Forensic Profiling of Rhinoceros Horn

Dr. Johan Linde
Faculty of Science, Department of Chemistry, Tshwane University of Technology, Nelson Mandela Drive, Arcadia, Pretoria, South Africa

Abstract:

Rhino populations in Africa and Asia face a severe threat from escalating horn trafficking, driven by persistent international demand that hampers conservation and strains law enforcement. Forensic profiling has emerged as a vital tool to combat this illegal trade. By applying advanced chemical, physical, and molecular techniques to analyze unique signatures in rhino horn, researchers can detect hidden contraband, distinguish authentic horn from counterfeits, and trace seized materials back to their geographic origins.

Rhino horn samples (100) were collected at Skukuza camp in the Kruger National Park. Fifty white and black rhino horns were selected for the study. Samples were collected by drilling into the base of the horn. Gas chromatographic analysis was performed using a Leco® Pegasus 4D, GC system comprising an Agilent 6890A GC and a ToF-MS. The system was operated in one–dimensional (1D) mode. Compounds were tentatively identified by comparing mass spectra with those in commercial libraries (NIST11®) and comparing experimental retention indices (RI) with those obtained from the online NIST Chemistry Webbook or literature. The GC-MS chromatograms revealed that certain volatile compounds occur consistently in both species. When a supervised OPLS-DA model was generated, a clear separation between the volatile profiles of the black and white rhinos was achieved. These shared chemical signatures can serve as a diagnostic tool to verify whether an unknown, suspected sample is indeed genuine rhino horn.