In vitro or in vivo Studies Disclosed the Antioxidant and Anticancer Activities of Mikania micrantha, an Invasive Alien Species in the World

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Mikania micrantha is one of the worst invasive alien species in the world. This exotic noxious weed is a perennial creeping climber grows vigorously in East Asia and US (especially Florida), and heavily damages Taiwan's ecosystem. This study examined the in vitro or in vivo anti-tumor, apoptosis, anti-angiogenesis, anti-metastasis, and antioxidant activities of ethanol extracts of Mikania micrantha leaf (MML), and revealed the underlying molecular mechanism. In vivo data showed that MML effectively inhibited the tumor growth in triple-negative breast cancer (MDA-MB-231) and leukemia (HL-60) cell xenografted nude mice. Bioluminescence imaging further confirmed MML inhibited lung metastasis in living MDA-MB-231-luc-injected nude mice. In vitro data showed that MML significantly inhibited the proliferation of breast cancer and leukemia cells. Furthermore, MML induced apoptosis, which was associated with DNA fragmentation, followed by a sequence of events, including ROS generation, cytochrome c release, caspase-3 activation, PARP cleavage, and Bax/Bcl-2 dysregulation in cancer cells. Notably, non-cytotoxic concentrations of MML inhibited VEGF-induced migration, invasion, tube formation, and MMP-9 expression in endothelial EA.hy 926 cells. Anti-metastatic effect of MML was further confirmed by inhibition of migration, invasion, and MMP-9/VEGF expressions in highly metastatic MDA-MB-231 cells. Antioxidant activity of MML was evidenced by DPPH radical scavenging activity, which could be due the presence of total polyphenols (52 mg/g). Furthermore, HPLC chemical fingerprint and active constituent (dihydromikanolide) in MML extracts were characterized. In conclusion, Mikania micrantha possesses antioxidant and anti-cancer effects that could be used in cancer chemotherapy.

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