

## Effect of plant extracts from *Plectranthus amboinicus*, *Moringa oleifera* and *Ocimum sanctum* Linn as a natural inhibitor on oxidation of fish oil

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Polyunsaturated fatty acids present in fish oil (FO) are highly susceptible to oxidation. Natural and synthetic antioxidants are effectively applied to stabilize FO against oxidation. This study was focused to evaluate the synergistic antioxidant effect of three plant extracts (1% w/v) prepared from *Plectranthus amboinicus* (Country borage, K), *Moringa oleifera* (Drumstick, M) and *Ocimum sanctum* Linn (Tulsi, T). Plant extracts were added individually and, in several combinations. FO oxidation process and FAC were studied under accelerated conditions (60 °C for 15 days) comparing with butylated hydroxy anisole (BHA). Total phenol content (TPC) was determined by Folin-Ciocalteu colorimetric method and 1-Diphenyl-2-picrylhydrazyl radical scavenging percentage (DPPH %) was measured to investigate the antioxidant activity. Peroxide value (PV), p-anisidine value (AV), and total oxidation (TOTOX) were determined to evaluate the stability of FO against oxidation and FAC was analyzed by Gas Chromatography-Mass Spectrometry. TPC was significantly changed ( $p < 0.05$ ) among the plant extracts as  $T > M > K$ . BHA showed the highest DPPH%. PV and

AV of all the samples were increased ( $p < 0.05$ ) during the storage. The lowest PV was recorded by T: M: K = 2:1:1 as  $42.27 \pm 0.94$  mEq O<sub>2</sub> kg<sup>-1</sup> while the lowest ( $p < 0.05$ ) AV was detected by FO treated with T: M: K = 1:1:1 as  $17.75 \pm 4.85$  at day 15. The lowest TOTOX ( $109.88 \pm 7.61$ ) was revealed that T: M: K = 2:1:1 combination was significantly reduced ( $p < 0.05$ ) FO oxidation compared to BHA and other treatments. The highest ( $p < 0.05$ ) Eicosapentaenoic acid + Docosahexaenoic acid content ( $201.37 \pm 2.87$  mg /g) and retention percentage (55.4%) was recorded by the T: M: K = 2:1:1 combination. Results revealed that T: M: K = 2:1:1 combination could be applied as a synergistic natural antioxidant combination to stabilize fish oil.

**Keywords:** Fish oil oxidation; Natural antioxidant; Gas chromatography-mass spectrometry; synergistic.

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