

Public Abstract

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Title:FUNCTIONALITY OF AZADIRACHTA INDICA A. JUSS (NEEM) IN BEVERAGES

A significant increase in the health consciousness of people all around the world has rekindled interest in age old medicinal systems such as Ayurveda and Unani. The various trees, herbs and shrubs used in these ancient practices are being incorporated today into foods and beverages to meet the health expectations of consumers from their diet. There is an intense curiosity among analytical chemists to identify the compounds that contribute to the health benefits. Azadirachta indica A. Juss is one such medicinal tree, indigenous to the Indian sub-continent that has found a revered place among village folks for its medicinal properties in being able to cure gastro-intestinal, dental and skin problems. Modern day research on cancer cell lines and animal models have shown neem to possess excellent anti-inflammatory, anti-cancer and anti-diabetic properties. In the first section, we analyze commercially available neem in the United States for its bio-active potential and contrast it with traditionally consumed teas- green and black tea. We found that the total polyphenols and anti-oxidant activities in green and black tea are far higher than in neem, possibly due to the presence of flavan-3-ols in these teas. However, we used LC-ESI-MS/MS to identify specific flavonols- myricetin, quercetin and kaempferol in neem leaves, which were present in greater quantities in neem than in these teas. These flavonols have been known to impart neem its anti diabetic property and therefore, its identification and quantification was crucial. In the second study, we examine the volatile profile of various neem leaf samples- powdered, dried and fresh, through solid phase microextraction (SPME) and essential oil extraction and analyze the constituents using gas chromatography-mass spectrometry. Fresh leaves

contain organosulfur compounds that are absent in other

samples. There is a preponderance of sesquiterpenes found in dried leaves and leaf powder. Diterpenes and acids were found to be major distinguishing factors between the HS-SPME and essential oil volatile composition of dried neem leaf powder. The study reveals information about the aroma profile of different neem samples besides lending credence to its health properties as some of the volatiles identified are known to possess health properties. In the third section, we see explore the effect of two adsorbent based de-bittering strategies on the bioactive potential and organoleptic properties of neem tea. While both the solid phase extraction (SPE) and Amberlite XAD-16 (AMB) are successful in reducing the bitterness, both lead to a reduction in flavonol, total polyphenol, limonoid glucoside and anti-oxidant activity. On comparison, the

reduction in SPE- treated neem tea is more than the AMB-treated, although both treatments lead to the removal of sesquiterpenes from the volatile profile. Given our results, the approach of using polyadsorbent resins for de-bittering purposes can be pursued further. In the final section, we explore the area of Ready to Drink beverages (RTD's) and the consequences of adding milk to tea. We observe, that while tea matrix-green, neem and black tea, does not affect the decrease in flavonols-myricetin, quercetin and kaempferol, the overall in-vitro phenolic content and anti-oxidant activity is reduced more markedly in green and black tea.

Among the different added milks, soya milk appeared to have the least effect on flavonols, phenolic content and anti-oxidant activity, in contrast with bovine and soya. Although, protein-flavonoid interactions are considered to be important, the change in protein content of milk did not explain the changes in-vitro effect on phenolic

compounds and consequent anti-oxidant activity.