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Comparative Biochemical Profile of *Ascaridia galli* Infected Broiler Chickens on Administration of Pineapple and Neem Leaves and Piperazine

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Abstract: A study was carried out to evaluate the change in serum biochemical profile of broiler chickens experimentally infected with *Ascaridia galli* on treatment with powdered leaves of neem and pineapple and with piperazin hydrate. The control and birds treated with piperazine, neem and pineapple show changes in the level of glucose, cholesterol, total protein, albumin, magnesium, potassium and SGPT. The piperazine treated groups can resist better the decreased in the glucose level compare to the groups treated with neem and pineapple. The serum cholesterol level of the control and treated birds shows increased in level while the total protein and albumin contents decreased in control and treated groups. However the decreased in the neem treated group was higher for total protein while the pipeapple treated group shows higher decrease in the level of albumin. The serum level of the potassium and SGPT level also changes in control as well as treated groups.

Key words: *Ascarida galli*, neem, pineapple, glucose, total protein, SGPT

INTRODUCTION

Poultry industry forms a major portion of the agriculture sector in developing countries including India. During the last two decades, India has had a remarkable growth in poultry industry. India's egg production was 2 million tones in the year 2002 and remained amongst the top 5 of egg producing countries in the world. The broiler meat production was 1.566 million tones in the same year (Poultry International, Vol-42, No. 11, Nov. 2003).

Ascaridiosis is still a cause of economic losses in modern poultry farming (Permin and Raving, 2001). Among the parasites next to the coccidium, *Ascaridia galli* infection in chicken is considered to be of great importance as it can cause extensive economic losses in different ways such as loss of weight, meat production, egg production and mortality of birds (Kamal, 1989). It is an intestinal worm and chickens under three months of age are mostly susceptible to it. Control of gastro-intestinal nematodes especially of *A. galli* is mainly based on regular anthelmintic treatment. However, because of high cost of medicines; the farmers cannot afford to purchase the anthelmintics. Further, frequent use of these anthelmintics increases the resistant population of nematodes (Walter *et al*., 1987). In this context the indigenous medicinal plants are used as effective and low cost herbal anthelmintics. Some indigenous plants like neem, pineapple and tobacco have been reported to have anthelmintic properties and are used as herbal anthelmintic. The present investigation was carried out to evaluate the change in the serum biochemical profile of the experimentally infected chickens with *A. galli*, treated with the leaves of neem and pineapple and anthelmintic piperazine hydrate.

MATERIALS AND METHODS

Sample collection and prevalence studies: In the present study intestine from 100 chickens were collected from different slaughterhouses in Aizawl to see the prevalence of *A. galli* infestation in poultry. The samples were brought to the laboratory immediately after collection. The mature parasites were recovered and collected after opening the individual intestine in normal saline solution following the procedure of Alcorn (2001). Further, the mature male and female worms were identified and separated based on their length.

Collection and authentication of plants: The plants *Azadirachta indica* (neem) and *Ananas comosus* (pineapple) were collected from different parts of Mizoram. Neem and pineapple leaves were collected and washed thoroughly with clean water for several times followed by double distilled water. Pineapple

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leaves were chopped into small pieces and then dried under shade at a well ventilated place. Both the leaves were ground to powder form and were stored at -4°C until use.

Culture and inoculation of infective eggs of *A. galli*: The collected female worms were macerated in a pestle and mortar with 5 ml PBS and washed 5-6 times in distilled water before placing them in clean petridishes for culturing in normal saline at 28-30°C for 21 days for embryonation in a B.O.D. incubator. Few drops of 5% formalin were added to the culture medium to prevent bacterial and fungal growth as described by Malik (1981), Deka and Borah (2008) and Islam *et al.* (2008). When the infective stage was reached, the eggs were collected in a centrifuge tube containing normal saline. The pellet was collected after washing with normal saline for three times at 1000 rpm. The pellet was suspended in double distilled water to count the number of eggs as per the procedure of Choudhury (1989).

One hundred commercial (Vencobb 400) broiler chicks procured from M/s. Ranchaw Dawr, Durtlang, Aizawl, Mizoram, India were used in the present study. Each of the chicks was fed with 2 ml of the egg suspension containing 400 eggs of infective stage of *A. galli*. After the appearance *of A. galli* eggs in the droppings of the infected birds i.e. between 55–62 days post infection, the birds were then randomly divided into 4 groups consisting of 25 birds in each group. Group I was untreated while Group II, III and IV were treated with piperazine, neem and pineapple leaves respectively.

Piperazine hydrate (Biprazine™, Brihans Laboratories) was administered at the rate of 200 mg/kg body weight orally as single dose while neem and pineapple leaf powders were administered orally after mixing it with saturated sucrose solution at the rate of 100 mg/kg body weight and 1 g/kg body weight as a single dose respectively.

Collection and processing of blood: Blood samples for biochemical analysis were collected from wing vein on 0 day, 7th, 14th, 21st, 28th and 56th day post treatment. Five birds from each group were randomly selected and 2 ml of blood was collected in strile test tubes without anticoagulant and allowed to clot. Serum was separated out and stored at -20°C until analysis. The serum biochemical parameters were estimated in a UV-Vis Spectrophotometer (Chemito-Spectroscan 2600) using commercially available diagnostic kits purchased from M/s.Crest Biosystems.

RESULTS AND DISCUSSION

The blood biochemical profile of the birds experimentally infected with *Ascarida galli* and those which were treated with piperazine and two herbal anthelmintics viz. leaves of neem and pineapple were evaluated using commercially available diagnostic kits. The serum biochemical profile of the control and treated chickens is given in Table 1. The serum glucose level in the control and treatment groups gradually decreased upto 21st day of post treatment thereafter, the level gradually increases. Wikipedia (wikipedia.org/wiki/Ascaridia_galli) and poultry world (www.world poultry) also reported the decrease in the level of glucose in *A. galli* infected chickens. Rawat *et al.* (2010) reported decrease in the level of glucose in serum as well as in pericardial fluid due to HPSV infection. Similar finding was also observed by Bhatti *et al.* (1989). The decreased in the level of glucose in the control group was higher compare to the treatment groups. On 21st day of post-treatment the level decreased to 45.10 mg/dl from 484.69 mg/dl on 0 day of treatment. Treatment with piperazine shows a recovery in the level of serum glucose from 28th day of post treatment onwards and the normal level was observed on 56th day of the post treatment. Similarly, treatment with neem leaf also shows recovery from 28th day of the post treatment onwards. However, the recovery in piperazine treatment is much higher compare with neem treatment.

The pineapple treatment of the infected birds showed decreased in the level of serum glucose upto 28th day and a marginal recovery from 56th day. The change in the level of glucose in control and treatment groups is shown in Fig. 1. Patra *et al.* (2010) reported that treatment of the infected birds with piperazine citrate, neem and pineapple leaves evacuated cent percent parasites on 14th, 56th and 28th day of post treatment respectively. The observed change in the level of serum glucose level in the present investigation may be correlated with the observation made by Patra *et al.* (2010). As treatment with piperazine citrate, neem and pineapple leaves evacuated cent percent parasites on 14th, 56th and 28th day of post treatment respectively, the recovery in the level of serum glucose is expected only after 28th, 56th and 28th day of post treatment for pipeazine, neem and pineapple.

The serum cholesterol in the control as well as in treatment groups increases from 0 day to 56th day of the treatment, however the increase in the level of the neem treatment group was much higher compared to the control group and groups treated with piperazine and pineapple. Figure 2 shows the change in the level of cholesterol in control and different treatment groups.

The serum total protein in the control as well as in the groups treated with piperazine and pineapple shows decreased in level upto 14th day of post-treatment, thereafter the level gradually increases and attains the normal level on 56th day. The neem and pineapple treatment seems to be more effective compare to piperazine treatment in maintaining the level of serum

Table 1: Biochemical profile of the control and treated birds with piperazine and two herbal anthelmintics viz. neem and pineapple leaves on different stages of treatment

Parameter	Groups	0 day	7th day	14th day	21st day	28th day	56th day
Glucose (mg/dl)	Control	484.69	404.08	313.26	45.10	63.27	204.08
	Piperazine		463.27	342.86	99.18	133.67	450.0
	Neem		380.61	340.82	94.08	98.57	130.61
	Pineapple		456.12	330.61	120.53	33.06	44.89
Cholesterol (mg/dl)	Control	70.21	76.40	83.82	91.51	93.26	140.45
	Piperazine		75.28	91.69	108.98	133.71	144.94
	Neem		100.00	101.12	140.45	251.69	379.78
	Pineapple		100.00	101.12	149.44	171.91	212.36
Total protein (g/dl)	Control	7.08	3.23	2.67	3.14	6.32	7.18
	Piperazine		5.15	2.20	2.93	4.96	5.74
	Neem		3.14	3.73	4.57	7.16	9.96
	Pineapple		4.73	4.14	4.57	4.77	8.88
Albumin (g/dl)	Control	1.17	0.82	1.64	1.95	1.30	1.20
	Piperazine		1.19	1.64	1.02	2.87	1.91
	Neem		1.02	1.42	1.72	1.62	2.07
	Pineapple		0.93	0.98	1.94	1.81	2.98
Globulin (g/dl)	Control	5.91	2.41	1.03	1.19	5.02	5.98
	Piperazine		3.96	0.56	1.91	2.09	3.83
	Neem		2.12	2.32	2.85	5.54	7.89
	Pineapple		3.80	3.16	2.63	2.95	5.90
A:G ratio	Control	0.19	0.34	1.59	1.64	0.26	0.20
	Piperazine		0.30	2.93	0.53	1.37	0.49
	Neem		0.48	0.61	0.60	0.29	0.26
	Pineapple		0.25	0.31	0.74	0.61	0.51
Magnessium (mg/dl)	Control	0.69	0.65	0.49	0.37	0.36	0.52
	Piperazine		1.31	1.27	0.93	0.76	0.32
	Neem		0.11	0.66	0.89	1.32	0.46
	Pineapple		0.31	0.36	0.47	0.61	0.38
Potassium (mmol/L)	Control	4.49	4.51	7.32	9.55	10.53	17.95
	Piperazine		5.04	6.15	7.39	10.66	17.62
	Neem		5.00	6.54	7.90	16.99	17.00
	Pineapple		4.75	16.22	16.76	17.12	16.89
SGPT (U/dl)	Control	29.53	30.00	21.23	13.50	9.00	18.00
	Piperazine		52.50	200.00	233.00	150.00	31.50
	Neem		48.00	32.00	7.50	36.00	70.50
	Pineapple		13.50	21.00	24.00	33.00	51.00

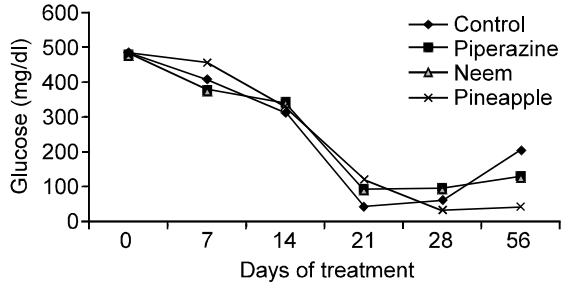

Fig. 1: Change in the Glucose content of the birds in control and treated with piperazine, neem and pineapple leaves in different stages of treatment

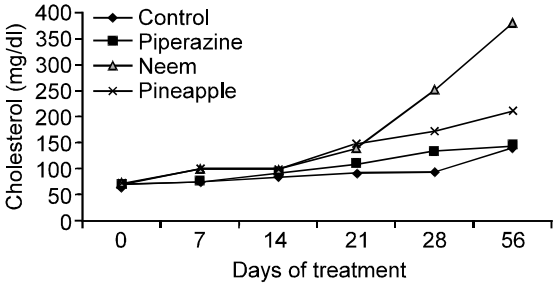

Fig. 2: Change in the Cholesterol level of the birds in control and treated with piperazine, neem and pineapple leaves in different stages of treatment

total protein. The level decreased to 3.14 g/dl on 7th day and 4.14 g/dl on 14th day from 7.08 g/dl on 0 day of post treatment for neem and pineapple treatment groups respectively. Thereafter, the level starts recovering from 21st day onwards and normal level was attained on 28th day and 56th day of the post treatment for neem and pineapple respectively. The serum total protein of control and treatment groups at different days of treatment is shown in Fig. 3.

The observed decreased in the serum total protein is in agreement with the findings of Deka and Borah (2008) and Tanwar and Mishra (2001). Deka and Borah (2008) reported a significant decrease ($p<0.05$) in total protein of chicks infected orally with one hundred and five

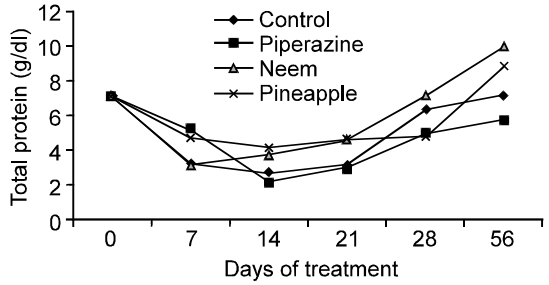

Fig. 3: Change in the Total Protein level of the birds in control and treated with piperazine, neem and pineapple leaves in different stages of treatment

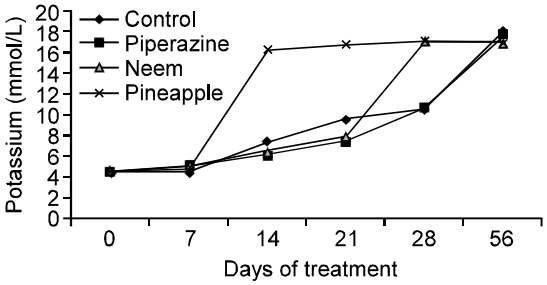

Fig. 5: Change in the Potassium level of the birds in control and treated with piperazine, neem and pineapple leaves in different stages of treatment

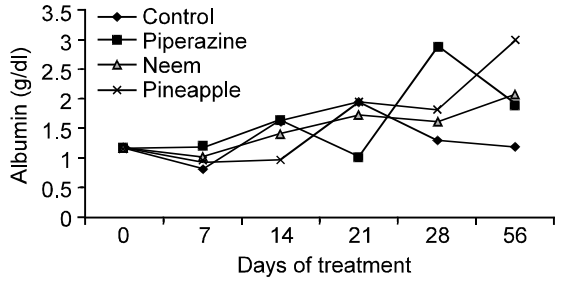

Fig. 4: Change in the albumin content of the birds in control and treated with piperazine, neem and pineapple leaves in different stages of treatment

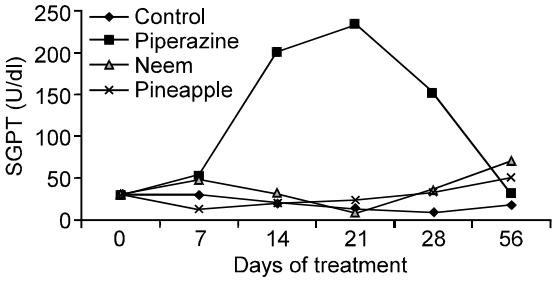

Fig. 6: Change in the SGPT level of the birds in control and treated with piperazine, neem and pineapple leaves in different stages of treatment

hundred infective eggs of *A. galli*. Hypoprotenaemia might occur due to increased motility of intestine as in diarrhoea. In that case the proteins might get lost from the bowel (Deka and Borah, 2008). Coles (1967) reported that a considerable loss of tissue protein may occur through leakage into gut with loss of digestive secretion and mucous due to intestinal parasitism in anaemic birds, which also cause inefficient protein absorption and utilization in the system to the extent of leading to marked decrease in serum protein.

The *A. galli* infection in chickens shows decreased in the level of serum albumin. The level decreased to 0.82 g/dl from 1.17 g/dl on the 7th day. The observed decrease in the level of serum albumin is in agreement with the findings of Deka and Borah (2008). The decrease din serum albumin level is a common form of hypoproteinaemia due to its small size and osmotic sensitivity to fluid movement. The albumin is selectively lost in intestinal parasitism. The hypoalbuminaemia of intestinal parasitism is aggravated by increased albumin catabolism (Tanwar and Mishra, 2001). The treatment of the infected birds with piperazine, neem and pineapple resists the decrease in the level of serum albumin. The lowest level in the piperazine treated group was observed on 21st day while in the neem and pineapple treated groups the lowest levels were observed on 7th day of post treatment (Fig. 4).

Rawat *et al*. (2010) reported significant reduction ($p<0.05$) in total protein, albumin and globulin in the chickens experimentally infected with HPSV. Shivachandra *et al*. (2003) also reported decrease in the level of total protein, globulin and albumin upto five week of PI in chickens with HPSV infection. The observed lower level of total protein and albumin in the neem treated group compare to the piperazine and pineapple treated groups is due hepatotoxic effect of neem. Biu *et al*. (2009) reported that neem leaf aqueous extract is toxic to both the liver and kidney of chicken which lead to decreased in the level of total protein and albumin.

The serum level of magnesium in the control group shows gradual decrease in the level upto 28th day. In piperazine treated group the observed level was highest on the 7th day (1.31 mg/dl) thereafter, the level gradually decreases. The lowest level of serum magnesium was observed on 7th day for neem and pineapple treatments (0.11 mg/dl and 0.31 mg/dl respectively).

The serum potassium profile of the control and treatment groups shows a similar pattern. The level increased from 4.49-17.95 on 56th day in the control group. Similarly, the level increased to 17.62, 17.00 and 16.89 for piperazine, neem and pineapple respectively. However, the pineapple treated groups shows sharp increased in the level (16.22) on 14th day of post-treatment and remains constant thereafter (Fig. 5).

The serum ALT level in control and treated groups is shown in Fig. 6. The level in the control group decreased and the lowest level was observed on 28th day.

The piperazine treated groups have very high levels of serum ALT and highest level was observed on 21st day (an increase from 29.53 U/dl to 233 U/dl) while the lowest level was observed on 21st and 7th day in the case of neem and pineapple treatments respectively. The level decreased to 7.5 U/dl on the 21st day of post treatment in the case of neem while the level decreased to 13.50 U/dl on the 7th day of post treatment in the case of pineapple.

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