



# Effect of *Tulsi* Ingredients on Gonadal Development of Common carp, *Cyprinus carpio communis* under Tarai Region of Uttarakhand

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## ABSTRACT

The present study was conducted for comparing the effect of *Tulsi* ingredients, Eugenol and Ursolic acid on the reproductive performance of common carp (*Cyprinus carpio*) under Tarai condition of Uttarakhand. The results revealed that role of Ursolic acid in enhancing gonadal development and effect of Eugenol in decreasing gonadal development in *C. carpio*. Indicators of reproductive profile (GSI, fecundity and sperm count) exhibited more potency of Ursolic acid and less potency of Eugenol in gonadal differentiation and development. These observations indicate that Eugenol and Ursolic acid can also be used for selective enhancement of gonadal development depending upon the requirement.

**Key words:** Common carp , Eugenol, Gonadal development, Ursolic acid.

## INTRODUCTION

The carp (*Cyprinus carpio communis*), is one of the most extensively translocated and domesticated fish species in the world. Carp originated in central Asia and spread east and west to China and the Danube (Balon, 1974). The species was successfully spread throughout Asia and Europe, was domesticated as an ornamental and aquaculture species. Now days, Demand for fish exceeds production and per capita consumption is steadily increasing day-by-day. To enhance fisheries production, it has become a necessity to increase fisheries production by developing effective technologies for ensuring maximum output from minimum input and to get maximum profit. Strategies for increasing fish production include quality stocking material, water quality management, adequate balanced diet and incorporation of various additives. There are large number of feed additives available to improve fish growth performance some of these additives

used in feed mill are chemical products especially hormones and antibiotics may cause unfavorable side effects (Bello *et al*, 2012). Basil (*Ocimum basilicum* L.) is one of the most famous, annual or perennial herb belonging to the family Lamiaceae. Eugenol and Ursolic acids are the two ingredients of tulsi plant responsible for growth of fishes (Prakash and Gupta, 2004). Eugenol is a phenolic compound and major constituent of the essential oils extracted from different parts of Tulsi plant (Boyer *et al*, 2008). Ursolic acid is a triterpenoid compound which exists widely in natural plants in the form of free acid or aglycones for triterpenoid saponins (Pemminati *et al*, 2011). Previous researches have confirmed that tulsi is cheap and easily available medicinal plant and have effect on fertility of fishes. The aim of the present study to observe the effects of the active ingredients of *tulsi*, Eugenol and Ursolic acid on the gonadal development of the fish *Cyprinus carpio communis*.

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**Table 1. Status of Gonadal development during rearing period in long term treatment with common carp**

Parameter	Treatment									
	T <sub>0</sub>		T <sub>1</sub>		T <sub>2</sub>		T <sub>3</sub>		T <sub>4</sub>	
	Female	Male	Female	Male	Female	Male	Female	Male	Female	male
Hepato-somatic Index	0.48 <sup>a</sup> ±0.08	0.21 <sup>b</sup> ±0.02	0.69 <sup>a</sup> ± 0.07	0.82 <sup>a</sup> ± 0.05	0.44 <sup>ab</sup> ± 0.86	0.64 <sup>a</sup> ± 0.76	0.16 <sup>c</sup> ± 0.02	0.21 <sup>b</sup> ± 0.02	0.18 <sup>bc</sup> ± 0.03	0.16 <sup>c</sup> ± 0.01
Gonado-somatic index	12.00 <sup>b</sup> ±1.15	8.79 <sup>b</sup> ±0.18	23.70 <sup>a</sup> ±1.75	22.45 <sup>a</sup> ± 0.60	27.67 <sup>a</sup> ±2.68	27.22 <sup>a</sup> ±4.22	24.17 <sup>c</sup> ±0.60	4.55 <sup>b</sup> ±0.11	3.44 <sup>c</sup> ±0.16	3.08 <sup>b</sup> ±0.30
Fecundity (per g of ovary)	2966.60 <sup>b</sup> ± 220.96		4672.90 <sup>a</sup> ± 151.20		5018.60 <sup>a</sup> ± 100.22		1525.89 <sup>c</sup> ± 189.3		995.20 <sup>c</sup> ± 34.30	
Sperm count(per ml of milt)	-	33.18 <sup>c</sup> ± 1.77	-	48.59 <sup>b</sup> ± 0.97	-	62.30 <sup>a</sup> ± 1.26	-	15.15 <sup>d</sup> ± 1.44	-	11.58 <sup>d</sup> ±0.40
Motile sperm (per ml of milt)	-	9.95 <sup>c</sup> ± 0.76	-	32.96 <sup>b</sup> ± 1.18	-	46.83 <sup>a</sup> ± 1.75	-	5.40 <sup>cd</sup> ± 0.86	-	3.58 <sup>d</sup> ±0.45
Non motile sperm (per ml of milt)	-	23.22 <sup>a</sup> ± 1.86	-	16.46 <sup>b</sup> ± 1.21	-	14.76 <sup>bc</sup> ± 1.03	-	9.76 <sup>cd</sup> ± 0.81	-	8.89 <sup>d</sup> ±1.03

## MATERIALS AND METHODS

Hundred specimens of common carp were obtained from the instructional fish farm of College of Fisheries, Pantnagar. Ten aquaria 4'x1'x1' were divided into five groups having one replicate for each group. Six specimens were put from the acclimatized fish after recording length and body weight. Diet was prepared by mixing Eugenol and Ursolic acid with the conventional diet in different concentrations. Feeding was done @ 5% body weight twice daily.

Short-term treatment (7d) was carried out to observe the acceptability of diet supplemented with Eugenol and Ursolic acid and its effect on survival and behavior of fish. Long-term treatment (60days) was recorded in response to feeding of different concentrations of Eugenol and Ursolic acid for sixty days. The length-weight data of each specimen from all experimental groups was recorded separately at the time of first sampling. All other parameters were recorded for each group of fish separately after sixty days at the time of termination of the experiment. Paired 't' test was used for comparing length and weight of common carp while Statgraphics statistical package was used for analyzing GSI, HSI, Fecundity, sperm count, motile and non-motile sperm.

## RESULTS AND DISCUSSION

### *Gonadosomatic index (GSI) and Hepatosomatic index (HSI)*

Among the feeding groups, maximum GSI was obtained in T<sub>2</sub> (male-27.22 and female-27.67) group followed by T<sub>1</sub> (male-22.4 and female-23.7) group while minimum GSI in T<sub>3</sub> (male-4.55 and female-4.17) group followed by T<sub>4</sub> (male-3.08 and female-3.44) along with control (male-8.79 and female-12.00) in both sexes. However, the differences among the treatments was significant (Table 1). Comparison among the feeding groups exhibited maximum HSI for T<sub>1</sub> (male-0.82 and female-0.69) group followed by T<sub>2</sub> group (male-0.64 and female-0.44) while minimum in T<sub>3</sub>

(0.21) followed by T<sub>4</sub> (0.16) group in male and T<sub>4</sub> (0.18) followed by T<sub>3</sub> (0.16) group in female. The difference among the treatments was significant.

### **Fecundity and Sperm count**

Relative fecundity ranged from 2966 to 5018, with maximum (5018) in T<sub>2</sub> and minimum (995) in T<sub>4</sub>. The effect of different diets on fecundity was significant. Sperm count ranged from 62.30 to 11.58, maximum (62.30) in T<sub>2</sub> and minimum (11.58) in T<sub>4</sub>. The effect of different diets on sperm count was significant (Table 1).

### **Motile Sperm**

Motile sperm ranged between 46.83 to 3.58, with maximum (46.83) in T<sub>2</sub> and minimum (3.58) in T<sub>4</sub>. The effect of different diets was significant. Non motile sperm ranged from 23.22 to 8.89, with maximum (23.22) in T<sub>0</sub> and minimum (8.89) in T<sub>4</sub>. The effect of different diets was significant.

Comparison between GSI, HSI, fecundity, sperm count, motile and non-motile sperm indicated that significant gain in Ursolic acid fed fishes. However, these parameters decrease in Eugenol fed fishes. Indicators of reproductive profile exhibited more potency of Ursolic acid fed fishes and less potency of Eugenol fed fishes in gonadal development.

Maximum GSI, fecundity and sperm count were registered higher in Ursolic acid fed fish and minimum values recorded in Eugenol fed fish. These parameters are indicator of gonadal development of fish. The findings were in line with Boyer *et al* (2008) who reported that Eugenol decrease growth and occurrence of bleaching in three species of corals. Prakash *et al* (2004) reported that Eugenol possesses properties of anti-fertility effects and Ursolic acid increases spermatogenesis and sperm count because of its estrogenic effects. In this study, diet T<sub>2</sub> supports higher gonadal development (GSI, fecundity and sperm count) as compared to other diets. So, Ursolic acid fed fish are hence also expected to grow bigger in the subsequent years and support higher GSI, fecundity and egg size as compared to fish fed on other diets. Since the

larger eggs carry more yolk which usually result in larger larvae with a capacity to thrive longer under unfavorable condition of food and physical environment. Hence, Ursolic acid appears to be best in terms of both fecundity and sperm count, which are the basic parameters in quality brood stock production. Eugenol can also be used for selective enhancement of growth or gonadal development depending upon the requirement.

### CONCLUSION

The present study clearly indicated that Eugenol and Ursolic acid can be used for selective enhancement of gonadal development depending upon the requirement and as per suitability. Indicators of reproductive profile exhibited more potency of Ursolic acid fed fishes and less potency of Eugenol fed fishes in gonadal development.

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