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Efficacy of Clove oil, Lidocaine-HCL and Propofol as Anesthesia in Nile tilapia *Oreochromis niloticus*

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The aquaculture sector is currently experiencing rapid growth and is seen as an efficient way to meet the increasing global need for fish. However, the intensification of aquaculture practices has made fish more vulnerable to different stressors, resulting in negative consequences. Anesthesia is frequently employed in aquaculture to tackle these challenges. Under this context, the present work aimed to evaluate the efficacy of three anesthetics including clove oil, Lidocaine-HCL and Propofol in Nile tilapia (*Oreochromis niloticus*) and assess their impact on hematological and biochemical parameters. A total of 32 fish with mean body weight 100.19 ± 2.81 g/fish and mean total length 17.54 ± 0.57 cm/fish were divided equally into four groups and named Clove oil group (30 mg/L), Propofol group (2.5 mg/L) Lidocaine-HCL group (120 mg/L), and Control group (no anesthetics). Induction time (deep induction) and recovery time were measured. To evaluate the impact of selected concentration of each anesthetic on physiological responses of Nile tilapia, the hematological indices, plasma protein and plasma glucose concentrations were measured at two blood collection times (10 minutes post-induction and 24 h post-recovery).

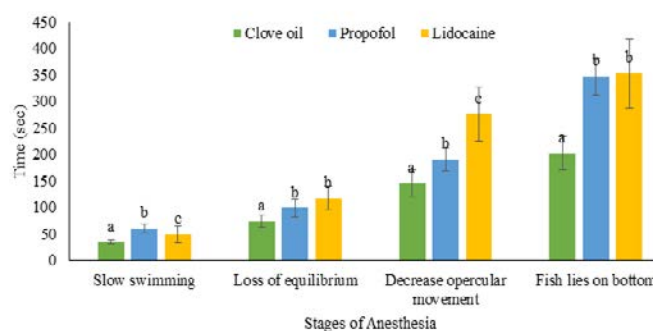


Figure: Time of the stages observed during the induction phase

The total anesthesia induction time for Clove oil (202.4 ± 32.1 sec) was significantly ($P < 0.05$) faster than by the Propofol (347.50 ± 34.77 sec) and Lidocaine-HCL (353.38 ± 65.47 sec). Similarly, fish treated with clove oil (313.5 ± 39.1 sec) also showed significantly faster rate of recovery compared to Propofol (2051.4 ± 41.7 sec) which in turn was significantly higher than those treated Lidocaine-HCL (781.1 ± 41.6 sec). To evaluate the impact of selected concentration of each anesthetic on physiological responses of Nile tilapia, the hematological indices, plasma protein and plasma glucose concentrations were measured at two blood collection times (10 minutes post-induction and 24 h post-recovery).

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To evaluate the impact of selected concentration of each anesthetic on physiological responses of Nile tilapia, the hematological indices, plasma glucose and total protein were measured. Hemoglobin, RBC Count, WBC, PCV, MCV, MCH and Platelet Count show significant differences between non-anesthetized and anesthetized group at 10 minutes post induction whereas RBC count, MCV and WBC count differed among groups at 24 h post -recovery. Irrespective of the anesthetics used, plasma glucose levels and total protein were higher in non-anesthetized group than in anesthetized groups.

Table: Time of the stages (sec) observed during the recovery phase

Treatment	Opercular and fin movement regain	Irregular balance	Total recovery (Normal swim)
Clove oil	156.8 ± 20.5^a	222.9 ± 20.6^a	313.5 ± 39.1^a
Propofol	226.4 ± 15.8^b	879.9 ± 39^c	2051.4 ± 41.6^c
Lidocaine	231.3 ± 25.4^b	456.4 ± 23.6^b	781.1 ± 41.7^b

Irrespective of the anesthetics used, plasma glucose levels and total protein were higher in non-anesthetized group than in anesthetized groups.

The findings of this study reveal that Clove oil, Propofol, and Lidocaine-HCL are effective, safe, and sufficient for completely sedating fish at the tested dosages. Clove oil ensures fast induction and recovery, ideal for short procedures whereas Propofol longer recovery time makes it suitable for longer surgical procedures, ensuring minimal deep pain during surgery, and larger interventions.