

Effect of Dietary Supplementation of *Aristolochia bracteolata* and *Astragalus gummifer* or their Combination on Bovans-Type Chicks

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Abstract: *Aristolochia bracteolata* and *Astragalus gummifer* are medicinal plants used in Sudanese folkloric medicine for the improvement of health by increasing body weight and treatment of various disorders, respectively. Bovans-type chicks were fed 10% *A. bracteolata* seed and 10% *A. gummifer* and 5% mixture of two plants of the standard diet for two weeks. No death among the chicks fed the test diets was observed during the period of the experiment. The 10% *A. bracteolata*, 10% *A. gummifer* and 5% mixture of two plants were toxic but not lethal to chicks and caused reduced body weight gain. Mild diarrhea was observed in the chicks on the 10% *A. gummifer* diet and those on the 5% mixture of two plants. Alterations of serum AST and ALT activities and total protein, albumin, globulin, cholesterol and uric acid were correlated with changes in haematology and pathological effects on *vital* organs.

Key words: *Astragalus gummifer*, *Aristolochia bracteolata*, bovans-type chicks

INTRODUCTION

Plants are used all over the World to obtain different therapeutic actions. Some herbs are used for antibacterial or antimicrobial activity^[1] and for anti fungal activity^[2]. Some plants have anti-inflammatory effect and other wide range uses^[3].

The effects of plants on animals are mainly attributed to their chemical constituents such as nitrates in *Tribulus* sp., oxalates in *Oxalis* sp., fluoroacetates in the South African plant, *Dichapetalum cymosum*, or selenium in *Acacia cana*. Also a large number of plants are known for their contents of certain photodynamic agents, thus causing photosensitization e.g. *Lantana* sp.^[4].

Aristolochia bracteolata (Aristolochiaceae), which is locally called *Um galagel* and/or *Erg-elAgrab* was also examined in this study. This herb is widespread and used in folk medicine to treat snake bites, as anti-malarial^[5,6] and had been used as a vermicide against guinea worms^[7]. *Aristolochia* is also dangerous because it has toxic effect which had been studied in small ruminants; rats, mice and rabbits^[8-10].

Astragalus gummifer (Gum tragacanth) is exudates from stems and branches of *A. gummifer* and other species of *Astragalus*. In Sudan *A. gummifer* is known as *El kateera*, while in other countries it is called Gum Tragacanth.

It is used as adoptogen; antitumour and demulcent. The gum obtained from the root and stem, is demulcent, though it is not often used internally because it is not completely soluble. This gum has been shown to stimulate the immune system and to suppress tumors^[11].

A. bracteolata and *A. gummifer* are medicinal plants used in Sudanese folkloric medicine for the improvement of health by increasing body weight and treatment of various disorders, respectively. The present study aimed to investigate the effects of these two plants or their mixture on growth performance, some biochemical, haematological parameters and histopathological changes on Bovans-type chicks.

MATERIALS AND METHODS

A. bracteolata and *A. gummifer* were bought from herbalist in Omdurman local market and seeds of each plant were ground and separately mixed in starter diet (Table 1).

Experimental design: Forty, one-day- old male Bovans-type chicks obtained from Coral Company, Khartoum were used. They were reared in pens within the premises of the College of Veterinary Medicine and Animal Production, Sudan University of Science and Technology, Khartoum-North. They were fed starter

Table 1: Composition of the starter ration

Ingredients	Percentage
Sorghum	62
Sesame cake	14
Groundnut cake	12
Wheat bran	05
Marble dust	01
Dicalcium phosphate	01
Super concentrate	05
Total	100

ration and provided free access to water for 14 days (adaptation period). The pens were illuminated at night and early morning throughout the experimental period. At the age of 14 days, the chicks were allotted at random to 4 groups each of 10 chicks. Group 1 chicks served as control and fed starter ration, group 2 fed 10% of ground seed of *A. bracteolata* diet, group 3 was fed 10% of *A. gummifer* diet and group 4 was fed mixture of two plants (5% *A. gummifer* + 5% *A. bracteolata*) for 14 days. Average body weight and body weight gain were estimated weekly for each group and the clinical signs were recorded. Chicks from each group were slaughtered by the end of the experimental period and the blood was collected for haematological and biochemical examination and vital tissue specimens were fixed in 10% neutral buffered formalin for pathological examination.

Haematological parameters: Blood samples were collected into dry test tubes containing heparin and examined for Haemoglobin (Hb) concentration, Packed Cell Volume (PCV), Red Blood Cell (RBC) counts, Mean Corpuscular Volume (MCV), Mean Corpuscular Haemoglobin (MCH) and Mean Corpuscular Haemoglobin Concentration (MCHC)^[12].

Serobiochemical methods: Sera were analyzed for the activities of aspartate transaminase (AST), alanine transaminase (ALT) and for concentration of total protein, albumin, globulin, uric acid and cholesterol using commercial kits (Linear Chemicals, Barcelona, Spain).

Pathological methods: Post-mortem findings were recorded and specimens of tissues (liver, kidney, heart and intestines) were collected immediately after slaughter of chicks, fixed in 10% neutral buffered formalin and embedded in paraffin wax, sectioned at 5 µm and stained with Haematoxylin and Eosin (H and E).

Statistical methods: The significance of differences between means was compared at each time point using Duncan's multiple range test after ANOVA for one-way classified data^[13].

RESULTS

Clinical observations: Chicks on the 10% *A. gummifer* diet (group 3) and those on the 5%

mixture of the two plants (group 4) showed mild diarrhea on days 7 to 14.

Effect on growth: In all test chicks (groups 2-4), there was depression in body weight gain ($p < 0.05$) at the end of experiment, as compared with control chicks (group 1) and shown in (Table 2).

Serobiochemical data: The effects of dietary *A. bracteolata* (group 2), *A. gummifer* (group 3) and their combination (group 4) on AST and ALT activities and concentrations of total protein, albumin, globulin, cholesterol and uric acid in the serum of Bovans-type chicks are given in Table 3. Analysis showed significant differences ($p < 0.05$) in AST, ALT, total protein, albumin, globulin, total cholesterol and uric acid between the chicks fed *A. bracteolata* (group 2), *A. gummifer* (group 3) and their combination (group 4) and the controls (group 1). AST activity was higher ($p < 0.05$) in group 2 and ALT activity was higher ($p < 0.05$) in groups 2 and 3. There were significant lower concentration ($p < 0.05$) in total protein, albumin, globulin and uric acid in group 2, 3 and 4 than the control. Cholesterol concentration was lower ($p < 0.05$) in groups 2 and 4 compared to the other two groups.

Haematological data: These data are presented in (Table 4). There were no significant differences in RBC, PCV, Hb, MCH and MCV between the birds on the 10% *A. bracteolata* (group 2), 5% mixture of the two plants (group 4) and the control chicks (group 1), but there was a decrease in MCV and MCH in the birds in the *A. gummifer* diet (group 3).

Histopathological changes: The kidneys of chicks in group 2, showed shrinkage of some glomeruli and infiltration of lymphocytes and those of group 3, had focal necrosis of cortical convoluted tubules with slight congestion in the cortex.

The liver of chicks in group 2 revealed focal necrosis and that of group 3 had accumulation of lymphocytes and hepatocellular necrosis.

DISCUSSION

The results of the present study indicated that feeding Bovans chicks with diet contain 10% *A. bracteolata*, 10% *A. gummifer* or their combination at 5%, each of the plants is toxic but not lethal as evidenced by impairment of growth, lesions in vital organs and serobiochemical alterations.

The dietary levels used represent non-toxic concentrations for chicks of a number of plants exemplified by *Cassia obtusifolia*^[14], *C. occidentalis*^[15]

Table 2: Changes in body weight gain of chicks fed *A. bracteolata*, *A. gummifer* or their mixture for 14 days

Groups	Body weight at Day(0)	Body weight gain at week one	Body weight gain at week two
Control(normal diet)	63±1.7	31±1.21	48±2.08
10% <i>A. bracteolata</i>	68±2.8 ^{N.S}	17.7±1.57*	32.3±4.8*
10% <i>A. gummifer</i>	60±2.2 ^{N.S}	29±1.08 ^{N.S}	14.5±3.3*
5% mixture of two plants	66±1.7 ^{N.S}	29±1.47 ^{N.S}	7.5±3.29*

Values are expressed as mean±SE. N.S = Not significant * = Significant at p<0.05

Table 3: Changes in serum constituents of chicks fed *A. bracteolata*, *A. gummifer* and their mixture for 14 days

Parameters	Groups			
	1 Control normal diet	2 10% <i>A.bracteolata</i>	3 10% <i>A.gummifer</i>	4 5% mixture of two plants
AST(i.u.)	18.2±0.6	23.8±0.8*	18.4±1.5 ^{N.S}	16.8±1.6 ^{N.S}
ALT(i.u.)	15.6±1.2	19.2±0.39*	10.8±0.4*	15.0±0.31 ^{N.S}
T.P. (g dl ⁻¹)	2.54±0.13	2.25±0.11*	0.75±0.11*	0.58±0.09*
Albumin (g dL ⁻¹)	1.5±0.08	0.86±0.18*	0.54±0.2*	0.45±0.13*
Globulin (g dL ⁻¹)	1.04±0.02	1.39±0.1*	0.21±0.04*	0.13±0.03*
Cholesterol(mg d ⁻¹)	156.5±5.7	74.2±5.6*	158.3±5.6 ^{N.S}	55.9±8.3*
Uric acid (mg dL ⁻¹)	4.64±0.91	0.7±0.11*	1.08±0.18*	0.97±0.32*

Values are expressed as mean ± SE. * = Significantly at p<0.05 N.S = Not significant

Table 4: Haematological changes in chicks fed *A. bracteolata*, *A. gummifer* and their mixture for 14 days

Parameters	Groups			
	1 control normal diet	2 10% <i>A.bracteolata</i>	3 10% <i>A.gummier</i>	4 5% mixture of two plants
Hb(g/dl)	6.7±0.35 ^{N.S}	6.7±0.37 ^{N.S}	6.5±0.23 ^{N.S}	7.1±0.19 ^{N.S}
PCV (%)	19.2±1.28 ^{N.S}	19.8±1.11 ^{N.S}	19.4±0.68 ^{N.S}	21.2±0.58 ^{N.S}
RBCs(X10 ⁶ m ³)	2.56±0.09 ^{N.S}	3.23±0.45 ^{N.S}	3.35±0.24 ^{N.S}	3.12±0.52 ^{N.S}
MCV(m ³)	75±7.7 ^{N.S}	66.8±9.4 ^{N.S}	59±3.9 ^{N.S}	74±10.8 ^{N.S}
MCH(pg)	26.2±1.8 ^{N.S}	22.2±3.1 ^{N.S}	19.6±1.3 ^{N.S}	25±3.6 ^{N.S}
MCHC (%)	33.9±0.28 ^{N.S}	33.3±0.05 ^{N.S}	33.3±0.01 ^{N.S}	33.4±0.05 ^{N.S}

Values were expressed as mean±standard error.N.S= Not significant. * = Significantly at p<0.05

and *Cucurbita maxima*^[16]. On the other hand, levels of 5% of dietary *Abrus precatorius*, *Ricinus communis* seeds and *Azadirachta indica* leaves have been found toxic for chicks^[6,17,18]. It seems, therefore, that susceptibility of chicks to feeding with plant materials is, at least, dependent on the type of active constituents and concentration in the amount added to the diet as well as the rate of their metabolic conversion in the liver to metabolites and consequent excretion. Considerable variations in the toxicity to poultry and livestock of different plant constituents are well documented.

No research has been done to delineate the toxic effects of *A. gummifer* in chickens. The fact that body weight and weight gain were decreased in birds on 10% *A. bracteolata*, 10% *A. gummifer* or 5% mixture of the two plants suggest that the plants contain one or more toxic substances that impaired growth and decreased their rate of excretion by the injured kidneys.

In the present study, the elevated activity of AST and ALT and the decreased concentrations of cholesterol, total protein, albumin and globulin in the serum of Bovans-type chicks fed *A. bracteolata*, *A. gummifer* for 2 weeks indicate liver damage.

CONCLUSION

This study demonstrated that *A. bracteolata* and *A. gummifer* are toxic but not lethal to

Bovans-type chicks at the concentrations used in the test diet.

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