Studies On Anthelmintic Activity Of *Cedrus Deodara* Oil On Common Poultry Worms *Ascaridia Galli* And *Heterakis Gallinae*

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ABSTRACT

Cedrus deodara (wood essential oil) triturated with twenty 20 and suspended in distilled water to make 16% stock solution was tested for its *in vitro* anthelmintic activity against common poultry worm *Ascaridia galli.* Under laboratroy conditions (temp. 41^0C) the suspension proved to the 100% effective at concentrations of 12%, 8% and 6% as it caused mortality (indicated by loss of motility) after a period of 7, 9 and 11 hours respectively. 2% suspension however, caused mortality of 80% worms in 12 hours.

The effect of wood essential oil examined on glucose uptake, phosphomonoesterase activity and lactic acid production of the parasites indicated a decline in glucose uptake with concommitant enhancement of lactic acid production and the activity of nonspecific phosphomonoesterases.

Key words : *Cedrus deodara, Anthelmintic, Ascaridia galli, Heterakis gallinae*.

Introduction :

Cedrus is a member of family Pinaceae and is locally known as 'Deodar'. It is found all over northern Himalayas and is largely cultivated in India mainly U.P. and Punjab as on ornamental tree. These are found upto a height of 4000 to 10000 ft. and are important for their woodbark, leaves and turpentine Trees are evergreen, its wood is carminative, daiphoretic diuretic and useful in feaver, flatulence, pulmonary and urinary disorders, rheumatism, piles, gravels in Kidney, ulcers and in skin diseases. Bark is powerful astringent, febrifuge and is useful for diarrhoea and dysentry wood yields oil with balsamic odour. Needles contain ascorbic acid and fresh needles contains 0.56% ethereal oil. From the ether extract of deodar deodarin was isolate (Dhar et al. 1968). Alcoholic extract of stem was reported to have anticancer activity against human epidermal carcinoma of the nasopharynx.

Material Method:

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.

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.

It the present studies the *Cedrus deodara* oil was used after triturating with tween 20 at 2,4 and 6%.

Results :

C. deodara (Wood essential oil) caused mortality in *A. galli* and *H. gallinae* after an exposure of 15, 13, 11 hrs and 11, 9 and 7 hrs in *A. galli* at 2, 4 and 6% respectively.

Effect of *C. deodara* oil on some biochemical activities of the parasites

Glucose uptake- Glucose uptake was reduced significantly ($P<0.05$) when the parasites were incubated with different concentrations of *C. deodara* oil (Table-1).

Glycogen contents: Glycogen contents were affected mildly when the parasites were incubated *in vitro.* A reduction of 11 and 15% was recorded with 2% oil in *A. galli* and *H. gallinae* respectively (Table-1).

Rate of oxygen consumption : Changes in the rate of oxygen consumption are given in Table-2. *C. deodara* oil reduced oxygen consumption of both the parasites. This reduction at 2% concentration was found to be 23 and 22% in both the parasites.

Lactic acid production : Lactic acid production was enhanced by 41 and 20% in *A. galli* and *H. gallinae* (Table-2) when the parasites were incubated with 2% oil of *C. deodara.*

Acid phosphomonoesterase activity : In both the parasites activity of acid phosphomonoesterase was reduced significantly ($P<0.05$) when incubated with 2-6% *C. deodara* oil. (Table-3).

Alkaline phosphomonoesterase activity : Alkaline phosphomonoesterase activity was reduced by 23 and 22% in both the parasites respectively with 2% *C. deodara* oil. (Table 3).

Cholinesterase activity: *C. deodara* oil shows no significant ($P>0.05$) effet on cholinesterase activity (Table-3).

No significant changes was observed in the bio-chemical activities of the host tissue with different concentration of *C. deodara* oil.

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 concentrations of *C. deodara* oil.

Parasites	Concentration			
	Control	2%	4%	6%
Glucose uptake				
A. galli	5.8±0.14[a]	4.4±0.31 (24.13)	3.7±0.28 (36.20)	2.8±0.28 (51.72)
H. gallinae	6.2±0.17	4.6±0.31 (25.80)	3.5±0.14 (43.54)	2.7±0.14 (56.45)
Glycogen contents				
A. galli	7.3±0.14	6.5±0.17 (10.95)	5.5±0.26 (24.65)	4.3±0.14 (41.09)
H. gallinae	6.7±0.24	5.7±0.14 (14.92)	4.4±0.14 (34.32)	3.7±0.28 (44.77)

a. 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 *C. deodara* oil.

Parasites	Concentration			
	Control	2%	4%	6%
Rate of oxygen Consumption				
A. galli	6.9±0.30[a]	5.3±0.24 (23.18)	4.5±0.13 (34.78)	3.6±0 (47.82)
H. gallinae	5.4±0.14	4.2±0.14 (22.22)	3.4±0.12 (37.03)	2.4±0.14 (55.55)
Lactic acid production				
A. galli	4.3±0.12	6.0±0.24 (40.84)	7.0±0.51 (64.31)	7.9±0.22 (85.44)
H. gallinae	6.0±0.23	7.2±0.31 (20.0)	8.8±0.74 (46.66)	9.6±2.3 (60.0)

a. 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 *A. deodara* oil.

Parasites	Concentration					
	Control	2%	4%	6%	I^a	r^b
Acid Phosphomonoesterase						
A. galli	7.9±0.2[c]	5.8±0.14 (26.58)	5.2±0.2 (34.17)	4.4±0.14 (44.30)	6.77	0.9906
H. gallinae	6.6±0.28	5.4±0.28 (18.18)	4.2±0 (36.36)	3.1±0.2 (53.03)	5.66	0.9819
Alkaline Phosphomonoesterase						
A. galli	8.4±0.14	6.5±0.7 (22.61)	5.7±0 (32.14)	3.3±0 (60.71)	6.15	0.9926
H. gallinae	7.7±0.02	6.0±0 (22.07)	5.0±0.46 (35.06)	4.1±0.17 (46.75)	6.60	0.9939
Cholinesterase						
A. galli	7.3±0.41	6.8±0.02 (6.84)	6.2±0.2 (15.06)	5.9±0.17 (19.17)	15.65	0.9722
H. gallinae	6.5±0.17	6.2±0.17 (4.61)	5.7±0.14 (12.30)	5.3±0.24 (18.46)	16.25	0.9586

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.

Table-4

The effect of different of *C. deodara* oil on host tissues (intestine and Caecum) in vitro.

Parasites	Concentration		
	2%	4%	6%
Glucose uptake	-	-	6.13[a]
Glycogen contents	-	-	5.84
Rate of oxygen consumption	-	-	6.18
Lactic acid	-	-	7.27
Acid phosphomonoesterase	-	-	3.26
Alkaline phosphomonoesterase	-	-	1.22
Cholinesterase	-	-	4.11

a. % reduction enhancement of control values ($n \geq 10$).

DISCUSSION

Efficacy of *C. deodara* oil against *A. galli* was first reported by Lal et al. (1976). In the present investigations involving *in vitro* experiments, the oil (6%) caused mortality in both *A. galli* and *H. gallinae* after an exposure of 6 and 3 hrs., respectively, *H. gallinae* was however, observed to be more sensitive than *A. galli.*

Since *C. deodara* oil reduced significantly the uptake of glucose (Table -1) it appears that it affects primarily the carbohydrate metabolism of the parasites. Saz (1957) reported that inhibition of carbohydrate absorption in helminth parasites living in an environment with low oxygen tension is disastrous because these parasites are reported (Von Brand, 1973) to depend entirely upon carbohydrate metabolism. Accumulation of lactic acid indicates inhibition of TCA cycle enzymes in the parasites.

C. deodara oil reduced the rate of oxygen consumption in both *A. galli* and *H. gallinae* in the present studies (Table-2). This suppression of oxygen consumption, following incubation with *C. deodara* oil, may be probably because of the inhibition of some enzyme of carbohydrate oxidation.

The activity of acid and alkaline phosphomonoesterase, which are reported (Pappas and Read, 1975) to play an important role in the carbohydrate metabolism of nematode parasites, were also inhibited significantly in both *A. galli* and *H. gallinae* (Table-3). Cheng (1964) and Halton (1967) have demonstrated the implication of these enzymes in glycogenolysis.

In the present studies, *C. deodara* oil did not affect the biochemical activities of host tissues (Table-4). Therefore, it appears to be harmless for the host and may prove be to a useful and safe anthelmintic agent for the control of *A. galli* and *H. gallinae.*

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