

## EVALUATION OF NEEM LEAF (*Azadirachta indica*) PRODUCT FOR WORM CONTROL ON GOATS

CHANDRAWATHANI P.<sup>1\*</sup>, ZARY SHARIMAN Y.<sup>2</sup>, PREMAALATHA B.<sup>1</sup>, RAHIMAH H.<sup>2</sup>, NORHAFIZA N.H.<sup>2</sup>, NURULAINI R.<sup>1</sup>, NOR ANDILLA I.<sup>3</sup> AND AND WAHAB A.R.<sup>2</sup>

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

2 School of Biological Sciences, Universiti Sains Malaysia (USM), Minden, Penang.

3 Ladang Infoternak Sungai Siput , Perak Darul Rizduan, Malaysia.

\* Corresponding author: chandra1959@gmail.com

**ABSTRACT.** This study was conducted with the aim of investigating the effectiveness of Neem leaf extracts, *Azadirachta indica*, an indigenous medicinal plant, against helminths of goats. Two extracts were prepared with distilled water using two different techniques; that is, the Neem leaves Water Extract (NLWE) and decoction of Neem leaves (NLD). This study was carried out using 20 goats from a government farm in Perak. The two extracts showed variable degrees of efficacy in naturally infected goats, as measured by faecal egg count. Further evaluation is required to establish the efficacy.

### INTRODUCTION

Poverty and starvation is still a global concern even with massive advances in science and technology. Eight million people suffer from the lack of nutrition every year and about 24,000 deaths are reported daily. With the drastic increase in the cost of living being the major contributing factor of starvation, malnourishment and poverty, the Green Revolution is said to

be the answer for sustainable agriculture. The Green Revolution involves the use of sustainable and economically viable solutions for agriculture. For the livestock industry, sustainable feeds and economical control of diseases using less drugs would be one of the ways of improving productivity which will in turn provide food for humans. With this, there is an added interest in worm control for small ruminants using herbal remedies especially for smallholder farms.

Livestock industries, mainly goat and sheep, contribute most to the the gross national income in developing countries as. Unfortunately, the presence of various types of parasites especially endoparasites have become a major threat to these industries. Infection by parasitic worms have decreased the economical value in terms of milk and meat production of livestock industries causing millions of dollars of detriment each year. The common factor in husbandry system practised in the developing countries including Malaysia that exposes the livestock animals to worm parasites is dependence on grazing for feed. In this case, the animals are exposed

constantly to larval pick-up when grazing during wetter periods of the year.

Most parasites, such as gastrointestinal worm parasites have adapted to many strategies in their host and have the ability to evade or modulate the immune response of the host for their survival. The host-parasite relationships can best be described as the parasites continue to adapt using many strategies in the hosts and the hosts themselves continue to refine their immunological defences to combat the parasites. To control this worm infection in livestock establishments, the anthelmintic drugs such as salicylanilides and nitrophenols were applied in husbandry systems regularly (Coles *et al.*, 2006).

Goat farming in Malaysia has been plagued by helminthosis over the past few decades due to the development of anthelmintic resistance. Most anthelmintics are deemed ineffective due to frequent usage. Therefore, with the introduction of natural products which can be used as a parasiticide, the helminth problem can be controlled, thereby reducing morbidity and mortality. Local farmers can utilise these naturally occurring plants with minimal cost thereby giving better returns. Furthermore, natural herbs do not have residual effects of drugs which can further cause health problems in humans.

Helminths are recognised as a major constraint to livestock production throughout the tropics and elsewhere (Waller, 1987). Parasitic diseases are considered important in causing enormous economic losses through morbidity and

mortality in livestock. Among the parasitic diseases, gastro-intestinal (GI) nematodes are the most common parasite. The gastro-intestinal helminths are ranked in the top 10 most important diseases in goats and sheep in South-East Asia (Perry *et al.*, 2002). The gastro-intestinal nematodes associated with anaemia and gastroenteritis resulting in loss of body weight, stunted growth, diarrhoea, and reduced immunity, that greatly hampers the normal growth and production of the goats (Soulsby, 1982).

Chemical drugs have been used for decades to control these GI nematodes. The continuous usage of these drugs has contributed towards the anthelmintic resistance. Several research studies have been conducted to overcome this problem including the use of herbs and plants. Plants are known to provide drug residue free mutton for human consumption as compared to drugs for worm control. *Azadirachta indica* is found to be one the herbs used to expel parasitic worms from the gastro-intestinal system in the goats. The herbal preparations can be safely used to prevent or reduce the severity of disease (Murugaiyah, 2006). Thus, this preliminary study was designed to observe the effectiveness of this plant in two different forms, that is, Neem Leaf Water Extract (NLWE) and Neem Leaf Decoction (NLD).

## MATERIALS AND METHOD

The present study was conducted from July to August 2012 at a government

farm located in Sungai Siput, Perak. The faecal egg count (FEC) was the diagnostic test conducted in the Parasitology Unit of Veterinary Research Institute (VRI) to estimate the number of helminth eggs in a gram of goat faeces (Coles *et al.*, 1992)

## Animals

This study was carried out using 20 adult female Boer goats in the farm. All goats were monitored once a week for helminths faecal egg counts for 6 consecutive weeks. The goats were randomly allocated into 3 groups, ensuring that pre-treatment faecal egg counts were similar. The Control group had 10 goats, while the treated groups had 5 goats each.

The mean weight of the goats was 47.7 kg at the start of the study.

## Plant Extract

### *Preparation of Neem Leaves Water Extract (NLWE)*

In this study Neem leaves were selected as the plant material based on their biological activities, and multidirectional therapeutic uses (Brahmachari, 2004; Biswas *et al.*, 2002 & Asha *et al.*, 2008). The neem trees are commonly available and leaves were collected from the trees on the grounds of Universiti Sains Malaysia, Penang, Malaysia. The selected parts (leaves) were freshly harvested, washed and carefully cleaned by using running tap water and

then left to air-dry under the shade for two days

The dried leaves were ground to a powder by using an electrical grinding mill (Panasonic MX-335), and the resulting powder was stored in air-tight containers at room temperature until used. The botanical species identification of the Neem tree was made by the Herbarium Department, School of Biological Sciences, Universiti Sains Malaysia, Penang, Malaysia.

A total of 60.0 g of powdered Neem leaf material was mixed with 300 ml of sterile distilled water in 1500 ml conical flask and heated in a water bath (Stuart, waterbath-RE300B) at 70°C for 6 hours, the resulting extract was filtered through filter paper (Whatman No. 1, USA) and concentrated later by using a rotary vacuum evaporator (Heidolph Rotary Evaporator) at 40°C. The concentrated extract was left to dry in the oven at 40°C for 48 hours. The resulting sediment was stored at 4°C until used.

A total of 17.7 g of Neem paste extract was diluted with 1000 ml distilled water producing a water extract whereby 200 ml of water extract is equivalent to 3540 mg of Neem extract and was given to each goat with an average body weight of 50 kg. Therefore, the dose rate is 70.8 mg of Neem extract/kg body weight. The extract was given orally to each goat using a syringe.

### ***Preparation of Neem Leaves Decoction (NLD)***

Fresh mature neem leaves were collected from the tree in the grounds of the VRI. A total of 17.7 g of leaves was weighed, torn into half and the pieces were soaked in 1000 ml of distilled water for 41 hours. Then, the decoction was filtered and kept in a clean bottle for use at room temperature.

A total of 17.7 g of fresh Neem leaves were soaked into 1000 ml distilled water and 200 ml of the decoction equivalent to 3540 mg of Neem extract was given to each goat with an average weight of 50 kg. Therefore, the dose rate is 70.8 mg/kg of Neem decoction per kilogram body weight. The extract was given orally to each goat using a syringe.

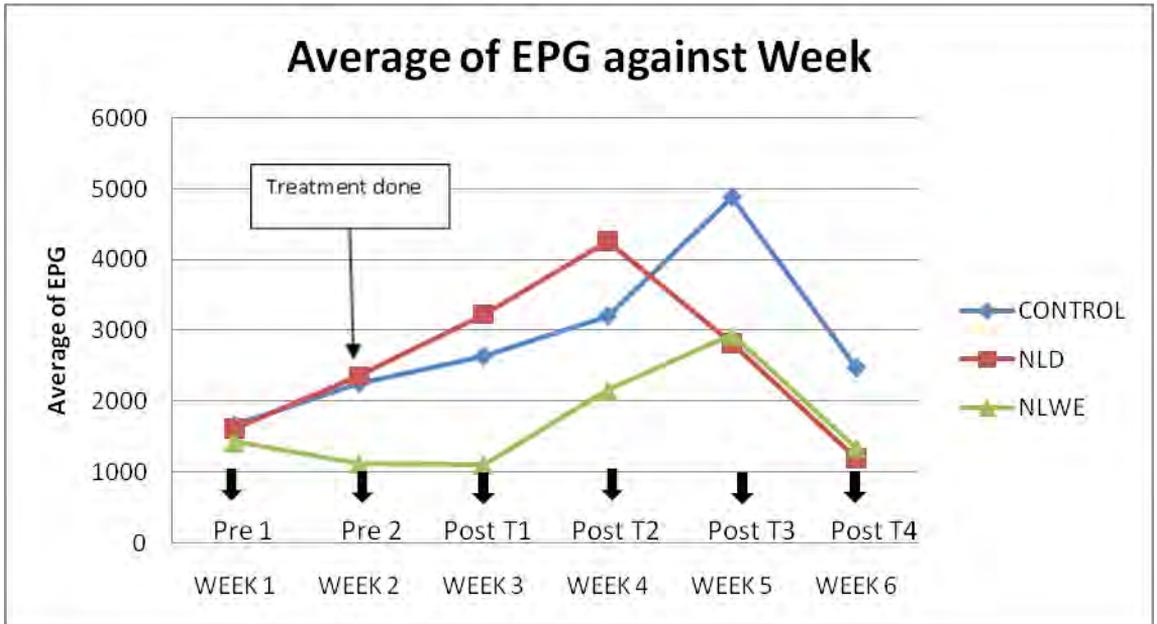
### **Management of animals**

A total of 20 apparently healthy female animals between the ages of 1-2 years were chosen randomly from a flock of 400 animals. They were tagged, weighed and identified for the experiment to standardise the 3 groups according to weight and fecal egg count. The animals grazed 5 hours per day on improved pastures with no rotational grazing. Cut grass and molasses is also provided with *ad lib* water in the pens. The stocking rate on pastures is 80 goats/1.2 hectare.

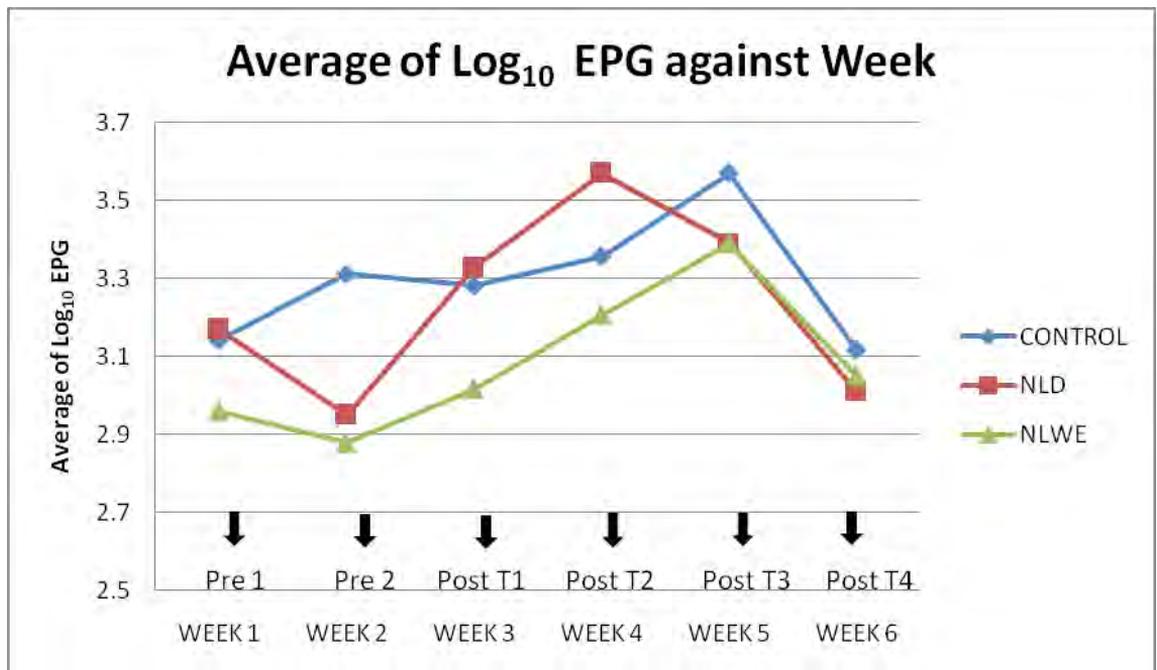
### ***Specimen collection and laboratory techniques***

Blood samples (EDTA) were collected from week 1 and week 6 for Packed Cell Volume (PCV). Fecal samples were collected for FEC weekly whereby McMaster technique was done. In addition, FAMACHA technique was used to estimate any anaemia cases in the experimental goats. This technique examined the colour inside the lower eyelid and ranked the results from 1 to 5 according to the redness observed. FAMACHA was done twice in week 1 and week 6.

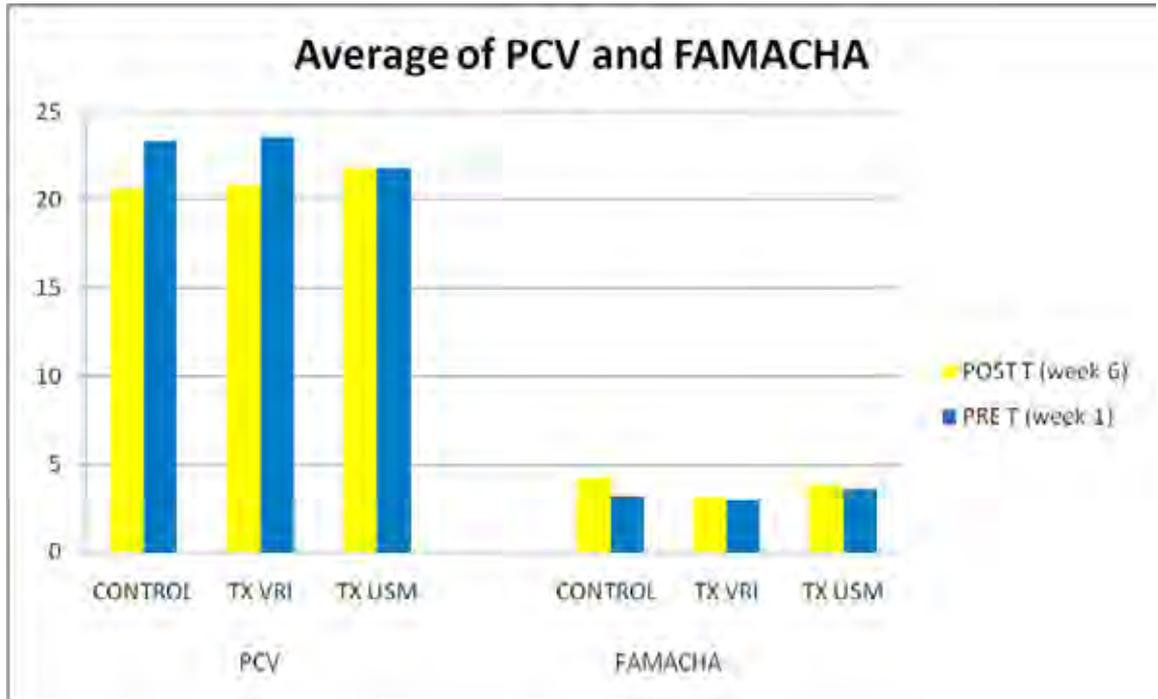
The McMaster method modified from the Manual of Veterinary parasitological laboratory Techniques, (1986) was used to detect helminthiasis in small ruminants. Animals with faecal egg counts of 800 to 1000 epg and above are considered to be significantly infested with helminthiasis where treatment is necessary. During the course of study, rectal fecal samples were collected every week from each goat. Three grams of faeces were used in a Modified McMaster technique to estimate the faecal egg count (epg), with a sensitivity of egg counted representing 50 eggs per g of faeces. Faecal cultures were used for larval differentiation. Blood (EDTA) was collected from each goat and used for Packed Cell Volume (PCV) using microhaematocrit method.



**Figure 1:** The average Faecal egg count over a 6 week period for 3 groups of animals



**Figure 2:** The average Log values of Faecal egg count over a 6 week period for 3 groups of animals



**Figure 3:** The Average PCV(%) and FAMACHA values pre and post treatment in 3 groups of animals

***Faecal culture***

Faecal culture was done on faecal samples collected each week according to method suggested by Manual of Veterinary parasitological laboratory Techniques, (1986). The larvae obtained were later determined by morphological observations under microscope (40× magnification) using keys suggested by Manual of Veterinary parasitological laboratory Techniques, (1986 ).

**RESULTS**

Faecal Egg Counts were recorded from week 1 until week 6. The results in Figure

1 show the faecal egg count for each group. For the control group, the average FEC increased from week 1 until week 5 and decreased on week 6. Whereas, the treatment group NLD increased on week 1 until week 4 and suddenly dropped in week 6. Treatment group for NLWE shows the FEC decreased from week 1 to week 3, and then increased to week 5 and decreased back in week 6. Figure 1 shows the average of EPG against week in the 3 groups. Figure 3, shows that the PCV of all animals throughout the study was between 20-25% indicating anaemia as all animals were heavily infested with helminths. The post treatment PCV was lower as the blood sucking parasites were causing the

anaemia with the constant challenge from the infected pastures. Correspondingly the FAMACHA also showed anaemia, more severely in the post treatment values. The most dominant parasite species observed was *Haemonchus contortus*.

From the observation in this study, it is shown that Neem leaves water extract have the potential to reduce the faecal egg count of gastrointestinal nematodes of goats as seen in some weeks but the effect is not consistent. The efficacy of NLWE extract is functional for only 2 weeks after the given treatment. During the following weeks, there was however an increase in faecal egg count. While for NLD treatment there is no significant effect on the parasites between the treated and control groups.

## DISCUSSION

The herbal preparations have the potential to reduce work burden or prevent disease conditions from getting worst or even death of the animals (Murugaiyah *et al.*, 2006). Plant anthelmintics have been in the forefront of this growing awareness (Hammond *et al.*, 1997). A reason for this could be that they fall into the category of readily applicable elements of ethnoveterinary medicine in livestock development (McCorkle and Mathias-Mundy, 1992). Today, farmers may not be able to buy anthelmintic drugs due to the high costs especially in developing countries involving rural and non-commercial farmers. So, ethnoveterinary medicine mainly on herbal products for the treatment

of their livestock and other animals would be a good option. Indigenous systems of medicine reports a numbers of plants for their anthelmintic efficacy. A number of researchers (Neogi *et al.*, 1964; Sharma *et al.*, 1971; Kalesaraj, 1974 and Lal *et al.*, 1976) also worked on the anthelmintic activity of medicinal plants (Sujon *et al.*, 2008) indicating their usefulness in combating anthelmintic resistance.

As the study was conducted under routine management conditions, the results may be affected by feeding systems such as free pasture grazing on contaminated pastures as the animals are constantly challenged with infective larvae. As with all herbal remedies, the dose and animal condition is vital in the success of the use of these products. From week 1 until 4, they were 'grazing' while during the following weeks, the 'cut and carry' method was used for feeding animals. In the grazing system, animals are continuously challenged with infective larvae from pasture thereby faecal egg counts may increase. However, when they are fed cut and carry fodder, the feed may be uncontaminated and there is no more parasitic challenge, hence the faecal egg count stabilises or decreases.

From the results, we can conclude that the dosage given was insufficient as faecal egg counts were generally increasing. Further work needs to be conducted to optimise the dose rate for animals especially under different management conditions and to estimate the amount of tannin, which may influence the efficacy of the leaf product. Tannin is

believed to be helping in expelling the gastrointestinal parasitic nematodes in goats. As the faecal culture result showed that *Haemonchus contortus* is the main parasite species infecting these animals, disease management steps must be taken in order to control this parasitic worm infection in goats.

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