nurulaini R., Nor Andilla I., Rahimah H., and Wahab A.R. (2013). Evaluation of neem leaf (*Azadirachta indica*) product for worm control on goats. *Malaysian Journal of Veterinary Research* Vol. **4(1)**:5-12
3. Coles G. C., Jackson F., Pomroy W. E., Prichard R. K., von Samson-Himmelstjerna G., Silvestre A., Taylor M. A. and Vercruysse J. (2006). The detection of anthelmintic resistance in nematodes of veterinary importance. *Veterinary Parasitology* 136, 167–185
4. Devendra C. (2006). *Enhancing animal protein supplies in Malaysia: Opportunities and challenges.* Kuala Lumpur: Academy of Sciences Malaysia pp. 5-8.
5. *FAMACHA© Information Guide.* Livestock Health and Production Group of South African Veterinary Association. Retrieved from http://www.fao.org/docs/eims/upload/agrotech/1906/FAMACHA%20InfoGuideFEB04v4final.pdf on 14th May 2014.
6. Fatimah I., Borhan A.S. and Whitten L.K. (1989). Gastrointestinal parasitism in goats. In: *Proceedings of the 6th International Conference of Institutes for Tropical Veterinary Medicine, Livestock Production and Diseases in the Tropics*, 28 August–1 September 1989. International Agricultural Centre, Wageningen, The Netherlands, pp. 351–353.
7. Jalila A., Dorny P., Sani R., Salim N.B. and Vercruysse J. (1998). Coccidial infections of goats in Selangor, peninsular Malaysia. *Veterinary Parasitology* **74:**165-172
8. Kaur B. (2010). Consumer preference for goat meat in Malaysia: Market opportunities and potential. *Journal of Agribusiness Marketing* Vol. **3:**40-55
9. *Manual of Veterinary Parasitological Laboratory Technique, reference book 418. 3rd Edition* 1986. Ministry of agriculture, Fisheries and Food, Malaysia.
10. Mukherjee T.K., Sivaraj S. and Panadam J.M. (1991). Goat production in Malaysia. In: Saithanoo, S., Norton,.B.W., Eds., *Goat Production in the Asian Humid Tropics.* Proc. Int. Sem. Hat Yai, Thailand, 28–31 May 1991, Prince of Songkla University, Hat Yai, Thailand, pp. 7–14.
11. *National Key Economy Area (NKEA)* Agriculture. Retrieved from http://etp.pemandu.gov.my/Agriculture-@-Agriculture_aspx on 14th May 2014.
12. Priscilla F.X., Amin M.R. and Rahman S. (2014). Comparative study of neem (*Azadirachta indica*), Bitter gourd (*Momordica charantia*) extract as herbal anthelmintic and Albendazole as chemical anthelmintic in controlling gastrointestinal nematodes in goats. *IOSR Journal of Agriculture and Veterinary Science,*Vol. **7(2):**33-37