American-Eurasian J. Agric. & Environ. Sci., 15 (9): 1882-1886, 2015
ISSN 1818-6769

DOI: 10.5829/idosi.aejaes.2015.15.9.12781

Effects of *Cyperus scariosus* on the Growth of Maize (*Zea mays*) Selected from District Bannu

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Abstract: *Cyperus scariosus* is an angiosperm belonging to family *Cyperaceae*, traditionally used as an anti-microbial, anti-inflammatory and anti-fungal agent. The present study aims to evaluate the allelopathic properties of the crude extract of *Cyperus scariosus* against the root and seedling growth under controlled conditions. *Cyperus scariosus* plant was collected from District Bannu. Dried plant was ground and extracted with methanol to prepare methanol crude extract. Phytotoxicity activity of *Cyperus scariosus* plant was done against maize (*Zea mays*) seeds. The results obtained in this study showed that methanolic extract of *Cyperus scariosus* (CSME) showed minimum stalk growth and maximum stalk and root inhibition by using 3 mg/ml as compared to control. The order of effect of *Cyperus scariosus* plant on stalk and root growth after 5 and 10 days may be written as; 3mg/ml >1.5mg/ml>0.75mg/ml>0.37mg/ml. Similarly (CSME) significantly reduced the fresh and dry weight which may be due to presence of bioactive allelochemicals.

Key words: Phytotoxicity activity · *Zea mays* · *Cyperus scariosus* · Root inhibition · 3mg/ml · *In vitro* assay

INTRODUCTION

Every year, about 13% of the world's crops are lost due to damages caused by weeds. The progress of weed control technology such as transgenic crops and synthetic herbicides has made a great input to the enhancement of crop yields through the years [1]. Medicinal plants have an important role in improving various pathogenesis [2, 3, 4] as well as allelopathic properties [5] Allelopathy means the inhibition of plant growth through the production of phytochemicals/ phytotoxins released by another plant. This incident represents competition between neighboring plants for light, water and nutrients [6]. Over use of synthetic herbicides to control weeds leads to an increased risk of herbicide resistant weed biotypes [7] and harsh environmental pollutants [8]. Alternate weed management strategies that are ecofriendly and cost-effective are therefore a time demanding issue throughout the world. In this backdrop, phytotoxic plants might help in resolving the problems created by synthetic herbicides as they possess growth retarding substances. Recently, there has been an increasing interest shown by the researchers on phytotoxic medicinal plants [9, 10]. These phytotoxic plants could be used in several ways to control weeds *viz*; sowing/transplanting them as relay or cover crops with main crops, direct application of their crude extracts as bioherbicides, or isolation and characterization of their active substances and using them as a tool for new natural and biodegradable herbicides development [11].

The *Cyperus scariosus* plant is an angiosperm belonging to family *Cyperaceae*, contains almost 3000 species out of which about 220 species are recognized as weeds. *Cyperus scariosus* has a number of major and minor chemical constituents, many of which may show the pharmacological activities, but the main active components appear to be the sesquiterpenes. These are aromatic, spicy tasting molecules among main sesquiterpenes identified in *Cyperus* rhizomes. The rhizomes of *Cyperus scariosus* plant possess pleasant aromatic odour, the important oil may also be used as an anti-microbial, anti-inflammatory, anti-fungal agent and it is used as one of the elements in many formulations for

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the Ayurvedic systems of medicine [12]. Therefore, this study was established to evaluate the allelopathic properties of the crude extract of *Cyperus scariosus* against the root and seedling growth of maize (*Zea mays*) under controlled conditions.

MATERIALS AND METHODS

Plant Collection: Roots of *Cyperus scariosus,* were recognized by Prof. Abdul Rahman, GPGC Bannu collected from District Bannu. The plant specimen was placed in the Herbarium Department of Botany University of Science and Technology Bannu for future reference as voucher no WK-101. The plant sample was dried at room temperature and was ground mechanically up to mesh size 0.1mm.

Plant Extraction: One hundred (100 g) fine powder of *Cyperus scariosus* was soaked in 500 ml methanol with temperate shaking and then was placed at room temperature for 5 days. After five days the plant was extracted and filtered by using Whatman filter paper and the filtrate was concentrated with the help of the Rotary Evaporator, follow evaporation at 37°C to obtain crude extract.

Phytotoxic Bioassay: The plant growth of maize (*Zea mays* L.) was tested against the phytotoxic activity of *Cyperus scariosus* extract. This phytotoxic test of *Cyperus scariosus* extract was performed according to the protocol given by McLaughlin and Rogers [13]. Different fractions of *Cyperus scariosus* extract were prepared from the stock solution *viz*; 3, 1.5, 0.75 and 0.37mg/ml. 500µl of,1.5,0.75 and 0.37mg/ml solutions was taken (with the help of micropipette) and was put on the petri plates labeled it. Distilled H_2O was used as a control. After that the petri plates were kept for drying at 40°C for the evaporation of methanol. Then 5 ml distilled water was added on each filter paper set in the petriplates of all the four concentrations as well as in the control. Five seeds of maize (*Zea mays*) from already washed by 1% $HgCl_2$ and soaked in distilled water. Seeds were placed in each petri plate. All the petri plates were incubated in the growth room and after five days, the first reading i.e. length of root/ radical was taken and distilled water to each plate was added to maintain the moist condition. After ten days, the last reading of the seed's growth was taken and the % inhibition of growth was calculated. Fresh and dry weight was also recorded.

RESULTS

Phytotoxicity Assessment

Effect of *Cyperus Scariosus* Plant on Stalk and Root Growth after 5 Days: Phytotoxic (allelopathic) effect of *Cyperus scariosus* was evaluated against maize (*Zea mays*) growth under controlled environmental conditions in the growth room. Methanolic extract of *Cyperus scariosus* (CSME) showed minimum stalk growth and maximum stalk inhibition with 3 mg/ml as compared to control (Fig. 1 and 2). Similarly (CSME) showed minimum root growth and maximum root inhibition at concentration of 3mg/ml. The order of effect of *Cyperus scariosus* plant on stalk and root growth after 5 days may be written as; 3mg/ml >1.5mg/ml>0.75mg/ml>0.37mg/ml.

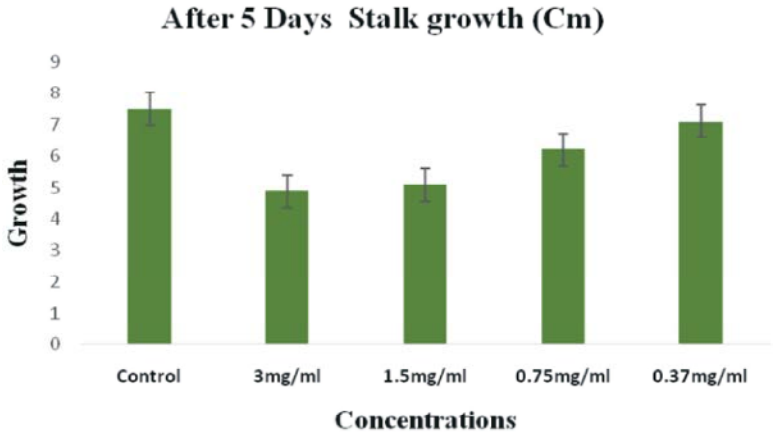

Fig. 1: Effect of *Cyperus scariosus* L. on maize (*Zea mays*) stalk growth

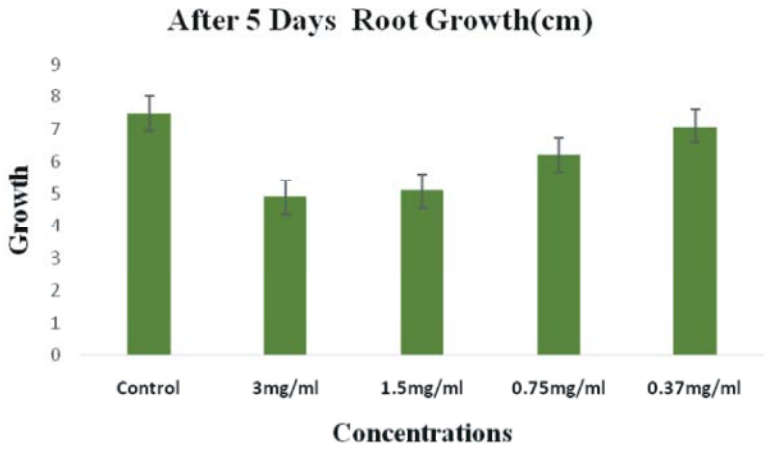

Fig. 2: Effect of *Cyperus scariosus* L. on maize (*Zea mays*) root growth

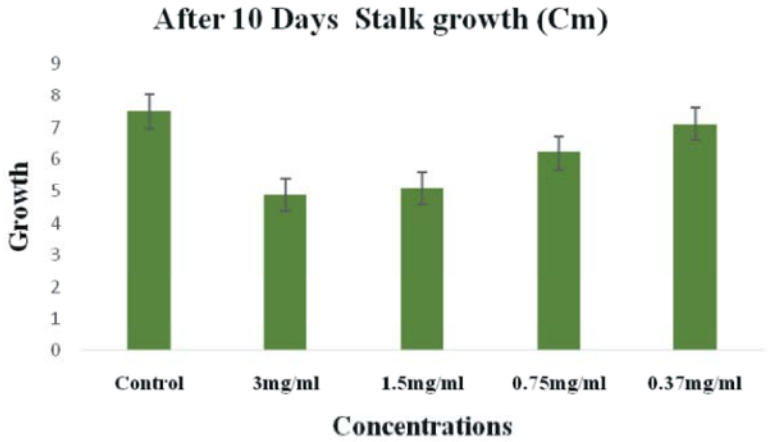

Fig. 3: Effect of *Cyperus scariosus* L. on maize (*Zea mays)* stalk growth

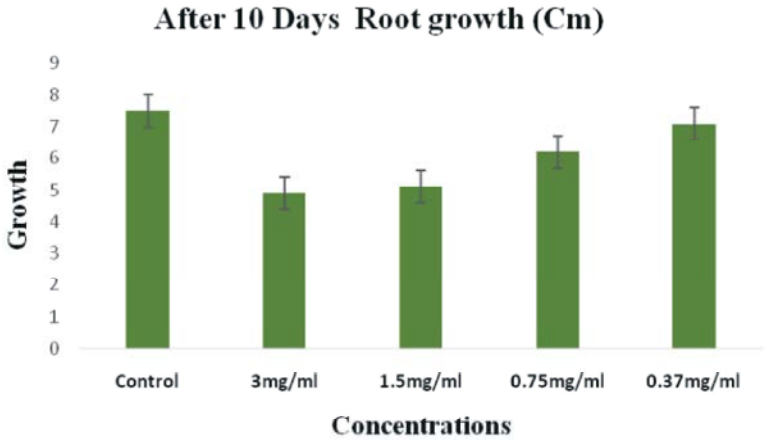

Fig. 4: Effect of *Cyperus scariosus* L. on maize (*Zea mays)* root growth

Effect of *Cyperus Scariosus* Plant on Stalk and Root Growth after 10 Days: After 10 days of experiment methanolic extract of *Cyperus scariosus* (CSME) showed minimum stalk growth and maximum stalk inhibition with 3mg/ml (Fig. 3) as compared to control. In the same way (CSME) showed minimum root growth and maximum root inhibition at concentration of 3mg/ml (Fig. 4). The order of effect of *Cyperus scariosus* plant on stalk and root growth after (10) days may be written as; 3mg/ml >1.5mg/ml >0.75mg/ml>0.37mg/ml.

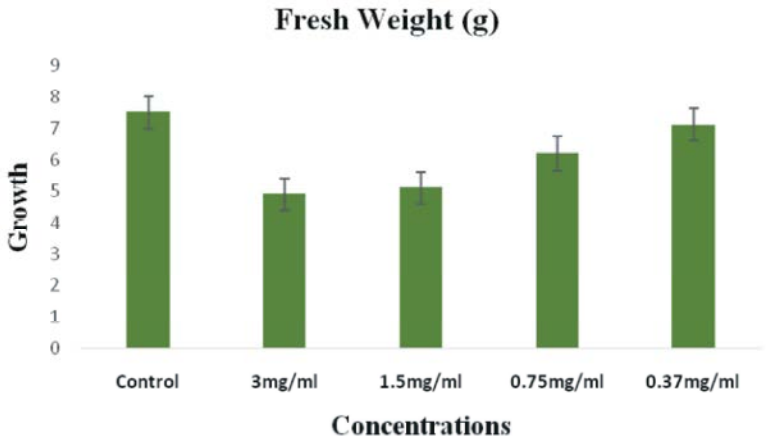

Fig. 5: Effect of *Cyperus scariosus* L. on maize (*Zea mays*) fresh weight

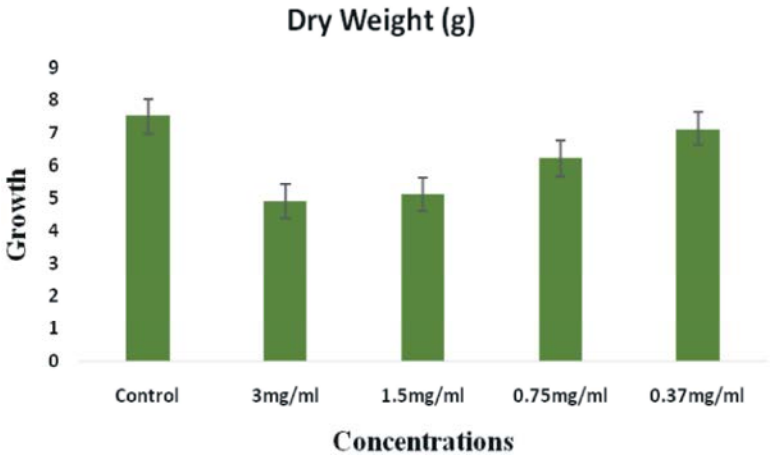

Fig. 6: Effect of *Cyperus scariosus* L. on maize (*Zea mays*) dry weight

Effect of *Cyperus scariosus* Plant on Fresh and Dry Weight: After the 10 days of the treatment, fresh and dry weight was calculated and it was observed that, methanolic extract of *Cyperus scariosus* significantly reduced the fresh and dry weight; indicating the occurrence of the bioactive allelochemicals in the methanolic extract. At the end of the experiment, the mass of the experimental seedlings were dried under controlled condition and it was found that, the weight of (CSME) was efficiently less as compared to the control (Figs. 5 and 6).

DISCUSSION

All over the world the medicinal plants are used for the treatment of various diseases due to their least side effects or no side effects as compared to synthetic chemicals. The treatments through the herbal drugs are common all over the world and in Pakistan the medicinal plants and herbal drugs are also used for the treatments of various diseases [3]. Some of the medicinal plants have phytotoxic activities which inhibit the growth of weeds and unwanted plants. The phytotoxic results obtained from the methanolic extract of *Cyperus scariosus* showed that they inhibit the germination of roots and shoots of the maize (*Zea mays*) plants but not to a significant level as compared to the other medicinal plants. The significant results were found by Kordali *et al.* [14] that the essential oils and phenolic compounds isolated from Turkish *Origamum acutidens* completely inhibited the germination of roots and shoots and possess antifungal activity when compared to the standard compounds. According to Javid [15] the water extracts of *Withania somnifera* and *Datura alba* have the same bioactive compounds which significantly inhibited the growth of roots and shoots of *Rumex dentatus* L (Highly competitive weeds in wheat).

Conclusion and Recommendations: The methanolic extract of *Cyperus scariosus* showed significant activities which may be attributed to the presence of bioactive constituents and recommended for herbicidal proposes in future.

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