

SOME EFFECTS OF USING CLOVE OIL AS A FISH ANESTHETIC

By

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ABSTRACT

A series of studies were conducted to determine the effect of clove oil in Wild guppy (*Poecilia reticulata*), Nile tilapia (*Oreochromis niloticus*) and common carp (*Cyprinus carpio*). Female Wild guppy (*Poecilia reticulata*) (age matched) were exposed to clove oil (BDH UK- 1.041-1.054 g/ml) concentrations of 20 µl/l, 25 µl/l, 30 µl/l, 35 µl/l and 40 µl/l for one hour with 16 fish in each concentration. Induction times were obtained when the fish sank motionless to the bottom with total loss of balance and the fish were transferred to fresh water one hour after the exposure to the anesthetic and the recovery time was noted .

Clove oil concentration of 20 µl/l produced deep or mild sedation at all times. Induction times differed significantly (ANOVA, $p < 0.001$) among concentrations of 25 µl/l, 30 µl/l, 35 µl/l, and 40 µl/l and recorded as 37 ± 2.7 , 27 ± 1.6 , 9 ± 0.7 and 2 ± 0.3 minutes respectively. Clove oil concentrations of 25 µl/l and 30 µl/l did not show any mortalities and average recovery time for each concentration were 46 ± 9 seconds and 101 ± 11 seconds respectively. Only 25% of fish survived in 35 µl/l and 40 µl/l concentrations. Therefore, clove oil concentrations of 25 µl/l and 30 µl/l could be used to anesthetize Wild guppies within 37 ± 3 to, 27 ± 2 minutes respectively at 28°C and they could be handled for 33 ± 3 to 23 ± 2 minutes respectively.

In a subsequent study, female Wild guppies (age matched) were exposed to clove oil concentrations of 18 µl/l, 19 µl/l, 20 µl/l, 21 µl/l, 22 µl/l and 23 µl/l with 25 fish in

each concentration. Fish were observed for 12 hours and transferred to fresh water to note the recovery time.

Behavioral changes were not observed in 84 % and 48 % of fish in concentrations of 18 $\mu\text{l/l}$ and 19 $\mu\text{l/l}$ respectively. Majority of fish (88 %) were in mild sedation while the rest (12 %) were in deep sedation in the clove oil concentration of 20 $\mu\text{l/l}$. This concentration produced mild sedation in all the fish even after 1 h of exposure. Clove oil concentration of 21 $\mu\text{l/l}$ anesthetized 8 % of fish while the rest were in either mild (44 %) or deep sedation (48 %). Clove oil concentrations of 22 $\mu\text{l/l}$ and 23 $\mu\text{l/l}$ were lethal to a major proportion of fish (44% and 64 % respectively). All the fish in concentrations of 20 $\mu\text{l/l}$ and 21 $\mu\text{l/l}$ showed 10 minutes recovery time.

Clove oil concentration of 20 $\mu\text{l/l}$ can be recommended for procedures requiring mild sedation for an extended period of time while 21 $\mu\text{l/l}$ can be recommended for procedures requiring deep sedative effect for Wild guppy.

Nile tilapia (*Oreochromis niloticus*) and common carp (*Cyprinus carpio*) (age matched) were randomly separated to seven groups of 40 fish (20 fish from each species) to anesthetize in clove oil concentrations of 15 $\mu\text{l/l}$, 30 $\mu\text{l/l}$, 45 $\mu\text{l/l}$, 60 $\mu\text{l/l}$, 75 $\mu\text{l/l}$ and 90 $\mu\text{l/l}$ and the induction time was recorded up to 30 minutes. Anesthetized fish were immediately transferred to fresh water and the recovery time was noted. Another

experiment was conducted with the clove oil concentrations of 6 $\mu\text{l/l}$, 8 $\mu\text{l/l}$, 10 $\mu\text{l/l}$, 12 $\mu\text{l/l}$, 14 $\mu\text{l/l}$ and 16 $\mu\text{l/l}$ with a total immersion time of 12 hours.

Average induction times observed in 30 $\mu\text{l/l}$, 45 $\mu\text{l/l}$, 60 $\mu\text{l/l}$, 75 $\mu\text{l/l}$ and 90 $\mu\text{l/l}$ clove oil concentrations for tilapia were 14 ± 2.1 min, 4.5 ± 1.1 min, 2.2 ± 0.9 min, 0.7 ± 0.1 and 0.5 ± 0.2 minutes respectively while it was 13 ± 2 min, 3 ± 0.9 min, 2 ± 0.4 min, 0.9 ± 0.1 and 0.6 ± 0.1 minutes respectively for common carp. All the fish, which were kept in 15 $\mu\text{l/l}$ concentration, were found either in the stage of deep or mild sedation. Both species recovered within 90 seconds irrespective of the exposed clove oil concentrations. Clove oil concentrations of 45 $\mu\text{l/l}$, 60 $\mu\text{l/l}$ and 75 $\mu\text{l/l}$ could be used to anaesthetise both species within five minutes with 100% survival. Results from the second experiment demonstrated that clove oil concentration of 10 $\mu\text{l/l}$ and 12 $\mu\text{l/l}$ could be safely and effectively used on tilapia and common carp for sedating them for 12 hrs period.