

**THE ALLELOPATHIC PROPERTIES
OF OLEANOLIC ACID 3-O-MONOGLUCOSIDE SECRETED BY ROOTS
OF *CALENDULA OFFICINALIS* TO THE SOIL**

Ruszkowski D., Uniewicz K., Auguścińska E., Janiszowska W.

*Department of Plant Biochemistry, Institute of Biochemistry,
Warsaw University, 1 Miecznikowa St., 02-096 Warszawa*

Many dicotyledonous plants accumulate a wide range of triterpenic oleanolic acid (OL) glycosides. There is an array of pharmaceutical products derived from some of these plants, which are used for the treatment of various diseases and ailments. Marigold (*Calendula officinalis* L.) well known for its medicinal properties and cosmetic use, contains two series of OL glycosides, i.e. “glucosides” (derivatives of 3-O-monoglucoside) and “glucuronides” (derivatives of 3-O-monoglucuronide). Our previous studies have shown that all glycosides of OL are synthesized in leaves. Glucuronides arise slowly but steadily and then they are transported to and stored in flowers, while glucosides are quickly synthesized and two “pentaglucosides” are systemically transported to roots where they undergo gradual deglycosylation to 3-O-monoglucoside. All OL glycosides have biological activity depending on the number and the type of bound carbohydrate moieties. Glucosides are mainly haemolytic agents and glucuronides are potent fungistatics and bacteriolytics.

Recently we have shown that marigold secretes 3-O-monoglucoside (I) to the medium during vegetation. So the aim of the present study was to examine allelopathic properties of this compound.

In order to determine the allelopathic potential of I we studied the inhibition of seed germination of lettuce (*Lactuca sativa*), cuckoo-flower (*Cardamine pratensis*) and wheat (*Triticum aestivum*). In addition, the inhibition or stimulation of root and hypocotyl growth was determined which is often a more sensitive parameter than the germination rate alone.

Bioassays were performed by adding 5ml of test solution (10, 150 or 300 µg/ml) to 50 target seeds placed on a sheet of Whatman No1 filter paper in a 10 cm diameter Petri dishes kept in the dark at 23°C for 3 days until the control seeds had germinated. Bioassay results were tabulated as percent of germination and as radicle and shoot lengths of germinated seedlings in comparison to control. The obtained results showed that I completely inhibited the germination of *L. sativa* at 150 µg/ml, slightly that of wheat (10-18%) whereas the cuckoo-flower seeds were unaffected by in the ranges of I concentrations used in the bioassays.

Low concentration of I (10 µg/ml) stimulated the root growth of *L. sativa* and *C. pratensis* seedlings by 20 and 14% but higher concentration inhibited by about 60-40% respectively. The shoot growth was inhibited by 17-40% depending on the tested plant and the concentration of I.

The results show that 3-O-monoglucoside of oleanolic acid secreted to the soil possesses very strong allelopathic properties in relation to the dicotyledons and weaker activity to the monocotyledons.