

**EFFECT OF PHYSICALLY STRUCTURED WATER PRODUCED BY
NANO-TOURMALINE IMPREGNATED CERAMIC BEADS ON
IMPROVING EXTRACTABILITY OF CAFFEINE, CURCUMIN AND
OIL EMULSIFICATION**

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Physically structured water (PSW) possesses reduced molecular cluster structure. The study researched into identifying the effect of PSW on caffeine and curcumin extractability and oil emulsification. PSW obtained using a column of nano-tourmaline impregnated ceramic balls was compared with non-structured water (NSW) based on physical properties. ORP, pH and NMR frequency of PSW and NSW were different ($P > 0.05$), and were -113 & $+97$ mV, 8.64 ± 0.08 & 6.83 ± 0.06 and 55 & 120 -Hz respectively. Caffeine was extracted from black tea, green tea, coffee and instant coffee at 24.5 ± 0.2 and $95 \pm 2^\circ\text{C}$ for 30 min in triplicate using PSW and NSW (2×2 factorial, CRD) and quantified by spectrophotometry (273 nm). PSW increased ($P < 0.05$) the extractability of caffeine at 95°C by 83.6% (black tea), 79.7% (coffee), 56.6% (green tea) and 3.6% (instant coffee). Caffeine contents from black tea (63.2 mg l^{-1}), coffee (60.2 mg l^{-1}) and instant coffee (135.0 mg l^{-1}) with PSW at $24.5 \pm 0.2^\circ\text{C}$ were not different ($P > 0.05$) from the contents extracted at $95 \pm 2^\circ\text{C}$ with NSW. Curcumin was extracted from turmeric powder (sieve size, 300 μ) at 24.5 ± 0.2 and $95 \pm 2^\circ\text{C}$ for 20 min in triplicate using PSW and NSW (2×2 factorial, CRD), and the absorbencies (420 nm) of the extracts were compared. PSW increased ($P < 0.05$) the extractability of curcumin at $95 \pm 2^\circ\text{C}$ by 430% and at $24.5 \pm 0.2^\circ\text{C}$ by 282% . Virgin coconut (VCO), sunflower and olive oils were sonicated (50 -Hz, 5 min) in triplicate with PSW and NSW in a CRD, and the turbidity at 500 nm were measured daily for 6 days. Turbidity of VCO was significantly higher ($P < 0.05$) by 1.1 -, 1.2 -, 1.2 -, 1.2 -, 1.2 - and 1.5 -fold on day 1, 2, 3, 4, 5 and 6 respectively when treated with PSW than with NSW. Similar pattern of turbidity was evident in other oils. PSW is more effective than NSW in extracting caffeine and curcumin and emulsifying oil.