



INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

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Thesis Title: **Extraction of Dietary Bioactive Components from Sea Buckthorn Leaves and Whole Berries using Organic Solvent and Supercritical CO₂, and Its Application in the Synthesis of Silver Nano Particles**

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SHORT ABSTRACT

The berries and leaves of *Hippophae salicifolia* have nutritional and bioactive characteristics, with the leaves being more nutritious and physiologically active than the berries. Vitamin C was the most abundant phytonutrient in the berries, whereas the leaves had the highest total soluble sugar concentration. The berries and mixture of leaves were successively extracted using n-hexane, chloroform, ethyl acetate, acetone, methanol, and water. Total phenolic content (TPC) was highest in the leaves-methanol extract (157.97 ± 2.09 mg GAE/g) and berries-aqueous extract (48.45 ± 1.94 mg GAE/g). Berries-aqueous and leaves-methanol extracts showed excellent global antioxidant scores. Further, extraction of polyphenolic compounds from *H. salicifolia* leaves using supercritical carbon dioxide (SC-CO₂) was optimized to achieve maximum yield of extraction, TPC and antioxidant activity. Under optimized condition. the experimental data showed good agreement with the predicted values. SC-CO₂ extraction was more selective for the extraction of ferulic acid, myricetin, and quercetin. SC-CO₂ extracts demonstrated notable antibacterial activity. In addition, process variables (pressure, temperature, and CO₂ flow rate) for oil extraction from *H. salicifolia* berries using SC-CO₂ were optimized with the objective to achieve maximum oil yield, β -carotene, and total tocopherol contents. CO₂ flow rate had a maximum effect on oil yield, while pressure showed a significant influence on β -carotene and total tocopherol contents of oil. The optimum extraction condition was 27.02 MPa pressure, 48.46 °C temperature, 16.45 g/min CO₂ flow rate. The oils extracted using solvent and SC-CO₂ extraction contained 92.72 and 91.42% UFA. SC-CO₂ extracted oil had higher TPC and antioxidant activity than solvent extracted oil. SC-CO₂ extracted oil exhibited lower thermal stability and higher resistance to mechanical stress. Finally, silver nanoparticles (Ag NPs) were synthesized using methanol and aqueous extracts of *H. salicifolia* leaves and berries. Phenolics, proteins, benzenes, and sulforaphane are responsible for converting Ag⁺ to Ag⁰. Ag NPs were spherical with an average particle size of 7.87 ± 2.9 nm to 13.86 ± 5 nm. Ag NPs synthesized using aqueous extracts were smaller than those synthesized using methanol. Whereas Ag NPs produced from methanolic extract of leaves exhibited the highest antioxidant and antibacterial activity.