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## White birches buds: Chemical composition and perspectives for therapy of tumors

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Birch buds (*Betulae gemmae*) are widely used in Russian and Chinese traditional medicine not only as a diuretic and diaphoretic agent but also as an antiseptic, anti-inflammatory and analgesic. In spite of long history of therapeutic use of birch buds in folk medicine the existing information about their chemical composition and pharmacological effects is insufficient. The present study was designed to investigate the chemical composition of buds from two species of white birch and the *in vitro* cytotoxic effect of extracts from these sources on selected tumor cells. Extracts of *Betula pubescens* Ehrh. and *Betula pendula* Roth buds were obtained using three different methods like supercritical carbon dioxide extraction by washing of exudate covering the whole buds and extraction of milled buds with diethyl ether. The chemical composition of extracts was investigated by GC-MS method; cytotoxicity was determined by MTT assay using cancerous Ishikawa, MCF-7, MDA-MB-231, DLD-1, HeLa and normal skin fibroblasts as target cells. Anticancer drugs cisplatin, melphalan and 5-fluorouracil were used as reference agents. As the result of GC-MS investigation, 150 substances of different classes were identified in all extracts. The chemical composition of *B. pubescens* and *B. pendula* buds was highly contrasting. Bud extracts of the former have contained relatively high quantity of sesquiterpenoids and flavonoids, while the latter main components of extracts were from the triterpenoids. The results of biological assay indicated that birch bud extracts has demonstrated the concentration dependent and differential cytotoxicity which is rather weak at 30 µg/mL, moderate to high at 100 µg/mL and very high at 300 µg/mL. The highest cytotoxic activity had bud exudates obtained from both *betulae* species and SFE extract from *B. pendula* exert greater cytotoxic effects than SFE extract from *B. pubescens* and ether extracts. The rich composition of birch buds suggests possible wider spectrum of their biological activity than showed old commendations. It was stated that birch bud extracts could be a promising source of compounds with cytotoxic activity against various cancers.

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