Effects of harvesting conditions on selected flesh freshness criteria and stress responses of *Trachinotus ovatus* and *Epinephelus coioides*

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摘要

本研究探討不同的收穫方式對卵形鰤鰤 (Trachinotus ovatus) (放血、
CO₂ 麻醉、冰暈、丁香油麻醉) 及點帶石斑 (Epinephelus coioides) (上述四
組加上腦部猝死組) 鮮度與生理緊迫反應之影響。分別於死亡後第 0、1、
3、6、9、12、24、48、72、96 小時進行肌肉採樣，並分析僵直指數 (RI)、
肌肉 pH 值、揮發性鹽基態氮 (VBN)、K 值及 ATP / IMP 比值、
TBARS。測定血漿中皮質醇、葡萄糖、乳酸、肌酸肌酶 (CK) 及轉氨酶
(GOT, GPT) 進行緊迫分析。卵形鰤鰤及點帶石斑之丁香油組 RI 達 100 %
所需時間最長分別在死後第 24 小時及第 12 小時，完全解僵分別在在 96
及 120 小時。丁香油組之肌肉 pH 值最高，而 CO₂ 組之肌肉 pH 值顯著
低於其他組。K 值及 TBARS 值兩種魚均以丁香油組最低，且隨儲存時
間增加而濃度逐漸上升。ATP / IMP 比值兩種魚均以丁香油組 D 高於其
他組，其次為冰暈組。卵形鰤鰤丁香油組血清皮質醇濃度低於其他組約 1.4
倍，點帶石斑卵則以腦死組最低。葡萄糖及乳酸濃度與皮質醇含量呈正相
關。CK、GOT 及 GPT 濃度兩種魚均顯著低於他組但與冰暈組相似。

本研究結果建議卵形鰤鰤及點帶石斑收穫時以丁香油配合冰暈可有效
延緩僵直起始、延長儲存期之鮮度及降低魚隻緊迫。

關鍵字：收穫、緊迫、點帶石斑、卵形鰤鰤、鮮度
Abstract

The aim of this study was to assess the independent effects of harvesting conditions on selected flesh freshness criteria and stress responses of *Trachinotus ovatus* and *Epinephalus coioides*. Five stunning/slaughtering methods, exsanguinations, CO$_2$ narcosis, hypothermia, clove oil narcosis and spiking were compared to assess their suitability as stunning methods. Sampling was performed 0, 1, 3, 6, 9, 12, 24, 48, 72 and 96 h after death and for all sampling times, rigor mortis assessment, muscle pH, volatile basic nitrogen (VBN), K value, ATP/IMP ratios and thiobarbituric acid value reactive substances (TBARS) were determined as quality parameters. Moreover, plasma cortisol, glucose, lactate, creatine kinase and transaminase (GOT, GPT) were determined as stress indicators. Both fish spices from the clove oil narcosis groups attained highest rigor scores between 12-24 h after death. The muscle pH values and ATP/IMP ratio were significantly higher in clove oil narcosis groups than other treatments. Values for VBN, K, TBARS, CK, GOT and GPT were significantly lower in the clove oil narcosis groups. Lower Cortisol production in the clove oil (*Trachinotus ovatus*) and spiking (*Epinephalus coioides*) treatments and maximum plasma cortisol levels were reached in the CO$_2$ narcosis groups. For both species, clover oil narcosis seems to be optimum method to minimize the suffering during slaughter.

Keywords: harvesting; stress; *Trachinotus ovatus*; *Epinephalus coioides*; freshness.