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Allelopathic effect of ursolic acid on growth and physiology of green gram cultivar KM-2

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SUMMARY

Allelopathic effect of ursolic acid, a secondary metabolite obtained from the leaves of *Canthium dicoccum* on the germination, growth and some physiological aspects of green gram (*Vigna radiata)* cultivar KM-2 was investigated in this study. The negative influence on the green gram was maximum in ursolic acid treated plants (2.0mm) than control was evident from the bioassay and pot culture studies. The inhibition of seed germination and the decrease of seedling growth increased with increasing concentration of ursolic acid was very well understood from the morphometric measurement on root, shoot length, leaf area and biomass. Correspondingly the total number of lateral roots and the number of root nodules were very much reduced proportionately with increasing concentrations of ursolic acid treatment. There was considerable reduction in the level of photosynthetic pigments, total sugars, starch as well as soluble protein in the treated plants. The increased level of Malondialdehyde (MDA) suggested the negative influence of test solutions on membrane integrity and the increased activity of the oxidative enzymes such as Polyphenol oxidase (PPO) and Peroxidase (PO) through light on the production of enzymes to over come the effect of stress produced by the allelo chemical.

Key words : Allelochemical, Growth, Green gram, Photosynthetic pigment, Antioxidants.

Allelopathy, the term to refers the Inhibitary or stimulatory interaction between all types of plants including micro-organisms (Molisch, 1937). It refers to both autotoxic and hetrotoxic effect. Harbone (1989) studied that variety of chemicals may be released in the surrounding during the process of leaching of fallen leaves, residues of the previous crops. They contain water soluble inorganic and organic compounds (Rice, 1971).

Target species are affected by the toxins of allelo chemicals in many ways (Einhellig, 2002) and the toxic chemicals may inhibit shoot /root growth (Jayakumar *et al.*, 1998). They may inhibit nutrient uptake or they may attack a naturally occurring symbiotic relationship there by the destroying the plant's usable source of a nutrient (Elemore, 1980)

They also reduce the photosynthetic pigments, thereby reducing the amount of sugar, starch and soluble protein in the treated plants (Jayakumar *et al.*, 1998). The structural and fundamental integrity of the membrane is very much disturbed and it is indicated by the increase in the content of malondialdehyde (MDA) level.

Ursolic acid is a secondary metabolite of a sacred grove tree, *Canthium dicoccum*, and the green gram cultivar KM-2 *(Vigna radiata)* is a legume crop grown nearby field of the sacred grove. Hence, the allelopathic effect of the allolochemical, ursolic acid on the growth and physiology of the legume was studied in this project.

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MATERIALS AND METHODS

Certified seeds of *Vigna radiata* were used in this experiment. The molar solution was prepared by dissolving one mole of ursolic acid, first dissolved in chloroform (1ml), and then in methanol (1ml) later in distilled water and then its volume was made upto 1000ml. From this molar solutions, different milli molar concentrations (0.5mM, 1.0mM and 2.0mM) were prepared by diluting it with distilled water.

Bio assay was carried out in sterilized Petridish lined with whatmann. No.1 filter paper at 28 $\pm$2°c. The seeds were initially surface sterilized with 0.1% mercuric chloride solution for 60 sec. and then washed thoroughly with tap water and were used for both Petriplates and pot culture studies. Sterilized seeds were soaked in tap water for 24 hrs and were treated with different concentrations of ursolic acid (T_1 - 0.5 mM ; T_2 - 1.0 mM ; T_3 - 2.0 mM) water was used in Control (T_0 – 0.0 mM) in bioassay.

The seedlings grown under normal photoperiodic conditions, were irrigated with different concentrations of ursolic acid (250ml/pot) on alternate days and control plants were irrigated with tap water. The plants were removed from the pots on 15 / 30 DAS, washed