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Allopathic impact of a weed Fumaria indica (L.) on germination and seedling growth of oil yielding plant Brassica campestris

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Abstract The present experiment was carried out to investigate the allelopathic impact of weed FUMARIA INDICA (HAUSSKN) commonly known as indian fumitory on the seed germination and seedling growth of mustard (Brassica campestris) shoot and root aqueous extract of both the weed were applied at 50% and 100% concentrations along with Hot and Cold water comparison under laboratory conditions. Distilled water was used as control. The experiment was laid out in complete randomised design with replications. The revealed that F.indica had greater inhibitory effects on most of the physiological parameter (ie. Germination percentage,GVI,SVI,Shoot/Root length and fresh/Dry biomass) of mustard seedlings 100% concentration was found to show most inhibitory effect as compare to control. Shoot leachates as well as hot water leachates were most effective than root leachates and cold water leachates respectively. Whereas, cold root leachates possessed positive effect at higher concentration.Thus, the allelopathic impact of F indica was dependent on applied dosses.

Keyword:- Allelopathy, Fumaria indica, Brassica campestris, Germination, Seedling growth

Introduction

The chemical interactions of several plant species have long been known to mankind. Molisch meticulously laid out the concept and gave it the name allelopathy. Others have attempted to broaden the concept of allelopathy to encompass nearly all of chemical ecology, but for the sake of this commentary and review, it is defined as chemical interactions between plants via chemicals other than primary metabolites, including those involving participation from microorganisms. This still represents a huge variety of interactions. The majority of the interactions of interest have involved chemical interactions that provide the allelochemical producer with an advantage over the plant that is being influenced by the allelochemical. According to Wang et al. (2006), allelochemicals may be categorised into the following groups based on the structure and characteristics of the molecules through which they are produced.

2 Allelopathy is a phenomenon involving either direct or indirect beneficial or adverse effects of a plant (including micro-organisms) on another plant through the release of chemicals in the environment (Rice, 1984). For over 2000 years, allelopathy has been reported in the literature with respect to chemicals and plant interference (Weston and Duke, 2003). The earliest recorded observation of weed and crop allelopathy was made by none other than Theophrastus, "the father of botany," who in 300 B.C. wrote in his botanical works about how chickpeas 'exhausted' co-existing for years with agriculture. But intensive scientific research into the recognition and understanding of allelopathy has only occurred over the past few decades (Narwal et al., 2005).

During the last four decades, the results of allelopathic effects of crops on weeds revolutionised scientists, who put much effort into using this phenomenon to reduce the dependence on chemical herbicides for weed control (Weston and Duke, 2003; Alsaadawi et al., 2007; Weston et al., 2013). In the tropical and subtropical irrigated areas, where the climate conditions are favourable for year-round cropping, little research has been done; presumably, allelopathy has a greater role to play under these conditions, where an array of crops and weeds exist together. Allelopathic research of subtropical vegetation in Taiwan has some examples of plants that have allelopathic potential but have not yet been used as biological control herbicides, such as Phyllostachys edulis (Chou and Yang, 1982), Leucaena leucocephala (Chou and Kou, 6 1986), Delonix regia (Chou and Leu, 1992), and Zelkova formosana (Chou et al., 1989).

Scientists have suggested this phenomenon as the "Novel Weapon Hypothesis", an approach for these invasive species to spread and grow fast (Callaway and Riedenour,

2004) by exerting allelopathic effects on crops and other weed seed germination and growth as well as by releasing water-soluble compounds into the soil (Batish et al., 2007).

1) Water soluble organic acids. Straight chain alcohols, aldehyde and ketone.

2) Simple unsaturated lactons.

3) Long chain fatty acids and polyacetylenes.

[4] 4) Quinines

5) Phenolics

6) Cinnamic acids and its derivatives

7) Coumarins

8) Flavonoids

9) Tannins

Several compounds have been identified as exhibiting allelopathy (Rice 1974). Most of the plants produce secondary metabolites in large amounts (approximately more than 10,000 in number), viz., phenolics, terpenoids, alkaloids, fatty acids, steroids, and polyacetylenes. These play an important role in allelopathy, which [1] includes both positive and negative effects (Inderjit, 1996; Olofsdotter, 1998; Rice, 1984; Waller, 1987).

The F. indica plant has been explored exhaustively for its phytochemical and pharmacological activities. From the foregoing accounts, it is evident that the F. indica plant has been used ethnomedically as a valuable therapeutic agent for a variety of diseases, as we have illustrated in this research. Moreover, it is used beyond the ethnomedicinal ones in experiments on animals. Several compounds isolated from this plant could be responsible for its pharmacological activities.

Test plant - MUSTARD (BRASSICCA CAMPESTRIS) The genus brassica of family Cruciferse (Brassicaceae) is consisted of several multipurpose species which yield edible leaves, roots, stems and seeds as spice. Brassicas are also extensively cultivated as a cash crop, vegetables and fodder

Brassicas are generally grown in northern and western parts of India or in the world above 20 N of latitude. Brassicas oleliferous [8] are important rabi (post-rainy) season oil seed crop in India Mustard is a contiment that has been used for culinary, religious and cultural purposes by humanity since time immemorial. Mustard has figured prominance [5] in the indian tradition and its medicinal properties have systematically evaluated and documented in the Ayurveda.

Weed plant : GAZAR GRASS (FUMARIA INDICA) [1] The genus FUMARIA (Fumariaceae) consists of 46 species in the world and Fumaria species are known as "fumitory, earth smoke, beggary, fumes, vapor, fumittery or wax dolla" in English. Fumaria indica (Hausskn)Pugsley (Findica) (Fumariaceae) is small, scandent, branched, annual berb wild in plain and lower hills. It is locally known as "Pitpapra", or "Shahtrah" in india and its vernacular names are "common fumitory" in English. "Pitpaprs", "Parpataka" in kannad "Shahterab" in Kashmin. "Turu" or "Thusha" in Tamil, and "Chotarashi" in Telegu

Materials and method 1). Chemicals - Bavistin, Mercuric chloride and Distilled water.

2). Plant material - Mustard seeds(T-59 VARUNA) and weed plant.

Petriplate Observation : Effect of hot and cold aqueous shoot and root leachates of F.indica germination and seedling growth Brassica campestris after 10 days of treatment

0 0.02 0.04 0.06 0.08 Shoot 0 25 50 75 100 shoot root S. No. Weed Extracts Part used Concen tration Germination % GVI SVI R. Length (cm) S. Length (cm) Dry wt. (mg) 1 Control 96.66±3.33 6.87±3.24 4.70±0.08 3.54±0.54 4.87±0.09 3.15±0.03 Hot Shoot 50% 6.66±1.66 0.21±0.07 0.07±0.03 0±0 1.13±0.14 1.13±0.12 100% 31.66±1.66 4.59±0.13 4.59±0.13 0.93±0.26 2.7±0.27 1.96±0.17 2 F. Indica Root 50% 36.66±6.00 1.08±0.17 1.47±0.20 0.36±0.13 4.06±0.18 2.74±0.65 100% 81.66±1.66 3.81±0.22 8.19±0.46 1.1±0.30 10.03±0.54 4.08±0.11 Cold Shoot 50% 68.33±3.33 2.78±0.19 2.04±0.11 0.22±0.04 2.86±0.20 2.20±0.19 100% 63.33±9.27 1.02±0.59 5.41±0.52 1.33±0.67 8.7±0.52 2.95±0.52 Root 50% 90±2.88 3.89±0.36 9.32±0.65 2.93±0.44 10.33±0.41 2.27±0.89 100% 90±5.00

8.08±1.06 13.75±0.7 3 5.16±0.60 15.3±0.40 2.52±0.66

Result : GRAPHICAL COMPARISION REPRESENTATION IN PETRIPLATE EXPERIMENT

Conclusion : 1).Higher concentration to show most inhibitory effect as compare to control.

2).Shoot leachates as well hot water leachates were most effective then root leachates and cold water leachates respectively.

3).Cold root leachates possessed positive effect at higher concentration.

-35 -17.5 0 17.5 35 52.5 70 Hot cold Hot Cold 0 25 50 75 100 Control Shoot Root 0 25 50 75 100 Shoot Root 0 25 50 75 100 Shoot Root

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