

Alternative control for endoparasites infection in goats by feeding fresh matured and immature leaves of *Terminalia catappa*¹

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ABSTRACT: In this study, alternative method for endoparasites control was investigated by fed the goats with fresh matured and immature leaves of native plant named *T. catappa* or locally known as Ketapang. Eighteen mix Katjang goats obtained from local farmers were used. Goats with naturally infected with endoparasites consist of helminth and protozoa were equally divided into three groups which are control group and two treatment groups. Goats in two treatment groups were daily-fed with matured and immature *T. catappa* fresh leaves respectively while goats in control group were only fed with normal pellet and water was provided *ad libitum* to all groups. Faecal samples was collected every two days and subjected to Mc Master faecal egg count for four weeks. Clinical observation on goats was also done during the treatment period to examine any abnormalities on its physiological aspects. The results show that higher percentage of endoparasites' eggs reduction in goats fed with mature leaves at 72% compared to goats fed with immature leaves at 63%. Control goats did not showed significant reduction in terms of the endoparasites' eggs. There were also no any abnormalities on goats during the treatment period. In conclusion, by feeding fresh matured and immature leaves of *T. catappa*, there is a potential of this plant to be an alternative for endoparasites control in goats.

Key words: Endoparasites control, *Terminalia catappa*, faecal egg count

INTRODUCTION

Production of ruminants makes profit since long time ago and goats are one of major animals in livestock industry (Wahab, 2003). However, nowadays, a range of diseases become a main factor that reduces number of goats' production. Endoparasitism infection is an important disease in ruminants worldwide and most developing countries faced this problem (Ademola *et al.*, 2004). This situation became one of the main constraints in livestock production (Ademola *et al.*, 2004). Previous work by Soulsby (1982) reported that from chronic endoparasitism infection, it caused high mortality rates in young ruminants and for the adult's animals, it also considerably suffered. Sani *et al.*, (1985) was described about the important spesies of helminth and protozoa that can infect goats specifically in Malaysia which are *Haemonchus contortus*,

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Trichostrongylus colubriformis, *Moniezia expansa* and *Oeseophagostomum columbianum* for helminth, while *Coccidia sp.* for protozoa. Therefore, as conventional method to control this disease, a range of drugs were used such as closantel, oxfendazole and ivermectin (Wahab, 2003).

Unfortunately, according to Hammond *et al.*, (1997), these manufactured anthelmintics have some serious disadvantages, such as non availability in some developing countries including Malaysia, high cost, and risk of misuse leading to anthelmintic resistance. The resistance developed in many species of endoparasites. Anthelmintic resistance that rises as a phenomenon worldwide had limited the effectiveness of anthelmintic drugs on controlling endoparasites infection in animals. This situation could affect the production of the animals including goats.

Regarding to this situation, traditional knowledge about plants that believe containing anthelmintic properties were explored. It is because, parasitologists worldwide agreed that native plants that traditionally used as natural anthelmintics can offer an alternative which is both sustainable and environmentally acceptable (Hammond *et al.*, 1997). Nowadays, the interest in the study of natural anthelmintic from any potential plants is increasing (Soekerya *et al.*, 2009; Hammond *et al.*, 2007; Waller *et al.*, 2001 and Akhtar *et al.*, 2000). For example, in Malaysia, Cassava (*Manihot esculenta*) leaves and Neem (*Azadirachta indica*) leaves were successfully used for parasites control (Chandrawathani *et al.*, 2002; Chandrawathani *et al.*, 2006; Nurulaini *et al.*, 2007). Throughout the days, more plants or herbs should be explored to give extra choices to the local farmers. Based on the ethnoveterinary knowledge, Ketapang or *Terminalia catappa* also have anthelmintic properties and can be used to expel the endoparasites.

Because of anthelmintic resistance problem and other disadvantages of conventional anthelmintic that based on drugs, more alternative should be given to the farmers. Thus, this study was conducted to apply the ethnoveterinary knowledge so that anthelmintic potential of Ketapang (*Terminalia catappa*) can be scientifically reported. This experimental plant was easily found and native around marine-coastal area and other location. Since there is no any scientifically study about the anthelmintic potential of this plant, thus, this preliminary study was undertaken to scientifically examine the anthelmintic potential for endoparasite control in goats consisting helminth and protozoa, and to determine is there any side effects to the physiological aspect of the goats following daily feeding of this plant.

MATERIALS AND METHODS

Plant used in this study was naturally and natively growth at marine-coastal area of Kuala Terengganu., Terengganu, east coast of Peninsular Malaysia. The matured and immature leaves of *T. catappa* were freshly cutting using standard agronomic practices and bring up to the animal house every morning during the trial period.

Experimental animals used in this study were mix Katjang goats bred. The animals were purchased from local farmers around Kuala Terengganu area. Eighteen male goats, 2-3 months of age, and weighing approximately 13-16 kg were equally divided into three groups. Once the goats were bringing up to the animals house, they were let free for at least a week before the experiment started to make the goats comfortable with the new environment. Goats were fed with normal goat's pellet and water *ad libitum* twice a day; at the morning and afternoon.

Before the experiment was started, faecal samples were freshly collected from all the goats and faecal egg count were done to obtain the mean number of egg per gram (EPG) from all three groups. Then, from day-1 to day-31, goats from group 1 and group 2 were treated with matured and immature leaves of *T. catappa* respectively. While goats in group 3 were untreated. The matured and immature leaves of *T. catappa* that freshly collected were separated from the stalks and fed fresh to the treated group daily. All the leaves were weighed specifically for each animal according to individual body weight with the daily allowance of 3g/kg body weight. During the trial period, normal goat's pellet was given to all animals only after the

treated animals finished eating their daily allocation. Water was provided to all the goats *ad libitum*.

Faecal samples were freshly collected from the goat's rectum once per two days. This faecal sampling was done for each animal in the morning and was continued for four weeks. These samples were subjected to the McMaster faecal egg counting technique, using 3 g individual faecal samples (Christopher *et al.*, 1992). All the faecal egg count values during the experimental period were analyzed using Paired Sample T-Test.

For physiological aspects examination on the goats, clinical observation was done two times daily. Any abnormalities or physiological changes were recorded and analyzed at the end of the study.

RESULTS AND DISCUSSION

The results of Fecal Egg Count Reduction Test (FECRT) that was conducted towards the goats are shown in Table 1.

Table 1. Mean number of endoparasites eggs from the goats

Day	Group 1	Group 2	Group 3
1	1367.67	1367.67	1683.33
3	1333.33	1400.00	1800.00
5	1283.33	1416.67	1816.67
7	1233.33	1266.67	1933.33
9	1200.00	1233.33	1883.33
11	1550.00	1250.00	1950.00
13	1183.33	1150.00	1916.67
15	966.67	933.33	2666.67
17	533.33	516.67	1883.33
19	466.67	533.33	1700.00
21	383.33	400.00	1816.67
23	533.33	550.00	1566.67
25	866.67	666.67	1766.67
27	1000.00	600.00	2000.00
29	666.67	700.00	1200.00
31	382.33	500.00	1500.00

From the Figure 1, percentage of reduction for number of endoparasites eggs can be obtained by compared the pre and post values. The percentage of reduction for the group that treated with the matured leaves is higher from the percentage of the reduction for the group that treated with immature leaves. While for the control group, the percentage of reduction is slightly no different.

Anthelmintic resistance problem has led the scientist in worldwide to explore natural product to be an alternative to the anthelmintic drugs. According to Hoste *et al.* (2008), there is increment of interest for these natural resources since the last 15 years as a novel approach to control endoparasites infection in goats. Based on ethnoveterinary medicine, *T. catappa* was traditionally used for treating endoparasitism infection in goats in South East Asia countries such as Philippine, Thailand and Myanmar. Unfortunately, there is no scientifically study about the effectiveness of this native plant in controlling endoparasitic disease in goats. In this preliminary study, it's reported that the percentage of reduction for the mean number of endoparasite eggs in goats treated with matured leaves of *T. catappa* is 72%. While for the goats treated with

immatured leaves of *T. catappa*, the percentage of reduction for the mean of endoparasite eggs is 63%. For the comparison, the percentage of reduction for the control group is slightly no different between pre and post values, which are only 11% reduction.

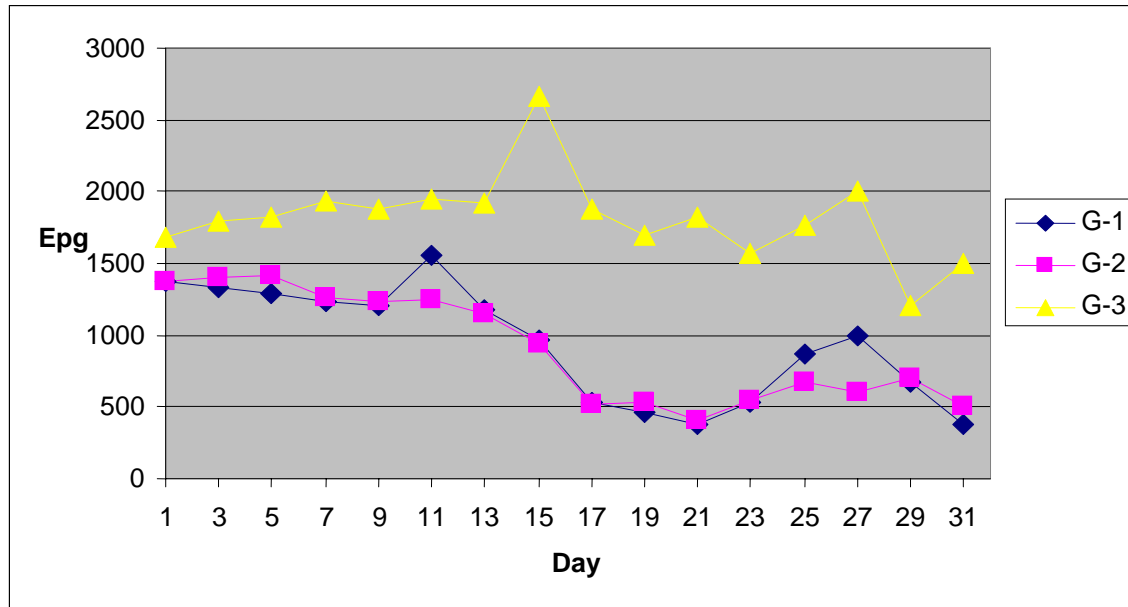


Figure 1. Mean faecal egg count, egg per gram (epg) of the *T. catappa* leaves fed (treated) and the control group.

From previous reports, it found that plant secondary metabolites (PSM) such as tannins, alkaloids, glycosides and terpenes are involved in the anthelmintic properties that responsible to the anthelmintic potential of that various plants. Studies done by Fan *et al.* (2003) and Azrul and Effendy (2008) found the similar result that *T. catappa* contain tannins quantitatively. In this study, both groups treated with matured and immature leaves of *T. catappa* showed reduction of endoparasite eggs more than 60% respectively. As concerned, the reduction values between 60% to 80% can be compared with previous work related to the reduction test. With this range of reduction, it showed highest reductions observed for parasite eggs excretion (Paolini *et al.*, 2003a; Paolini *et al.*, 2003c; Shaik *et al.*, 2004; Shaik *et al.*, 2006; Heckendorn *et al.*, 2006; Heckendorn *et al.*, 2007 and Terril *et al.*, 2007) and also for reduction of female endoparasites fecundity (Paolini *et al.*, 2003c; Heckendorn *et al.*, 2006; Heckendorn *et al.*, 2007; Terril *et al.*, 2007 and Paolini *et al.*, 2003b) when animals consumed plant containing tannins.

For clinical observation on physiological aspects on the goats during this experimental period, there were no any abnormalities or physiological changes following daily feeding of this experimental plant. The goats were succeed to adapt with this plant and showing no rejection to this plant when it given to them in their pen.

According to the results observed in this preliminary study, it maybe concluded that leaves of *T. catappa* or locally known as Ketapang is have anthelmintic efficacy against endoparasites infection in goats. Both matured and immatured leaves have a potential to be the natural anthelmintic for goats. The physiological examination that done daily was supported this finding so that this plant was not given any side effects towards the animal physiological aspects.

CONCLUSIONS

Based on these findings, it can be concluded that this tropical native plant can be used as an alternative approach for controlling endoparasites infection in goats and can be widely promoted to the local farmers as natural anthelmintic. For future research, the anthelmintic activity of this plant should be separately subjected to each species of endoparasites, in particular nematode helminth and protozoan itself. Further research is needed to find a good mechanization to obtain an optimum effect of this plant for controlling endoparasites infection in goats in order to give an alternative to the farmers and improve the number of goats' production.

LITERATURE CITED

- Ademola, I. O., Fagbemi, B. O. And Idowu, S. O. (2004). Evaluation of the Anthelmintic Activity of *Khaya senegalensis* Extract Against Gastrointestinal Nematodes of Sheep: In Vitro and In Vivo Studies. *Veterinary Parasitology* 122: pp. 151-164.
- Akhtar, M. S., Iqbal, Z., Khan, M. N. And Lateef, M. (2000). Anthelmintic Activity of Medicinal Plants With Particular References to Their Use in Animals in the Indo Pakistan Subcontinent. *Small Ruminant Research* 38, 99-107.
- Azrul, L. M. and Effendy, A. W. M. (2008). Evaluation of Total Phenolics and Total Tannins in Ketapang (*T. catappa*) Leaves for Worm Control in Goats. In: Proceeding of the 20th Veterinary Association of Malaysia Annual General Meeting and Congress, Bangi, Malaysia, 15-17 August 2008
- Chandrawathani, P., Brelin, D., Nor Fasihah, S., Adnan, M., Jamnah, O., Sani, R.A., Høglund, J. and Waller, P. J. (2002). Evaluation of the Neem Tree (*Azadirachta indica*) as a Herbal Anthelmintic for Nematode Parasite Control in Small Ruminants in Malaysia. *Tropical Biomedicine* 19(1&2): 41-48.
- Chandrawathani, P., Chang, K. W., Nurulaini, R., Waller, P. J., Adnan, M., Zaini, C. M., Jamnah, O., Khadijah, S. and Vincent, N. (2006). Daily Feeding of Fresh Neem Leaves (*Azadirachta indica*) for Worm Control in Sheep. *Tropical Biomedicine* 23(1): 23-30.
- Christopher, R., Chandrawathani, P. and Cheah, T.S. (1992). *Manual on Parasitology* (Editor, P. Loganathan) pp. 12-14. Department of Veterinary Services, Malaysia.
- Fan, Y. M., Xu, L. Z., Gao, J., Wang, Y., Tang, X. H., Zhao, X. N., and Zhang, Z. X. (2003). Phytochemical and Antiinflammatory Studies on *Terminalia catappa*. *Fitoterapia* 75 (2004) 253-260.
- Hammond, J. A., Fielding, D., and Bishop, S. C. (1997). Prospects for Plant Anthelmintics in Tropical Veterinary Medicine. Review Article, *Veterinary Research Communications*, 21, 213-228.
- Heckendorn, F., Haring, D. A., Maurer, V., Zinsstag, J., Langhans, W. And Herzberg, H. (2006). Effects of Sainfoin (*Onobrychis viciifolia*) Silage and Hay on Established Populations of *Haemonchus contortus* and *Cooperia curticei* in Lambs. *Veterinary Parasitology* 142: 293-300.
- Heckendorn, F., Haring, D. A., Maurer, V. And Hertzberg, H. (2007). Individual Administration of Three Tanniferous Forage Plants to Lambs Artificially with *Haemonchus contortus* and *Cooperia curticei*. *Veterinary Parasitology* 146: 123-124.
- Hoste, H., Torres-Acosta, J. F., Alonso-Diaz, M. A., Brunet, S., Sandoval-Castro, C. and Houzangbe-Adote, S. (2008). Identification and Validation of Bioactive Plants for the Control of Gastrointestinal Nematodes in Small Ruminants. In: Proceedings of the 5th International Workshop: Novel Approaches to the Control of Helminth Parasites of Livestock 2008, Ipoh, Malaysia. pp. 56-72.
- Nurulaini, R., Khadijah, S., Adnan, M., Zaini, C. M., Jamnah, O., Waller, P. J. and Chandrawathani, P. (2007). Potential Use of Cassava (*Manihot esculenta*) Leaves for Worm Control for Small Ruminants in the Tropics. In: Proceedings of the 21st International Conference of the World Association for the Advancement of Veterinary Parasitology. Belgium.
- Paolini, V., Dorchies, P. and Hoste, H. (2003a). Effects of Sainfoin Hay on Gastrointestinal Nematode Infection in Goats. *Veterinary Record* 152: 600-601.
- Paolini, V., Frayssines, A., De La Farge, F., Dorchies, Ph. and Hoste, H. (2003b). Effects of Condensed Tannins on Established Populations and on Incoming Larvae of *Trichostrongylus colubriformis* and *Teladorsagia circumcincta* in Goats. *Veterinary Parasitology* 34: 331-339.
- Paolini, V., Bergeaud, J. P., Durantón-Grisez, C., Prevot, F., Dorchies, P. and Hoste, H. (2003c). Effects of

- Condensed Tannins on Goats Experimentally Infected with *Haemonchus contortus*. *Veterinary Parasitology* 113: 253-261.
- Sani, R., Awang, I. P. R., and Sheikh-Omar, A. R. (1985). Incidence and Factors Affecting Endoparasitism in Goats in Serdang, West Malaysia. *Kajian Veterinar*, 17: 127-131.
- Shaik, S. A., Terril, T. H., Miller, J. E., Kouakou, B., Kannan, G., Kallu, R. K. and Mosjidis, J. A. (2004). Effects of Feeding *Sericea lespedeza* Hay to Goats Infected with *Haemonchus contortus*. *South African Journal of Animal Science* 34 (Suppl 1): 248-250
- Shaik, S. A., Terril, T. H., Miller, J. E., Kouakou, B., Kannan, G., Kaplan, R. M., Burke, J. M. And Mosjidis, J. A. (2006). *Sericea lespedeza* Hay as a Natural Deworming Agent Against Gastrointestinal Nematode Infections in Goats. *Veterinary Parasitology* 139: 150-157.
- Soekerya, S., Waller, P. J., Try, P. and Høglund, J. (2009). The Effect of Long-term Feeding of Fresh and Ensiled Cassava (*Manihot esculenta*) foliage on Gastrointestinal Nematode Infections in Goats. *Trop. Anim. Health Prod.* (2009) 41: 251-258.
- Soulsby, S. and Mathus, R. S. (1982). Helminths, Arthropod and Protozoa of Domestic Animals. The English Language Book Society and Bailliere Tindall, London, pp. 238-245.
- Terril, T. H., Mosjidis, J. A., Moore, D. A., Shaik, S. A., Miller, J. E., Burke, J. M., Muir, J. P. and Wolfe, R. (2007). Effects of Pelleting on Efficacy of *Sericea lespedeza* Hay as a Natural Dewormer in Goats. *Veterinary Parasitology* 146: 117-122.
- Wahab A. R. (2003). *Cacing Dalam Kambing; Masalah dan Penyelesaian*. Siri Syarahan Umum Pelantikan Profesor Univesiti Sains Malaysia
- Waller, P., Bernes, G., Thamsborg, S. M., Sukura, A., Richter, S. H., Ingebrigsten, K. And Høglund, J. (2001). Plants as Deworming Agents of Livestock in the Nordic Countries: Historical Perspective, Popular Beliefs and Prospects for the Future, *Acta Veterinaria Scandinavica* 42, 31-44.