Artemisia annua L.: a traditional Chinese medicinal plant for a modern weed management ?

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Traditionally, the interference between plants has been attributed to the competition for environmental resources such as water, light and nutrients. Now, several scientists investigate another aspect of plant interference, allelopathy, which is the release by one plant of chemicals that affect other plants in the vicinity (Anaya, 1999). The relevance of this phenomenon in ecosystems is presently the subject of a strong scientific debate, but recent results plead for its importance in both natural and agricultural environments (Birkett et al., 2001; Ridenour & Callaway, 2001). Understanding allelopathy could influence different agronomic practices, especially in weed management. For instance, the weed-suppressive activity of several cover crops has been attributed to the release of allelochemicals (Lydon et al., 1997).

From lab, glasshouse and field experiments, we selected several species with very potent allelopathic properties, the most promising species being *Artemisia annua*, a Chinese medicinal plant. This plant is known to produce artemisinin, a sesquiterpene lactone with very potent antimalarial activities and also strong phytotoxic properties (Duke et al., 1987). In the past years, we developed a strain of *A. annua* very rich in artemisinin: "Artemis" (Delabays et al., 2001). We also gathered accessions with almost no artemisinin ("Göttin") that we can now use as an "internal standard" in lab and field experiments aimed at assessing the allelopathic properties of the plant and the role played by artemisinin.
In *in vitro* bioassays, water extract from the leaves of artemisinin-rich *Artemsisia annua* proved strongly phytotoxic, while no inhibitory effects could be observed with water extracts from artemisinin-poor *A. annua.*
In field trials (2000, 2001 and 2002), incorporation into the soil of dry leaves of artemisinin-rich *A. annua* significantly reduced weed emergence (between 65 and 80 %) and weed dry weight (>80 %). With leaves from artemisinin-poor *A. annua* the observed effects ranged from no inhibition to a significantly lower inhibition of weed development
Also, soil analysis confirmed the presence of artemisinin up to 8 weeks after the incorporation of artemisinin-rich leaves.

These results support both the involvement of artemisinin in the inhibitory effects observed in the fields and the allelopathy hypothesis. Nevertheless, results obtained in 2001 and 2002 with *Aremisia annua* strain "Göttin" (low artemisinin content) indicate that other molecules are perhaps also involved, as already suggested by Lydon et al. (1997) in their trials carried out with artemisinin-poor *A. annua* plants.

References

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