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Anthelmintic evaluation of *Carica papaya* against gastrointestinal helminths of goats

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Abstract

The study was aimed to investigate the anthelmintic efficacy of aqueous seed extract of *Carica papaya* against gastrointestinal helminths of goats. The animals positive for helminth infestation were selected and given aqueous seed extract of *Carica papaya* while, normal healthy control group was kept without any treatment. Haemo-biochemical parameters were assessed. Aqueous seed extract of *Carica papaya* demonstrated significant decrease in average EPG count of helminth infested goats. The progressive per cent decrease in EPG was observed as 41.26%, 73.80% and 90.47% on 3rd day, 7th day and on 21st day post-treatment respectively. Haematological parameters showed appreciable increase however, biochemical parameters were unaffected indicating extract having better efficacy on blood profile. Based on the results obtained in this study it was found that, the aqueous extract of *Carica papaya* possesses better anthelmintic activity and could offer an alternative source for control of gastrointestinal helminths of goats.

Keywords: Anthelmintic, *Carica papaya*, seed extract

Introduction

The gastrointestinal helminths cause great economic loss in terms of decreased growth rate, productivity and mortality in small ruminants. Goats are more susceptible to various gastrointestinal helminth infections due to its grazing habits (Das *et al.*, 2016) [1]. Among ancient civilisations, India has been known to be rich repository of medicinal plants. The forest in India is the principal repository of large number of medicinal and aromatic plants, which are largely collected as raw materials for manufacture of drugs and perfumery products (Joy *et al.*, 1998) [2]. The virtual reliance on anthelmintic drugs alone to control internal parasites of livestock is inappropriate and ultimately unsustainable. In the tropics and subtropics, widespread and high levels of anthelmintic resistance, particularly in nematode parasites of small ruminants, is rife. But more to the point, many farmers in these regions of the world are resource poor and cannot afford or are reluctant to purchase drugs that may also be of dubious quality (Krecek and Waller, 2006) [3].

Papaya (*Carica papaya* L.) is a popular and important fruit tree in tropical and subtropical parts of the world. The dried papaya seeds given as elixir with honey have shown significant effect on the human intestinal parasites, without significant side effects. Benzylisothiocyanate, present in seeds is the chief anthelmintic (Vij and Prashar, 2015) [4]. The biochemical mechanism of action of Benzylisothiocyanate, an active component obtained from *Carica papaya*, has been suggested as due to inhibition of glucose uptake and depletion of glycogen content (Kumar *et al.*, 2014) [5]. In the present study, the anthelmintic activity of aqueous seed extract of *Carica papaya* was evaluated against mixed gastrointestinal helminths of goats.

Materials and Methods**Collection of plant materials and extraction**

The seeds of *Carica papaya* (Papaya seed) were collected from fruits of papaya and also obtained from the local market. The collected seeds were cleaned and shade dried for 2 weeks. The dried seeds were pulverized into fine powder using a domestic mixer grinder in laboratory. For preparation of aqueous seed extract, 40 gms powdered seeds of *Carica papaya* were boiled in 500 mL of distilled water for 30 minutes after which it was filtered using a piece of muslin cloth. The filtrate was evaporated to complete dryness at 40°C, producing a fine solid residue. This solid residue was weighed after extraction and was kept in air and water-proof container and stored in a refrigerator at 4°C. The aqueous seed extract was prepared as described by Adeneye *et al.* (2009) [6].

In vivo assay**In vivo tests**

The experimental doses of plant extracts used in this study were calculated from the dosages which have been claimed to be effective in earlier studies (Ameen *et al.*, 2010, Effendy *et al.*, 2014, Ameen *et al.*, 2018)^[7, 8, 9]. Total 10 goats of 6-12 months age which showed eggs per gram of faeces (EPG) from 800 to 1200 before treatment were selected and given aqueous seed extract of *Carica papaya* (Papaya) @ 100 mg/kg body weight given orally once daily for 3 days while, ten apparently normal healthy goats free from helminth infestation, without any treatment were kept as normal control.

The efficacy of anthelmintic plant extract was judged based on faecal sample examination with EPG done before treatment ('0' day) and on 3rd, 7th and 21st day post-treatment. The body weights were recorded on '0' day pre-treatment and on 21st day post-treatment.

Estimation of haematological and biochemical parameters

Blood samples from goats under study, were collected on '0' day pre-treatment and on 21st day post-treatment from the jugular vein of each animal using 5 ml syringes and 24 gauge needles into appropriately labelled EDTA vials. Haematological parameters were determined as described by Sastry (1989) and Chakrabarti (1994)^[10, 11].

Statistical analysis

Data was collected and analyzed statistically by application of two way Factorial Completely Randomized Design and

Completely Randomized Design (Snedecor and Cochran, 1994)^[12].

Results and Discussion

The results of *In vivo* assays are shown in the Table 1. The mean EPG on '0' day was 1260 which after treatment with aqueous seed extract of *Carica papaya* at the dose rate of 100 mg/kg had significantly reduced to 120 on 21st day post-treatment. The progressive per cent decrease in EPG was observed as 41.26%, 73.80% and 90.47% on 3rd day, 7th day and on 21st day post-treatment respectively. Ameen *et al.* (2010)^[7] also found similar results for *Carica papaya* aqueous seed extract and attributed to the presence of papain in seeds of *Carica papaya*. Ameen *et al.* (2018)^[9] studied the anthelmintic efficacy of *Carica papaya* seeds against gastrointestinal helminths in goats and recorded significant reduction in EPG count after administering aqueous seed extract attributing to biologically active compound mainly papain and benzylisothiocyanate.

It was observed that, aqueous seed extract of *Carica papaya* (Papaya) @ 100 mg/kg body weight given orally once daily for 3 days had improved body weight efficiently in treated goats. The increase in the body weight of goats treated with the plant extracts might be due to removal of parasitic load which facilitates weight gain through proper digestion, absorption and metabolism of feed nutrients. Similar findings were experienced by Amin *et al.* (2010)^[13] who recorded a significant increase in body weight of cattle treated with Neem.

Table 1: Effect of *Carica papaya* aqueous seed extract on average EPG (Mean \pm SE) and per cent faecal egg count reduction in goats infested with gastrointestinal helminths

Interval/Parameter	0 day	3 rd day	7 th day	21 st day
Average EPG	1260.00 ^a \pm 103.49	740.00 ^c \pm 84.59	330.00 ^d \pm 86.98	120.00 ^d \pm 53.33
Per cent decrease in EPG	0	41.26%	73.80%	90.47%

Similar superscripts shows non-significant difference

Effect of plant extracts on haematological and biochemical values of goats

Blood profile viz. Haemoglobin, Packed Cell Volume and Total Erythrocyte Count of animals treated with aqueous seed extract of *Carica papaya* @ 100 mg/kg body weight given orally once daily for 3 days had increased following treatment and the maximum was noticed on 21st day post-treatment. The results of haematological parameters are shown in Table 2.

In haematological parameters, haemoglobin mean value before treatment was 7.61 \pm 0.21 which showed significant increase on 21st day post-treatment as 9.45 \pm 0.43. The Packed Cell Volume mean value before treatment was 27.00 \pm 0.66 which raised significantly to 35.30 \pm 1.19 on 21st day post-treatment. The Total Erythrocyte Count mean value before treatment was 5.79 \pm 0.60 and showed significant

increase to 15.96 \pm 0.99 on 21st day post-treatment. The Total Leucocyte Count mean value before treatment was 15.35 \pm 0.86 which showed significant reduction to 11.13 \pm 0.54. The eosinophils and monocytes showed significant reduction. These haematological changes were comparable to normal healthy control. No significant change in the values of neutrophils was observed. Similar findings were recorded by Ameen *et al.* (2010)^[7], Ameen *et al.* (2012)^[14] and Effendy *et al.* (2014)^[8] for efficacy of aqueous seed extract of *Carica papaya*. Ameen *et al.* (2018)^[9] observed similar results and attributed it to active compounds in *Carica papaya* seeds which stimulate haemopoietic system. The significant increase in TEC values could be due to haemopoietic system stimulation by minerals and vitamins contained in *Carica papaya* seeds (Nwofia *et al.*, 2012)^[15].

Table 2: Effect of *Carica papaya* aqueous seed extract on average values (Mean \pm SE) of haematological parameters in goats infested with gastrointestinal helminths

Blood Parameters	Groups	Pre-treatment	Post-treatment
Haemoglobin (g/dl)	<i>Carica papaya</i> Healthy Control	7.61 ^c \pm 0.21 8.14 ^b \pm 0.10	9.45 ^a \pm 0.43 8.21 ^b \pm 0.11
PCV (%)	<i>Carica papaya</i> Healthy Control	27.00 ^a \pm 0.66 28.80 ^a \pm 1.12	35.30 ^c \pm 1.19 28.20 ^a \pm 1.21
TEC (million/ cumm)	<i>Carica papaya</i> Healthy Control	5.79 ^d \pm 0.60 6.36 ^c \pm 0.70	15.96 ^a \pm 0.99 6.58 ^c \pm 0.55
TLC (thousand/ cumm)	<i>Carica papaya</i> Healthy Control	15.35 ^a \pm 0.86 12.49 ^b \pm 0.82	11.13 ^b \pm 0.54 14.29 ^a \pm 0.86

Similar superscripts shows non-significant difference

The biochemical values of serum total protein, serum albumin, and serum globulin and serum alanine

aminotransferase showed no significant changes, however serum aspartate aminotransferase showed slight elevation

though non-significant. The similar results were also recorded by Nwangwa (2012) ^[16] where he used aqueous seed extract of *Carica papaya* and found dose dependant effects of the extract on serum AST values, which he attributed to initial hepatic response to the administration of the extract.

Based on the changes in body weight, EPG of faeces and haematological parameters, it was concluded that aqueous seed extract of *Carica papaya* at the dose rate of 100 mg/kg body weight given orally once daily for 3 days was found very effective as anthelmintic. Therefore, the identification of novel promising anthelmintic plant extract such as *Carica papaya* extract may contribute for the development of phytotherapeutic products that could be more cost effective, safer and more easily accessible and provide a lower risk of resistance than the conventional therapeutic arsenal currently employed.

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