1. General introduction

Medicinal plants have been recognised for their therapeutic potential, and they continue to be a significant resource in the search for new medication alternatives. Natural plant-derived chemicals have become popular for the treatment of several diseases. Concurrently, there has been a decline in the number of recent pharmaceuticals being released to the market, leading to a renewed scientific focus on investigating natural sources for the purpose of drug discovery, despite the recognized challenges associated with this endeavor.

Ethnomedicinal studies have shown various scopes in developing a number of drugs to solve multiple challenges in the health sector (Basu et al., 2023; Haris et al., 2023; Priya and Kumar, M., 2023; Ranasinghe et al., 2023; Reddy et al., 2023). Even though every plant species is a valuable, useful, and versatile source of phytochemicals, crediting to their healing property, plant families belonging to gymnosperm are recognized for their unique and important phytochemicals with curative properties against different diseases. Taxaceae family belongs to gymnosperm which contains a large number of terpenoids mostly diterpenoids with anticancer activity. Our plant of interest is *T. wallichiana* or Himalayan yew (Figure 1A). As cancer remains one of the major causes of death worldwide, the search for effective treatments remains critical. The marker compound derived from the chosen medicinal plant is paclitaxel, a taxane that has attracted significant attention for its broad utility in the field of cancer research. Paclitaxel (Figure 1B) is an alkaloidal diterpenoid that has been found to be efficacious against several human cancers. Identifying a specific marker component, usually found only in plants, or conducting a comprehensive phytochemical analysis of any plant-derived product, is essential for evaluating its authenticity and efficacy. The phytochemicals found exclusively in plants serve the dual purpose of verifying the botanical identity of the product and offering valuable information regarding its possible medicinal characteristics and pharmacological activity. Researchers can determine the quality, purity, and consistency of herbal medicines, nutritional supplements, or pharmaceutical formulations by detecting and measuring these bioactive components. The utilization of this analytical methodology facilitates the maintenance of product integrity, the facilitation of regulatory compliance, and the provision of guidance for evidence-based therapeutic interventions. The primary objective of this research is to estimate phytochemicals and assess the estimation of marker compounds in *T. wallichiana* using densitometric HPTLC. As yew is a slow-growing plant and the presence of taxane in it very low (0.001-0.05%), it hampers commercial production of this anti-cancer drug (Kumar et

al., 2019). Additionally, phytochemical content varies according to the season, time, geographical location, and altitude. The present study thus focuses primarily on the selection of high-yielding Himalayan yew chemotypes in terms of paclitaxel content. Apart from this present study also aims to find out other phytochemicals and toxicological aspects of different chemotypes.

Figure 1A. *Taxus wallichiana* Zucc.

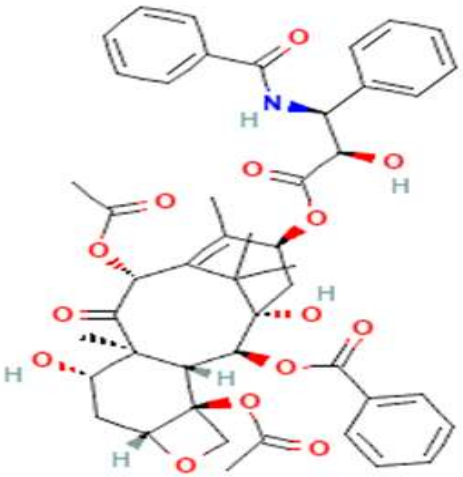

Figure 1B. Chemical structure of paclitaxel (Compound CID: 36314)

Keeping the above information in view, the objectives of the present study are as follows:

1. Collection and identification of *T. wallichiana* from the Himalayas.
2. Identification of elite chemotypes in terms of paclitaxel production from different Himalayan population of *T. wallichiana* using a validated HPTLC method.
3. Quantification of altitudinal, seasonal, and tissue specific variation of paclitaxel based on different chemotypes.
4. Qualitative and/or quantitative detection of some other phytochemicals from the selected chemotypes.
5. Genotoxicity assessment of the various plant extracts and pure compound**.**