Clove oil: a safe anesthetic for rohu fingerlings
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Abstract

This study was undertaken to add to the understanding of different concentrations of clove oil as an anaesthetic in rohu fingerlings for handling and transportation purpose. The objective of this research was to find out appropriate doses of clove oil for rohu fingerlings to use in the handling and transport of this species under central India weather conditions.

Keywords - anaesthetic, clove oil, Labeo rohita, stress, transportation

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I. INTRODUCTION

Anesthesia is induced as a common practice in modern aquaculture during sorting, handling, tagging, artificial reproduction procedure or surgery (Ross and Ross 1999). When fish are disturbed by way of above activities, stress-related changes in blood parameters occur within a few seconds. Stress may be defined as a natural reaction to a negative stimulus culminating in the mobilization and redirection of energy to support the “fight or flight” response (Selye 1950). During the stress response, the maintenance of important but not immediately critical functions is often sacrificed as a consequence of stress hormone release (Barton and Iwama 1991; Barton 2002). In fish, noncritical functions can include osmoregulation, reproduction, feeding, and particularly the exclusion and/or clearance of pathogens (Tort et al. 2004). As a result stressed individuals may become homeostatically compromised and suffer from tertiary consequences of stress such as increased vulnerability to disease, reduced reproductive performance, and reduced growth (Barton and Iwama 1991; Wendelaar Bonga 1997; Barton 2002; Tort et al. 2004). Anesthesia is routinely used as a valuable tool to minimize stress or physical damage (Palic et al. 2006). Clove oil is a natural product obtained from the flowers, leaves and stalk of the of Syzygium aromaticum. Its major active ingredient is oil eugenol (70-90% of clove oil by weight). It is a dark brown liquid with a rich, aromatic odour and flavor. Many studies have demonstrated that clove oil is safe, effective and cheap anesthetic for handling, transportation and other aquaculture purpose of fish (Javahery et al. 2012; Mitjana et al. 2014). Very scanty literature is available on the cultured fresh and warm water carp fish species, especially for practical use in aquaculture practices (Husen and Sharma 2014). Only one preliminary study related to anaesthetic efficacy of clove oil on rohu fry fingerlings has been reported (Farid et al. 2007). Hence this study was undertaken to add to the understanding of different concentrations of clove oil as an anesthetic in rohu fingerlings for handling and transportation purpose.

II. MATERIALS AND METHODS

The experiment was conducted at Department of Pathology, Nagpur Veterinary College, Nagpur, India. The clove oil from Dabur India P. Ltd. used in present study. The fingerlings were collected by fry net from nursery pond and kept for acclimatization in tank with regular fresh water supply for 7 days. Adequate feed was provided to fingerlings during acclimatization period. Glass
aquaria of (1×1×1) ft >45L equipped with aeration stone was used in the entire experiment. The pH of water was maintained at 7-7.2 throughout the experiment. The temperature of water and environmental was 28-30°C and 37-39°C respectively. 

The clove oil was evaluated at concentration of 15,20,25,33 and 50 µl/L. The fingerlings were starved for 24 h prior to the experiment and divided into two group each containing 6 fingerlings and transferred to experimental tank (45L) containing anaesthetic solution (10L). Only one concentration of clove oil was tested at a time. A control group was kept for every tested concentration of clove oil. For each concentration stages of anesthesia and recovery behavior were observed and recorded continuously for 12 h. After 12 h fingerlings were transferred to recovery tanks and monitored for another 24 h time for any mortality. Time of recovery was recorded in seconds using electronic stopwatch.

### III. RESULTS AND DISCUSSION

The time (min) of anaesthesia stages and recovery in rohu fingerlings are presented in table 1 &2. No mortality in rohu fingerlings was observed during the experimental period.

#### Table no.1

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Description of behavioural signs</th>
<th>Stages</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Normal</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Loss of equilibrium</td>
<td>Stage 1</td>
</tr>
<tr>
<td>3</td>
<td>Loss of gross body movements but with continued opercular movements and light narcosis</td>
<td>Stage 2</td>
</tr>
<tr>
<td>4</td>
<td>Deep narcosis with very indiscernible opercular movements</td>
<td>Stage 3</td>
</tr>
<tr>
<td>5</td>
<td>Surgical anaesthesia</td>
<td>Stage 4</td>
</tr>
</tbody>
</table>

#### Table no.2

<table>
<thead>
<tr>
<th>Concentration (µl/L)</th>
<th>Stages of anaesthesia (minutes)</th>
<th>Recovery (min)</th>
<th>Survival rate (24 hrs) (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A Normal</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>10</td>
<td>-</td>
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<td>-</td>
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<tr>
<td>15</td>
<td>..</td>
<td>6</td>
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<tr>
<td>20</td>
<td>..</td>
<td>4.5</td>
<td>5.6</td>
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<tr>
<td>25</td>
<td>..</td>
<td>4</td>
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<tr>
<td>33</td>
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<td>3.58</td>
<td>5.50</td>
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<tr>
<td>50</td>
<td>..</td>
<td>2.52</td>
<td>3.52</td>
</tr>
</tbody>
</table>

The clove oil was evaluated at concentration of 15,20,25,33 and 50 µl/L-1. Except at concentration of 15 µl/L-1 at all the concentrations surgical anaesthesia stage was observed within 10 min which indicates that the concentration of clove oil was sufficient. The clove oil concentrations between 33-50 µl/L-1 are sufficient to produce anaesthesia in a majority of fish species (Alam et al.)
2012; Hamackova et al. 2006). At given concentration of clove oil ideal anaesthetic criteria of rapid induction (< .3 min) and recovery (< .5 min) could not observed. This observation was in contrary to observation of Husen and Sharma (2015) they observed surgical anesthenia as per criteria of ideal anaesthetics at 50 µl/L-1 in rohu fingerlings. This difference could be due to temperature, body size and density of fish in the bath as these parameters influence the efficacy of most anesthetics. After recovery rohu fingerlings were observed up to 24 hrs and no mortality was recorded at any concentration of clove oil. The observations of present study will be useful in for handling procedures (e.g. measurements blood samples etc.) under Indian condition. At 10 and 15 µl/L-1 surgical anaesthesia stage was not observed and fingerlings kept in anaesthetic solution for 24. At 10 µl/L-1 light sedation i.e. reduced swimming activity slight loss of reactivity to tactile stimuli but without loss of equilibrium. At 15 µl/L-1 reduced swimming activity with complete loss of equilibrium was observed. When fingerlings were removed from anaesthetic bath after 24 h they regain all activity without any adverse effects. Ten microlitre per litre concentration can be safely used for transportation to mitigate stress of transport and reduce mortality.

IV. Conclusion

This research work will add new affirmation to anesthesia technique in rohu fish and will be applicable to the Indian Subcontinent which is home to rohu. Hence fish farmers can easily adopt this technology.

V. Acknowledgement

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BIBLIOGRAPHY