

Drug Discovery in Aqueous Stream of Palm Oil Milling

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A novel process was developed at MPOB for the recovery of valuable antioxidants with potential drug application from the aqueous stream of palm oil milling. Palm oil is the second most important edible oil in the world. The global palm oil industry generates about 68 million tonnes of aqueous by-products most of which are discarded as waste. Malaysia alone accounts for about 30 million tonnes of aqueous waste annually. Discharge of the untreated waste from any edible oil production including palm oil is highly polluting and this continues to be a global environmental concern. Although Malaysia has enforced stringent regulatory environmental standards, the challenge of converting such agricultural waste to high value products has until now remained elusive. The process for the recovery of antioxidants from the aqueous stream of palm oil milling provides an opportunity and a financial incentive to reduce pollution. The aqueous extract is rich in phenolic antioxidants, i.e. flavonoids, polyphenols and phenolic acids. It is also rich in water-soluble vitamins and organic acids. Flash chromatography coupled with biochemical assays confirmed potent free radical scavenging and reducing activities in several fractions. Cell culture studies using both human mammary and melanoma cell lines indicated that at low dosage, the crude extract significantly inhibited the progression of these cell lines. At high doses the extract was cytotoxic. However, it had no effect on the normal cell lines. Preliminary investigations suggest an apoptotic mechanism of action of the extract on the cancer cell lines. A rabbit atherosclerosis model indicated that the crude extract significantly reduced atherogenesis in rabbits maintained on an atherogenic diet. Histological studies did not indicate any changes that could be attributed to toxicity of the extract. Balb/C mice were yet another animal model used to test the extract. The mice were injected with skin melanoma cells and the extract showed potent anti-cancer activity as evidenced by the very small number of mice fed on the extract that developed the cancer compared to control mice. The tumour load was also significantly lower. Histological studies indicated that the extract did not have any effect on any of the other organs of the Balb/C mice. Microarray studies have been initiated to understand the mechanism of action of the extract and to further develop the extract for drug purposes.