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Reef fish waste for production of good auality fish oil

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Fish oil is a good source for ω-3 fatty acids such as docosahexaenoic acid (DHA) and eicosapentaneoic acid (EPA). Fish oil is commercially produced using tissues or waste of cod, salmon etc. Autoxidation of unsaturated fatty acids forms hydroperoxids, aldehydes etc. giving unpleasant order and flavor to fish oil. Fish oil is not produced in Sri Lanka and it is imported. Fish waste from fish processing industries has caused environmental problems. Reef fish is more oily than other marine fish. Objective of this research was to produce good quality fish oil from waste of different reef fish species and identify a good source. *Lutjanus rivulatus* (LR), *Plectorhinchus ceylonensis* (PC) and *Lethrinus olivaceus* (LO) were bought from fish market in Madampe.

Unrefined fish oils were obtained from viscera and head region of LR, fish waste of PC and LO by solventless microwave extraction and centrifugation (2800 rpm for 10 min.). Density, saponification value, iodine value, free fatty acid level (FFA) and peroxide value (PV) were determined by AOAC and AOCS methods. Oils were refined by bentonite treatment (method-i) and acid activated bentonite treatment (method-ii). To select the best refining conditions unrefined oils were treated with adsorbents (w/w 10 %) for different time periods (45 min., 75 min., 105 min.) and PV and FAA levels were measured. Fatty acid profiles were determined by GC. Unrefined oils were used as the control. All the experiments were carried out in triplicate.

Microwave heating was limited to one minute because the colour of fish oil changed when waste was heated for more than one minute. Centrifugation lowered the turbid appearance. Yield of unrefined oil from viscera of LR (41.8 %) was higher than that of the head region (10.7 %). Yield from PC and LO were 10.7 % and 3.1 % respectively. Refining changed the orange colour of the oil of LR to yellow due to removal of pigments by the adsorbents. Yellow colour of other two oils remained unchanged. Density, saponification value, iodine value and FFA level of the unrefined oils agreed with values given by International fish oil standards (IFOS), but PV of the oils from viscera of LR (5.5 meq kg^{-1}) and wastes of PC (5.3 meq kg^{-1}) were higher than the allowed maximum level (4.9 meq kg^{-1}). Comparison of effect of refining methods (i) and (ii) are shown in Table 1.

Table 1: Comparison of effect of refining methods (i) and (ii) on PV

	PV (meq kg^{-1})	
	LR viscera oil	PC waste oil
Allowed level	4.9	4.0
unrefined	5.5	5.3
Refining method (i), 75 min.	4.3	3.8
Refining method (ii), 75 min.	3.8	1.4

According to Table 1, both refining methods are good to lwer the PV.

Table 2: Comparison of effect of refining methods (i) and (ii) on FFA

	FFA (meq kg^{-1})	
	LR viscera oil	LR head region
unrefined	0.9	0.9
Refining method (i), 75 min.	0.6	0.6
Refining method (ii), 75 min.	0.9	1.0

As shown in Table 2, Effect of method- ii on lowering the FFA level is poor. Therefore the refining metod (ii) was rejected.

Table 3: Comparison of DHA and arachidonic acid levels of the oils obtained by the methd (i), 75 min

	DHA level (%)	Arachidonic acid level (%)
Oil from LR viscera	4.1	6.1
Oil from waste of PC	5.1	9.3
Reported values for shark liver oil	4.1	6.1

According to Table 3, oil obtained by the method (i) from waste of PC is better than the oil from viscera of LR and the reported values for shark liver oil.