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Studies on the Anthelmintic Activity of the Aqueous extract of Lycopersicum Esculentum (Tomato) in Common Poultry Worms Ascaridia Galli and H. gallinae

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ABSTRACT- Fresh fruits of Lycopersicum esculentum were purchased from the local market and after washing the crude extract was prepared withthe help of electric grinder. Suitable concentrations 6, 8 and 12% were prepared in distilled water. When tested in vitro all these concentrations caused mortality of A. galli and H. gallinae after a maximum exposure of 18 and 14 hours, respectively. The extract caused signficant reduction in glucose uptake, glycogen contents, oxygen consumption, acid and alkaline phosphomonoesterase activity. Lactic acid produciton in both the parasites was enhanced. The possible mode of action is discussed.

Keywords : Lycopersicum esculentum, Ascaridia galli, Heterakis gallinae, Anthelmintic.

Introduction : The present investigation aim at evaluating the efficacy of *Lycopersicum esculentum* (Tomato) fruit extract against common poultry worms *Ascaridia galli* and *Heterakis gallinae*.

Material and Mthods : Fresh fruits of *Lycopersicum* (Tomato) were obtained from the local market, washed properly and cut into pieces. Crude extract was prepared with the help of electric grinder and it was filtered through a fine musclin cloth and finally transferred to a volumetric flask to prepare 12% stock solution in normal (0.9%) saline. Concentration of 8 and 6% were prepared by diluting the stock solution with phosphated buffered normal (0.9%) saline. These concentration were tested *in vitro* for their anthelminitic efficacy.

Glucose uptake was determined by the method of Ahmad and Nizami (1987). Glycogen was estimated in the homogenates (20% w/v) of these worms according to the method of Good *et al.* (1933) as modified by Montgomery (1957). Rate of oxygen consumption was measured manometrically by the method of Warburg as described by Umbreit *et al.* (1964). Lactic acid production was measured by the method of Baker and Summerson (1941). Acid and alkaline phosphomonoesterase activity was also determined in homogenates, according to Bergmeyer (1971), whereas cholinesterase activity was measured by the method of Huerga *et al.* (1952), using acetylcholine as substrate. The chemicals used were of analytical grade.

The parasites *A. galli* and *H. gallinae* were obtained from the intestine and caecum respectively, of the common fowl *(Gallus gallus)* slaughtered in local poultry farms. After several washings in normal saline they were transferred saline (pH 7.2) to which 1 g of glucose/100ml was added. The requisite quantity of the extract was added to the incubation medium to obtain the required concentration and its effect was compared with untreated controls. Worms were incubated at 38^0C. Death was assumed to have occurred when all signs of movement had ceased.

Result : A. Effect of *L. esculentum* fruit extract on the parasites incubated *in vitro*

Aqueous extract of *L. esculentum in vitro* caused mortality after exposure of 18, 12 and 8 hrs. in *A. galli* and 14, 10 and 7 hrs. in *H. gallinae,* at concentration of 6, 8 and 12% respectively.

B. Effect of *L. esculentum* fruit extract on the biochemical activities of the parasites.

(i) Glucose uptake : A shown in Table 1 glucose uptake was inhibited by 53 and 56% in *A. galli* and *H. gallinae,* respectively when incubated with 12% aqueous fruit extract of *L. esculentum.*

(ii) Glycogen contents: When exposed to different concentrations of *L. esculentum* fruit extract, glycogen level was affected signficantly ($P<0.05$) in both *A. galli* and *H. gallinae* (Table 1)

(iii) Rate of oxygen consumption : *L. esculentum* fruit extract suppressed oxygen consumption by 64 and 63% in *A. galli* and *H. gallinae,* respectively at 12% concentration (Table 2).

(iv) Lactic acid production : *L. esculentum* aqueous fruit extract enhanced lactic acid production by 53 and 40% in *A. galli* and *H. gallinae,* respectively (Table 2).

(v) Acid phosphomonoesterase activity : In *A. galli* and *H. gallinae,* acid phosphomonoesterase activity was inhibited by 55 and 57%, respectively with 12% aqueous *L. esculentum* fruit extract. (Table 3).

(vi) Alkaline phosphomonoesterase activity : As shown in Table 3 alkaline phosphomonoesterase activity was inhibited by 51 and 55% in *A. galli* and *H. gallinae,* respectively when incubated with 12% aqueous fruit extract of *L. esculentum.*

(vii) Cholinesterase activity : When incubated with aqueous fruit extract (6%) of *L. esculentum* for 18 hrs. cholinesterase activity was diminuted by 11 and 15% in *A. galli* and *H. gallinae,* respectively (Table 3).

C. Effect of *L. esculentum* fruit extract on host tissues

No significant change was observed in the biochemical activity of the host tissues, when incubated with 6 to 12% fruit extract of *L. esculentum.*

Table-1

Changes in glucose uptake (mg/g wet weight) and glycogen contents (% wet wt.) in *A. galli* and *H. gallinae* after *in vitro* incubation with different concentration of *L. esculentum* fruit extract.

Parasites	Concentration			
	Control	6%	8%	12%
Glucose uptake				
A. galli	5.5±0.17[a]	4.0±0.55 (27.27)	3.3±0.22 (40.0)	2.6±0.22 (52.72)
H. gallinae	6.2±0.17	4.4±0.31 (29.03)	3.5±0.14 (43.54)	2.7±0.82 (56.45)
Glycogen contents				
A. galli	7.3±0.14	5.7±0.02 (21.91)	4.8±0.14 (34.24)	3.3±0.3 (54.79)
H. gallinae	6.7±0.14	5.1±0.17 (23.88)	4.2±0.14 (37.31)	3.7±0.1 (44.77)

Mean ± S.D.

Value in parentheses are percent change of control values.

Table-2

Changes in the rate of oxygen consumption (µl/mg weight/hour) and lactic acid production (µ mol/gm wet weight) in *A. galli* and *H. gallinae* exposed to different concentrations of *L. esculentum* fruit extract.

Parasites	Concentration			
	Control	6%	8%	12%
Rate of oxygen Consumption				
A. galli	5.5±0.17[a]	4.2±0.12 (23.63)	3.3±0.21 (40.0)	2.0±0.63 (60.63)
H. gallinae	4.9±0.2	3.4±0.11 (30.61)	2.7±0.82 (44.89)	1.8±0.2 (63.26)
Lactic acid production				
A. galli	4.26±0.1	5.3±0.24 (24.41)	5.9±0.17 (38.49)	6.5±0. (52.58)
H. gallinae	6.0±0.1	7.2±0.14 (20.00)	8.0±0.26 (33.3)	8.4±0.55 (40.)

Mean ± S.D.

Value in parentheses are percent change of control values

Table-3

Changes in acid and alkaline phosphomonoesterase (phosphatase units) and cholinesterase activity (µ moles acetylcholine/hour) in *A. galli* and *H. gallinae* following *in vitro* incubation with different concentrations of *L. esculentum* fruit extract.

Parasites	Concentration					
	Control	6%	8%	12%	I^a	r^b
Acid Phosphomonoesterase						
A. galli	4.7±0.14[c]	3.5±0.14 (25.53)	2.7±0.82 (42.55)	2.1±0.02 (55.31)	10.847	0.9910
H. gallinae	5.8±0.14	4.6±0.14 (20.68)	3.8±0.14 (34.48)	2.5±0.17 (56.89)	10.546	0.9884
Alkaline Phosphomonoesterase						
A. galli	5.3±0.24	4.4±0.31 (14.98)	3.5±0.14 (33.96)	2.6±0.22 (50.94)	11.778	0.9816

H. gallinae	4.7±0.14	3.8±0.14 (19.14)	2.8±0.1 (40.42)	2.1±0.02 (55.31)	10.847	0.9777
Cholinesterase						
A. galli	7.0±0.3	6.2±0.17 (11.42)	5.4±0.14 (22.85)	4.3±0.14 (38.57)	15.556	0.9756
H. gallinae	6.2±0.17	5.3±0.24 (14.51)	4.7±0.14 (24.19)	4.1±0.17 (33.87)	17.714	0.9940

a. Concentration required for 50% inhibition.
b. r = correlation coefficient of the activity of control and treated samples.
c. Mean ± S.D.

Value in parentheses are percent change of control values.

Discussion : *L. esculentum* aqueous fruit extract dossess anethelmintic properties as it caused mortality in *A. galli* and *H. gallinae in vitro* exposure of 8 and 7 hrs. at a concentration of 12%. Lower concentrations were also effective but required more time to cause 100% mortality. The perusal of the literature available, revealed that there is no previous. report about the anthelmintic properties of *L. esculentum* against *A. galli* and *H. gallinae* in Ayurveda however, it is reported to exhibit anthelmintic activity against some intestinal worms.

In the present investigations *L. esculentum* fruit extract is observed (Table-1) to inhibit glucose uptake of both the parasites. These endoparasites entirely depend upon carbohydrate metabolism (Von Brand, 1973), therefore, it appears that suppression of glucose uptake may contribute significantly in the mortability of *A. galli* and *H. gallinae.*

A significant reduction in glycogen contents (Table 1) and the rate of oxygen consumption (Table 2) of *A. galli* and *H. gallinate* observed in present investigations was supported by concomitant enhancement of lactic acid production. It probably indicates that *L. esculentum* interferes with the carbohydrate metabolism of the parasites.

The interference of *L. esculentum* fruit extract in carbohydrate metabolism of these worms is also supported by its inhibitory action on the activity of acid and alkaline phosphomonoesterase of the parasites, as observed (Table 3) during present investigations. Cheng (1964) and Halton (1967) have demonstrated the implication of acid phosphomonioesterase in glycogenolysis. In the present studies, *L. esculentum* has not been observed to cause any signficant effect on the metabolic activities of the host tissues. Therefore, it appears to be safe anthelmintic for the control of *A. galli* and *H. gallinae* in birds.

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