Indian Journal of Fundamental and Applied Life Sciences ISSN: 2231– 6345 (Online)
An Open Access, Online International Journal Available at www.cibtech.org/sp.ed/jls/2014/03/jls.htm
2014 Vol. 4 (S3), pp. 1831-1833/Hesammi et al.
Research Article

HELIANTHUS ANNUUS ALLELOPATHIC EFFECTS ON EARLY GROWTH STAGES OF BRASSICA NAPUS

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ABSTRACT
The use of allelopathic effects of some plants in weed management has attracted much attention. To evaluate the effect of the aerial parts extract of helianthus annuus on the germination percentage, plume length and radical length of brassica napus, test was done as a completely randomized design with three replications at laboratory conditions in 1388. Experimental treatments included: control treatment and treatment with 25%, 50%, 75% and 100% concentration of aerial parts extract of helianthus annuus. The results showed that the effect of different concentration of the aerial parts extract of helianthus annuus was significantly on seed germination percentage, plume and radical growth and decreased seed germination and brassica napus growth with increasing concentration of extract.

Keywords: *Helianthus Annuus Remains, Brassica Napus, Allelopathic Effects*

INTRODUCTION
There has long been observed an inhibitive response by plant species to certain neighboring Plants. The Greek philosopher and botanist, Theophrastus, noted this effect from cabbage as Early as 300 BC (Willis 1985). Since that time, others have documented similar plant interactions. In 1937, Austrian botanist, Molisch, described this phenomenon as allelopathy, which he determined to be the result of biochemical interactions between plants (Molisch 1937). When first described, allelopathy referred to both deleterious and beneficial interactions between species; since that time, however, allelopathy has been applied to only adverse plant interactions, rather than to both. First described by a Roman scholar during the first century, black walnut (Juglans nigra L.) has long served as the common example of allelopathic effects with its ability to inhibit growth of surrounding plants either through decaying leaves or nuts or from the tree itself (Weir *et al.,* 2004). Researchers have continued to examine allelopathy and the mechanism for biochemical inhibition, which was initially scrutinized by many since differentiation between this effect and plant competition remained uncertain (Weir *et al.,* 2004). Subsequent bioassays involving specific chemical compounds extracted from plants have confirmed that certain species do, in fact, produce biochemical that can inhibit plant germination and growth in the absence of resource competition (Einhellig 1994a). With confirmation of allelopathy, many investigations have been conducted in order to determine how best to utilize this effect for possible weed control in agricultural settings (Khanh *et al.,* 2005). The ability to inhibit weed growth through the implementation of cover crops into a crop rotation has been a focal point for this research for several reasons. In addition to weed suppression and control through allelopathy, as well as a mulching effect, cover crops provide substantial environmental benefits such as reduced erosion and water runoff (Price *et al.,* 2006; Truman *et al.,* 2003). Moreover, cover crops are readily available and easily adapted to many agricultural situations. Because of these many benefits, including natural weed suppression through allelopathy, the use of cover crops has become a vital component of sustainable agriculture systems, as well as organic production. Allelochemicals enter the environment from plants in a number of ways, such as plant degradation, volatilization, leaching from plant leaves, and from root exudation (Bertin *et al.,* 2003). During active plant growth, particularly in early growth stages or during periods of stress, root exudation, either through diffusion, ion channels, or vesicle transport, is the primary method for release of many organic and inorganic compounds into the rhizosphere (Battey and Blackbourn 1993). These compounds serve a multitude of functions such as

improving nutrient uptake, root lubrication, plant growth regulation, microorganism defense, and waste removal (Bertin *et al.,* 2003).

Chemical war or in other words, allelopathy is one of the intervention methods in plant growth that its harmful effect is caused by the releasing chemical materials of plants versus other plants. Term of allelopathy invented by Mulisch to express chemical interaction effects between plants that are inhibitor and stimulator in 1937. Although allelopathy usually is considered as one of the agriculture hardships, but nowadays, the available evidence suggests that these features can have a useful role in the management of weeds in agronomic ecosystems. The major parts of allelopathic researches include effects of plant residues are decaying on the subsequent plant that nowadays, have been developed in straw mulch agronomy systems or minimum or without tillage systems in order to create stable agricultural. Disadvantageous effect of allopathic substances may be as partial decreasing or preventing of germination and normal growth. These substances are released by leaching, decomposition of plant residues or seeping by roots in growing environment. The allelopathy compounds disordered plant growth by interfering in important physiological processes such as changing cell wall structure, permeability and membrane function, preventing of cell division and activity of some enzymes, balance of plant hormones, seed germination and pollen tube, nutrient uptake, pores movement, photosynthesis, respiration, protein and pigments synthesis, reducing of active transfer and changing in DNA and RNA. Brassica napus is a member of grass family, annual and oily plant, which is more application and provides industrial needs. The purpose of this experiment is to investigate the allopathic effects of the aerial parts extract of helianthus annuus on brassica napus.

MATERIALS AND METHODS

After collecting helianthus annuus residues and drying aerial parts include shoot and leaves were grounds in a mill. 100 mg of water was added per 5 g powder of helianthus annuus. It was mixed by a shaker for 24 hours. It was placed in the centrifuge for 15 minutes and then passed through a filter paper and was prepared the solutions with 25%, 50%, 75% and 100% concentration. After that 25 disinfected seeds were put in Petri dishes containing filter paper. To each Petri dish was added 5 ml of treatment solution, but 5 ml of distilled water was added within the control dish. This study was performed as completely randomized design with three replications in the laboratory of the Faculty of Agriculture, at Islamic Azad University of Shoushtar. The treatments were control, treatments with 25%, 50%, 75% and 100% concentration of the aerial parts extract of helianthus annuus. Germinated seeds of brassica napus were counted daily, and in the last day, 3 seedlings were randomly selected from each Petri dish. Radical length and plume length were measured by the ruler in millimeters. Data analyzed by SAS software and graphs were plotted using excel software.

RESULTS AND DISCUSSION

The results showed that concentrations of helianthus annuus extract have different effects on the germination and plume and radical growth of brassica napus. So that the aerial parts extract of helianthus annuus have an inhibitory effect on seed germination and was significant, and the germination percentage decreased with increasing extract concentration. Germination percentage of brassica napus compared with control is decreased due to stress on seed in the other concentrations. This is because of inhibitors in the aerial parts extract of helianthus annuus, which prevents cell division. Inhibitory effect with increased concentrations of allelochemicals. Effects of the aerial parts extract of helianthus annuus were significant on the plumule length of brassica napus in different concentrations; So that plumule growth is the maximum and the minimum in the control treatment and treatment with 100% concentration, respectively and plumule growth decreased with increasing concentration. Furthermore, results showed that different concentration of aerial parts extract of helianthus annuus was significant on the radical growth of the brassica napus; So that radical growth is the maximum and the minimum in the control treatment and treatment with 100% concentration, respectively. According to the results, brassica napus is extremely sensitive to allelopathic substances in aerial parts of helianthus annuus. Helianthus annuus reduces

germination and growth of brassica napus by releasing toxic root exudates and allelochemicals caused by of the decomposition residues. Residues of helianthus annuus in the field and its allelochemical effect can damage to brassica napus and weaken brassica napuus in the early stages of growth and require that in the early stages search solution to prevent the residues of helianthus annuus in the field.

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