Allelopathic Potential of Canola (*Brassica napus* L.) Residues on Weed Suppression and Yield Response of Maize (*Zea mays* L.)

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**Abstract**— Decomposition of some crops residues release secondary metabolites that exhibit phytotoxic effects on other plants. In order to determine allelopathic potential of canola on maize grain yield and suppression of some common weeds, a field experiment was performed in 2010. Treatments were weeding in two levels (whole season weeding and whole season interference) and incorporation of canola residues into the soil, in three levels (0%, 15% and 30%). Allelopathic effects of canola reduced density, fresh weight and dry weight of weeds. In particular, *Solanum nigrum* L. and *Amaranthus retroflexus* L. were inhibited while maize yield was not influenced by canola residues.

**Keywords**— Allelopathy, Canola, Maize, Weed control.

I. INTRODUCTION

Allelopathy, the ability of plants to inhibit germination of other plants is a resource for weed control in crops. Research efforts in the past have concentrated on the discovery and use of herbicides for weed control, but current research has pursued the discovery and refinement of cultural and biological control techniques for use in integrated systems [1].

Due to concerns of ecological, environmental, health problems [2] and increase the number of herbicide-resistant weeds in the use of synthetic herbicides [3], there have been considerable efforts in designing weed management strategies of allelopathic compounds as bioherbicides to suppress weed. Also biosynthesized herbicides are easily biodegradable, they are believed to be much safer than synthesized herbicides [2]. Controlling weeds with allelopathic crops residues was first postulated by Putnam and Duke [4]. Since then, efforts in various parts of the world have been underway to exploit the allelopathic potential of different plant species for weed control in various cropping systems [5].

Secondary plant metabolites include a variety of compounds that when released from plants into the environment, often attract or repel, nourish, or poison other organisms. The metabolites are released into the environment by means of four ecological processes: volatilization, leaching, decomposition of plant residues in soil, and root exudation [6].

Reference [7] terms allelochemicals as nature's own herbicides. Natural products relatively have short half-life and therefore considered safe of environmental toxicology standpoint [8]. The most practical and immediate way to use allelopathy in weed control is to use allelopathic cover crops in rotations, or apply residues of allelopathic weeds or crops as mulches [9]. Reference [10] shows that cover crop residues provided partial weed control during the early stages of crop growth by causing both physical and chemical interference.

Brassicaceae family has allelopathy potential on the growth of other plants [11]. They produce glucosinolates (GSLs) that are not biologically active. When the plant tissue is disrupted, the GSLs are hydrolysed to a number of products. The main breakdown products are Isothiocianates (ITCs) which are phytotoxic [11]. ITCs can only be released by the breakdown of the cells during decomposition of dead plant material or incorporation green plant material into the soil. Myrosinase, the enzyme responsible for catalysis of glucosinolate degradation, is physically separated from glucosinolates, thus preventing secondary glucosinolate product formation in living plants [12]. Physical disruption of plant tissue through grinding is necessary for further degradation of the glucosinolates into ITCs and other secondary products [13]. If *Brassica* spp. plant tissues are incorporated into the soil, it is possible to control weeds in the following crop by ITCs released from the mulch [12].

The objectives of this research were (i) to assess the allelopathic potential of canola residuals on suppression of some weeds and (ii) to determine the cover crop effect on maize grain yield under field conditions.

II. MATERIAL AND METHODS

The field experiment on maize (*Zea mays* L. var. *ksc 704*) was carried out in 2008 in Iran (at the agriculture research center of Kermanshah, 47°26′N, 34°8′E) on a clay–loam soil (10% sand, 53% clay and 38% silt, pH 6.8 and 1.1% organic matter). Based on the soil test recommendations, P and K were applied before seed sowing at 200 kg ha⁻¹ and 120 kg ha⁻¹,