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A study on the anaesthetic effects of clove-oil and carbon dioxide in *Portunus sanguinolentus* (blood-spotted crab)

A D Premaratne[1], E Pathirana[1*] and I Pathirana[2]
[1]*Faculty of Fisheries & Marine Science, Ocean University of Sri Lanka, Tangalle*
[2]*Department of Animal Science, University of Ruhuna, Kamburupitiya*

The authors have previously studied the effects of clove-oil (eugenol), xylazine and magnesium sulphate ($MgSO_4$) on the same species of crabs. The present study was carried out to evaluate the effects of carbon dioxide (CO_2) and to further study the effects of clove oil on blood-spotted crab (*Portunus sanguinolentus*), as anaesthetic agents.

The effects of clove-oil and CO_2 were evaluated separately, in normal, mature crabs (clove-oil, n=11; CO_2, n=5) of *Portunus sanguinolentus,* obtained from the by-catch. The average weight of the crabs was 62.60 ± 19.23 g (mean ± SD). Of the 11 crabs for clove-oil (group 1), male (n=5) and female (n=6) crabs were identified and studied separately. For group 1, clove-oil was used in a ratio of 0.15 ml per litre of sea water (clove-oil: ethanol, 1:5) in which crabs were immersed to be anaesthetized. Then crabs were maintained in this bath for a period of 30 minutes. Group 2 was immersed in sea water saturated with CO_2 (170 mg/l; pH = 6) and were maintained in the bath for a period of 15 minutes. All crabs were observed for signs of anaesthesia. The point at which an inverted crab was able to turn back to its normal position by itself, was considered as the point of complete recovery from anaesthesia.

The induction with clove oil was smooth and took 20 ± 5 minutes which lasted for 26 ± 6 minutes for male crabs, whereas none of the females showed signs of anaesthesia. Previously, the authors showed satisfactory anaesthesia in both male and female crabs of *P. sanguinolentus*, at a dose of 0.25 ml clove-oil per liter of sea water (clove-oil: ethanol, 1:3). The induction with CO_2 was also smooth and the crabs were anaesthetized in less than 5 minutes. The anaesthesia remained as long as the crabs were maintained in the CO_2 bath. In conclusion, clove-oil induced smooth and satisfactory anaesthesia in male blood-spotted crabs at the rate of 0.15 ml per litre of sea water. However, this dose seems ineffective for female crabs of the same average size. Smooth and satisfactory anaesthesia was also observed with CO_2 (170 mg/l; pH = 6) and the induction time was less compared to that of clove-oil.

erandivet@yahoo.com Tel: 0777586315