Ecological Requirements, Antioxidant Activity and New Chemotype Essential Oil from *Achillea millefolium* L. and *Achillea micrantha* Wild. in North of Iran (Golestan Province)

Masoumeh Mazandarani1*, Narges Osia2, Azad Khalili Mosavi2, Houman Bayat3

1 Department of Botany, Gorgan Branch, Islamic Azad University, Gorgan, Iran
2 Department of Agriculture, Astara Branch, Islamic Azad University, Astara, Iran
3 Pharmacist, Niak Pharmaceutical Lab, Gorgan, Iran

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Abstract

In many field observation, ecological equipment, phenology and ethnopharmacological data of *Achillea millefolium* L. and *A. micrantha* Wild. were studied. The inflorescences of plants were collected in different locations of Golestan province: Chaharbagh (2000 m) and Dozan (2200 m) respectively. Essential oils were obtained by steam distillation (Clevenger) and analyzed by gas chromatography-mass spectrometry (GC-MS). Total phenol (TP) and total flavonoid (TF) were determined with spectro photo meteri. Antioxidant properties were obtained by three radical scavenging activity methods: reducing power (RP), total antioxidant capacity (TAC) and 2,2-Diphenyl-1-picrylhydrazyl (DPPH). Field observation showed that both species of *Achillea* are perennial aromatic plants which can grow 30 to 70 cm tall, flowers appeared in mid to late of May where the annual average rainfall were 399-345 mm, in sandy loam to silty clay loam soil. These plants has been used in traditional medicine as antibacterial, anti infection ,anti spasm, sedative, astringent, anti nociceptive and wound healing. Flowers essential oils of *A. millefolium* and *A. micrantha* were characterized by higher amounts of similar constituents: binacryle (63.82%–83.63%), 1-8 cineol (14.97%–3.76%) and α-selinene (4.81%–4.49%) respectively. TP content (12.34±0.264 to 18.44±0.085 mgGAEG ml) and TF contents (61.003±2.38 to 80.30±5.793 mgQUE g–1) were measured in *A. micrantha* and *A. millefolium*, respectively. *A. micrantha* had more antioxidant activity with IC50 0.184±0.0475 µg/ml in dry weight in DPPH method than *A. millefolium* (IC50 0.178±0.178 µg/ml in dry weight in RP method). According to the results, there is a positive correlation between antioxidant activity and important secondary metabolites (TP, TF), this could help to study more about the application of these plants in traditional medicine as an antiseptic, anti spasm and antibacterial agent.

**Key words:** *A. millefolium* L., *A micrantha* Wild., Autecology, Essential oil, TF, TP, Antioxidant capacity, Golestan province, Iran