PINE: A SURVEY OF ITS VALUE ADDED PHYTOCHEMICALS

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Despite the fact that U.S. forests can absorb up to 14% of U.S. CO2 emissions, forest values is at constant risk because of the decline in housing, paper and paperboard markets. The 746 million acres of U.S. forests have the potential to supply more than 650 million m^3/year for industrial use, and southeast U.S. forests have the potential to supply 167 million m^3/year of pine. In addition of supplying wood for lumber, paper and pellet manufacturing, pine contains numerous phytochemicals that could be extracted prior to traditional uses. Dating back to the Great Depression, compounds leading to turpentine manufacturing were incorporated into southern US pulp and paper mills. As we continue to confront a changing environment of forest product needs, these alternative products may need to be assessed for tree improvement. Pine bark is a prime candidate for extraction of compounds with biological activity; work conducted in Scandinavia reported on bark extracted with ethanol, yielding phenolic compounds that displayed anti-inflammatory properties. Recently, Arkansas-grown pine needles were extracted by hydrodistillation, yielding essential oils (EO) containing, among others, α-pinene, β-pinene, D-limonene, terpineol, and (-) caryophyllene. It was determined that pine EO composition did not change as a function of sampling date. The sum of the percent content of α-pinene, β-pinene, D-limonene, terpineol and (-) caryophyllene, added together, in pine EO for April, May, June, July and September samples were 67.3, 67.7, 69.4, 67.5, and 75.5 %, respectively. Using the disk diffusion assay, the produced pine EO was tested against methicillin resistant strains of Staphylococcus aureus. Results showed that growth of *S. aureus* strain 13136, an intermediate methicillin resistant strain, was inhibited by pine EO. Pine EO was also tested for inhibition of Listeria monocytogenes, an important food borne pathogen, using the disk diffusion assay. Toxicity of pine EO was tested using the MTT [3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide] assay. Results showed that pine EO preparations containing up to 0.63% did not affect the viability of mammalian cells, which in this assay were Caco-2 human colon cancer cells.

The above-described results indicate that phytochemicals could be extracted from pine bark and needles, providing compounds that have multiple societal benefits. Successful identification of phytochemicals and ensuing use could prove to be a mode of adding value to traditional forestry operations.

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