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Applications of the antioxidant activity of Betel in food

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Piper betle L. (Family: Piperaceae, *Sinhala.* Bulath) is a common medicinal plant that possess potent antioxidant activity. The aim of this study was to evaluate the antioxidant potential of *Piper betle* hot water extract (HWE), cold ethanolic extract (CEE), essential oil(EO) with storage time and at elevated temperatures (170 – 200 ^{0}C) using DPPH (2, 2 – diphenyl –1 –picrylhydrazyl) scavenging method. In addition, the effect of CEE and EO on rancidity of fats (cake margarine) and oils (coconut oil and palm oil) was also determined. The rancidity of the fats and oils was determined by analyzing the peroxide values (PV) and free fatty acid (FFA) levels according to the AOAC methods.

Results showed that antioxidant activity of HWE, CEE and EO did not significantly deviate from the initial antioxidant potential (in terms of EC_{50} values) up to 12 months. The initial free radical scavenging activity of CEE was higher than that of BHT /butylated hydroxytoluene (EC_{50} of CEE and BHT : 6.2, 8.3 μg / mL) and lower than BHA / butylated hydroxyanisole (EC_{50} : 2.3μg / mL). In contrast, EC_{50} values of both HWE (EC_{50} : 17.5 μg / mL) and EO (EC_{50} : 12.7 μg / mL) were lower than that of BHT and BHA. However, when these extracts were exposed to elevated temperatures antioxidant activity was significantly reduced (EC_{50} values of CEE, BHT , BHA increased by 4 folds and HWE by 3 folds) compared to their initial values. The reduction of antioxidant activity of CEE was lesser than that of BHT and BHA possessed best antioxidant activity among the tested extracts even after exposure to elevated temperatures. FFA levels and PV were significantly lower in CEE and EO (at 100 ppm level) incorporated cake margarine samples compared to that of BHT (at 100 ppm level) incorporated samples up to 24 weeks at room temperature. Further, PV were significantly lower in CEE and EO (at 200 ppm level) incorporate coconut oil and palm oil compared to that of BHT (at 200 ppm level) treated samples up to 2 weeks at 50 ^{0}C. It can be concluded that these results indicate the ability of CEE and EO of *P. betle* leaves to delay the rancidity of fat and oil based products at room temperature or moderate temperatures. Further, under elevated temperatures antioxidant activity is reduced possibly due to change in the chemical constituents. In conclusion, this study revealed the antioxidant activity of *P. betle* extracts at three different stages of temperature (room, moderate and elevated temperature) and possible applications in food industry to reduce rancidity.

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