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Susceptibility of Bovans Chicks to Low Levels of Dietary Cassia Italica Fruits and *Ocimum basilicum* Leaves or their Mixture

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Abstract: The Sudanese *Cassia italica* fruits and *Ocimum bacilicum* leaves, used in local traditional medicine for the treatment of various ailments, were fed to male Bovans - type chicks at 10% of the standard diet for 2 weeks. A mixture (5+5%) of the two plants was also fed to chicks for a similar period. No death among the chicks fed the test diets was observed during the period of the experiment. Depression in growth, soft faeces and hepatonephrotoxicity were observed in chicks fed a diet containing 10% of *O. bacilicum* leaves. These findings were correlated with alterations in serum constituents and haematology. Impairment of growth, soft faeces and hepatotoxicity were also described in chicks fed 10% of *Cassia italica* fruits and 5% mixture of two plants.

Key words: *Cassia italica*, *Ocimum bacilicum*

INTRODUCTION

In tropical Africa, many of the species of Cassia such as *Cassia senna*, *C. tora* and *C. occidentalis* (Caesalpiniacae) are used in traditional medicine for the treatment of roundworm infection, constipation, fever, pleurisy, oedema and pustular or eruptive skin conditions[1,2]. The seeds of *C. tora* and *C. occidentalis* possess a strong antibacterial activity against *Staphyl-ococcus aureus, Bacillus subtilis*, *B. proteus* and *Vibrio cholerae* and against the fungi *Aspergillus flavus*, *A. niger* and *Trichophyton mentagrophytes*[3-5].

The medicinal Cassia species are rich in anthraquinones and anthrones[6], flavonoids and proantho-cyanides were isolated from various Cassia species, whereas alkaloids were detected in the seeds of *C. acutifolia*[7]. So, the effect is not only due to the presence of sennosides A and B rather a synergistic action of different components[8].

Ocimum basilicum (Labiatae) known as Sweet and Garden Basil, is commonly cultivated throughout Northern and Central Sudan. The dried leaves of *O. basilicum* contain different types of essential amino acids[9]. The oil is used in cosmetics, liquors, medicines and perfumes and the seeds are used as diuretic, antipyretic, antispasmodic and stomachic[10]. The antimicrobial activity of *O. Basilicum* against many kinds of bacteria and fungi was described by Masada[11].

The present study was designed to investigate the effect of low levels of dietary *C. italica* fruits and *O. basilicum* leaves through clinical, haematological and pathophysiological parameters of chicks.

MATERIALS AND METHODS

Plant material: *Cassia italica* fruits and *O. basilicum* leaves were purchased from a local market, dried in the shade, cleaned and separately mixed in starter diet (Table 1).

Experimental design: Forty, one-day-old Bovans-type chicks used in this experiment were obtained from Coral Company, Khartoum, 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 ration and provided free access to water for 2 weeks (adaptation period). Afterwards, the chicks were allotted at random to 4 groups, each of 10. Group 1 chicks were the controls and fed the normal diet, group 2 chicks received a diet containing 10% (w/w) *Cassia italica* fruit and group 3 received a diet containing 10% (w/w) *Ocimum basilicum* leaves. Chicks in group 4 were fed diet containing the mixture of the two plants (5% *C. italica* and 5% *O. basilicum*). The designated experimental diets were fed to chicks for 2 weeks. Average body weight and body

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Table 1: Percent composition of starter ration

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

weight gain were estimated weekly for each group and the clinical signs were recorded. Chicks of all groups were slaughtered by the end of the experimental period for pathological examinations. Blood samples were collected from each of the slaughtered birds for haematology and serum chemistry evaluation.

Blood analysis: Erythrocyte (RBC) count, Haemoglobin (Hb) concentration, Packed Cell Volume (PCV), Mean Corpuscular Volume (MCV), Mean Corpuscular Haemoglobin (MCH) and Mean Corpuscular Haemoglobin Concentration (MCHC) were estimated as described by Schalm *et al.*[12]. Sera were analyzed for the activities of aspartate transaminase (AST), Alanine Transaminase (ALT) and for concentrations of total protein, albumin, globulin, uric acid and cholesterol using commercial kits (Linear Chemicals, Barcelona, Spain).

Pathological examination: Postmortem findings were recorded and specimens of tissues (liver, kidneys, heart, spleen and intestines) were collected immediately after slaughter of chicks, fixed in 10% neutral buffered formalin, embedded in paraffin wax, sectioned at 5 μm and stained with Haematoxylin and Eosin (H and E) for histopathological examination.

Statistical analysis: 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

Effect on growth: The effects of treatment with diets containing 10% *C. italica* or *O. basilicum* and 5% mixture of the two plants on body weight and body weight gain of the chicks are shown in Table 2. The chicks fed diets containing 10% *C. italica* (group 2), 10% *O. basilicum* (group 3) or 5% mixture of the two plants (group 4) had depressed growth ($p<0.05$) when compared with controls (group 1) at the end of week 2. None of the chicks died during the course of the experiment.

Pathological findings: There was congestion and fatty change in the liver of group 2 chicks fed 10% *C. italica*. However, haemorrhage or congestion was observed in the liver and kidneys of the chicks fed 10% *O. basilicum* (group 3). In group 4 chicks fed 5% mixture of the two plants, there was congestion and fatty change in the liver and the heart.

On microscopy, there was accumulation of lymphocytes, dilatation of the sinusoids and focal necrosis of the hepatocytes of the chicks fed 10% *C. italica*. The hepatic damage also occurred in chicks fed mixture of two plants. Many renal proximal convoluted tubules were necrotic and the cortex had congested blood vessels and focal haemorrhage in chicks fed 10% *O. basilicum*.

Haematology and serum chemistry: Table 3 shows that in groups 2 and 4, the values of Hb, PVC, RBC and MCHC did not change. The MCV values of groups 3 and 4 and MCH of group 4 were higher ($p<0.05$) than the controls (group 1).

None of the chicks of the test groups showed significant changes in serum AST activity or albumin concentration. The activity of ALT and uric acid concentration were lower ($p<0.05$) in groups 2 and 4 than the control (group 1). Cholesterol concentration was higher ($p<0.05$) in group 4 and the globulin level was lower ($p<0.05$) in groups 2 and 3 than the control. Total protein concentration was only lower ($p<0.05$) in group 3 than the control. These data are summarized in Table 4.

DISCUSSION

The results of the present study indicated that the mean body weight gain of the Bovans chicks fed the 10% *C. italica,* 10% *O. basilicum* or 5% mixture of the two plants was significantly depressed at week 2 but an exact proximate analysis of the two plants tissue is unavailable. Research would be required to verify the role of the *C. italica* fruits and *O. basilicum* leaves at this concentration or at lower dietary levels e.g. 2% because many plants have been investigated for growth promoter effect. For example, the mean body weight of Wistar rats fed 2% *Francoeuria crispa* leaf diet was significantly elevated due to the presence of high protein content while incorporation of this plant at 10% of the basal diet caused hepatonephrotoxicity in rats[14]. Phytochemical studies had been conducted on *C. italica* aerial parts and demonstrated the presence of anthraquinones and anthrones[7]. It might be assumed that the development of soft faeces without enteritis or lesions in the intestine of Bovans chicks fed on 10% *C. italica* diet could be due to the presence of anthraquinones in the plant fruit.

The occurrence of soft faeces and fatty change, congestion or haemorrhage in the liver could explain the depressed growth in *C. italica* fed chicks. The hepatic

Table 2: Body weight and weight gain of bovans chicks fed *C. italica, O. basilicum* or their mixture for 2 weeks

Groups	Body weight (g)	Weight gain (g)
One week:		
1. Control (normal diet)	94.0±5.2	31.0±1.2
2. 10% *C. italica*	108.6±6.4^{NS}	41.6±1.8*
3. 10% *O. basilicum*	105.0±4.7^{NS}	48.5±2.3*
4. 5% mixture of the two plants	109.9±6.9^{NS}	44.5±2.2*
Two weeks:		
1. Control (normal diet)	142.0±6.6	48.0±2.1
2. 10% *C. italica*	113.4±8.5*	4.8±0.2*
3. 10% *O. basilicum*	128.0±4.8*	23.0±2.4*
4. 5% mixture of the two plants	117.0±7.2*	7.1±1.8*

Values are means±SE, NS= Not significant, * = p<0.05

Table 3: Haematological changes in bovans chicks fed *C. italica, 0. basilicum* or their mixture for 2 weeks

	Groups			
Parameters	Control	10% *C. italica*	10% *O. basilicum*	5% mixture of two plants
Hb (g/dl)	6.7±0.35	6.1±0.19^{NS}	6.8±0.35^{NS}	7.2±0.42^{NS}
RBC (10^6 mm^3)	2.56±0.09	2.74±0.31^{NS}	2.2±0.23^{NS}	2.21±0.26
PCV (%)	19.2±1.28	17.8±1.7^{NS}	19.2±0.97^{NS}	22.0±0.84^{NS}
MCV (m^3)	75.0±7.7	66.8±7.3^{NS}	92.1±11.7*	109.7±16.2*
MCH (pg)	26.2±1.8	23.1±2.4^{NS}	32.7±4.3^{NS}	36.2±5.6*
MCHC (%)	33.3±1.1	35.0±2.4^{NS}	35.5±1.6^{NS}	32.9±1.2^{NS}

Values are expressed as means±SE; NS= not significant; *= p<0.05

Table 4: Changes in serum constituents of bovans chicks fed *C. italica, 0. basilicum* or their mixture for 2 weeks

Parameters	Groups			
	Control	10% *C. italica*	10% *O. basilicum*	5% mixture of two plants
AST (iu)	18.2±0.6	15.2±1.4^{NS}	18.8±2.43	21.2±3.12^{NS}
ALT (iu)	15.6±6.93	2.2±0.55*	7.3±1.97*	4.8±0.17*
Total protein (g dL^{-1})	2.54±0.13	2.15±0.25^{NS}	2.07±0.77^{NS}	1.44±0.13^{NS}
Albumin (g dL^{-1})	1.49±0.09	1.54±0.86^{NS}	1.59±0.77^{NS}	1.44±0.13^{NS}
Globulin (g dL^{-1})	1.05±5.7	0.61±0.12*	146.6±7.0^{NS}	167.8±16.0*
Cholesterol (mg dL^{-1})	156.5±5.7	152.2±12.0^{NS}	146.6±7.0^{NS}	167.8±16.0
Uric acid (mg dL^{-1})	4.64±0.19	1.78±0.16*	2.0±0.2*	1.22±0.2*

Values are expressed as means±SE; NS= not significant; *= p<0.05

damage also occurred in chicks fed *O. basilicum* or the mixture of *C. italica* and *O. basilicum*, but these lesions were less marked.

Damage to the liver probably contributed to the increased serum cholesterol concentration particularly in the chicks fed the mixture of the two plants and to the decrease in globulin level in birds fed *C. italica* or *O. basilicum* singly.

The development of mild nephrotoxicity in chicks fed *O. basilicum* is indicated by the low serum uric acid concentration. Serum uric acid was found to increase in the Bovans chicks fed 10% *Ammi visnaga* for 6 weeks [15].

Although the values of Hb, PCV and RBC of the test chicks particularly those on 10% *O. basilicum* and mixture of the two plants did not significantly change probably due to fluid loss that caused dehydration. The increase in MCV values without effect on MCHC indicated macrocytic normochromic anaemia. Previous studies produced macrocytic anaemia in rats fed 10% *Artemisia abyssinica*[16]. On the other hand, normocytic hypochromic anaemia was observed in rats fed 10% *Cuminum cyminum*[17].

This study demonstrated susceptibility of Bovans chicks to feeding 10% *Cassia italica* fruits and 10% *Osimum basilicum* leaves singly or 5% mixture of the two plants for two weeks. Further studies are necessary to determine the nutritive value and the isolation, characteriza-tion and concentration of the active constituents of the plants to elucidate their modes of action and interaction.

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