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ORIGINAL ARTICLE

ALLELOPATHIC EFFECT OF *PARTHENIUM HYSTEROPHORUS* L. ON SEED GERMINATION AND SEEDLING GROWTH OF *VIGNA RADIATA* (L.) WILCZEK.(GREEN GRAM)

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ABSTRACT

Abstract

Evaluation of different extract concentrationof*Parthenium hysterophorus* L.on seedgerminationand seedling growth of *Vigna radiata* (L.) Wilczek. Stem and leaf aqueous extracts of *Parthenium hysterophorus* L. at 2, 4, 6, and 4.0% concentrations were applied to determine their effect on seed germination and seedling growth of test plants under laboratory conditions. Aqueous extracts of*(P.hysterophorus*) leaf and stem inhibited root length, shoot length and biochemical study. All aqueous extracts of weed significantly affected *V. radiata*, germination percentage, root and Shootlength and Biochemical study (Sugar, Starch and Amino acid) when compared with control. The greatest concentration showed a stronger inhibitory effect

Keywords*:* *Parthenium Hysterophorus*, Germination, Growth, *Vigna Radiata*

1.INTRODUCTION

Allelopathy is a natural phenomenon that takes place through secretion ofphytochemicals from one plant which causes beneficial or harmful effect on other(Ferguson and Rathinasabapathi, 2003). From agricultural point of view, allelopathyplays an important role in biological weed management and crop productivity(Bhadoria, 2011). Allelopathy can be defined as chemical interactions between and among both plants and microorganisms through the release of biologically active chemical compounds into the environment (Andrzej1977). Allelochemistry, the production and release of toxic chemicals produced by one species that affect a receiving susceptible species, has been the subject of diverse degrees of scientific enquiry (Tiffany et al. 2004). Recent advances in plant biology have permitted the revamp of allelochemistry as a biologically and ecologically sound explanation for plant invasion and plant–plant communication in the rhizosphere. (Lalitha *et al.* 2012).*Parthenium hysterophorus L.* is a member of the Asteraceae family an annual wasteland weed and aggressive colonizer of road sides, railway sides and crop fields in East and South Africa, India, Australia, Mexico, Canada etc.(Towers *et al*.,1977).Dwivedi et al.(2009) have reported about five million hactares of land in India has been invaded by *Parthenium* . This is the major problem in rangelands, cultivated lands etc. It affects the production of crops, human and animal healths and biodiversity of the ecosystem. *P. hysterophorus* invasion causes changes in above-ground vegetation and below-ground soil nutrient contents, disturbing the entire grassland ecosystem. It contains special characters such as high germination ability, high survival rate, large seed production capacities, easy dispersal of seeds, high allelopathic impact, completes life- cycle within four weeks, sometimes completes life-cycle twice in a year. It produces 15,000 to 25,000 seeds per plant (Haselar 1976, Joshi 1991) and seeds survive for several years in soil seed bank. *P.hysterophorus* fastly grows and is comfortable on alkaline to neutral clay soil. It induces changes in the physical, chemical and biological properties of soil. It also inhibits growth and nodulation of legumes because of the inhibitory effect of allelochemicals on nitrogen fixing and nitrifying bacteria (Deyama,1986). The allelochemicals released from *Parthenium* affecting many plant species are sesquiterpene lactones and phenolics(Swaminathan *et al.*1990). *Parthenium* secretes some allelochemicals which are lethal to plants, human beings and animals. *P.hysterophorus* is commonly known as congress grass, carrot grass, white head(English), ragweed Parthenium(USA), in India chatak chandani, gazar ghas and thandi booti, lewani bhang(Pakistan).The Greengram is a major edible legume seed in Asia . It is a fast-growing, warm-season legume. It reaches maturity very quickly under tropical and subtropical conditions where optimal temperatures are about 28-30°C and always above 15°C. It can be sown during summer and autumn. Hence, the present study was conducted to evaluate the effects of leaf

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extract of *P.hysterophorus* on seed germination andseedling growth of Green gram

2.MATERIALS AND METHODS

Preparation of aqueous extract

The *P.hysterophorus* plants which grew naturally in post harves paddy field ,they were uprooted and collected at their mature stage for the experiment. The plants were brought into the laboratory and were immediately separated into leaf and stem parts. Each part of the fresh plant was cut into small pieces, shade dried and then ground separately with help of grinder and made fine powder. 4 g powder of stem and leaves of *P.hysterophorus* were dipped in 100 ml of distilled water and filtrate through a muslin cloth followed by filter paper (No.1. Whatman International, Maidstone, UK). After 24 h of soaking at room temperature and then further diluted so as to get 2 to 8% aqueous extract, respectively, as adopted from Singh *et al*. (1989). The rate of seed germination (%) was recorded after seven days of setting up of the experiment.
Seeding length and (sugar,starch and amino acid) were recorded on seventh day old seedling of green gram treatd by leaf and stem extrac of *P. hysterophous*. For biochemical Studies entire seedling was used for estimation of Sugar (Nelson (1944), Starch estimated by method of Clegg(1056) and Amino acid forllowed by the method of Moore and Stein,(1948).

3.RESULTS AND DISCUSSION

As compared to the control (0%), the aqueous extracts of *P.histerophorus* from stem and leaf parts at 2 ,4,6 and 8% concentration levels exhibited significant inhibition on seed germination of Green gram. The effect was in general, more severe on leaf than that of stem extract treatmen. The inhibitory effect was concentration dependent (Fig.1.). The inhibition effect was found to increase with increasing concentrations of different aqueous extracts (Sisodia and Siddiqui, 2008, 2009). The shoot and root length(Fig.2) of Green gram seedlings were reduced significantly in response to all the *P.histerophorus* extracts. The fresh shoot aqueous extract of *Eucalyptus salignai*nhibited the germination of *Vigna unguiculata*L. Walpseeds. Inhibition of seed germination and seedling growth of some herbaceous plants by leaf extracts of eucalyptushave been reported (Siddiqui *et al.*, 2009)

The biochemical substances are released by plant leaching, root exudation, volatilization, residue decomposition and other processes in both natural and agricultural systems (Kruse *et al.*, 2000). Studies have shown the allelopathic effects of different parts of the plant species affect different plant organsin different ways in different plant species.The effects can vary in the intensity, duration and developmental stage during plant development.Several workers have reported on the allelopathic potential of common weeds on germination, seedling growth and yield of several crop species (Inderjit and Dakshini, 1998; Kong *et al.*, 2007; Ilory*et al.*, 2011(26); Chivinge (1985) and Hagin (1989) found that soil extracts or weed residues and decompose of organism possess allelopathic potential inhibit the growth and yield of some crops.

Results displaying the effect of extracts of *P.histerophorus* on the total Sugar content of Green gramseventh day old seedlings given in Fig.3. The aqueous leaf and stem extract of *P.histerophorus* caused a decrease sugar content in the seedlings of green gram over control. As the concentration of the extracts increased from 2 to 8% the sugar content of the seedlings also decreased and a maximum inhibition caused by 8% extract. The amino acid content(Fig.4) progressively decreased with increasing the concentration of weed extract. The reduction percentage was directly proportional to the concentration of extract. The maximum reduction percentage (45%) was observed in leaf extrat treatment. Similar results were obtained and indicating the phytotoxic/allelopathic effect of aqueous extracts of weeds include *Mikania micrantha* (Ismail and Kumar, 1996), *Vulpia sp*. (An et al., 1999), *Cyperus rotundus* (Quayyum et al., 2000), *Cardaria draba* (Kiemnec and McInnis, 2002), *Parthenium hysterophorus* (Batish et al., 2002a; Singh et al., 2003a), *Brassica nigra* (Tawaha and Turk, 2003), *Raphanus raphanistrum* (Norsworthy, 2003), *Ageratum conyzoides* (Batish et al., 2002b).The results demonstrated that greengram seeds were sensitive to allelopathic compounds released by *P.histerophorus*. There is need for further studies to be carried out on identifying the inhibiting allelochemical in the parts investigated.

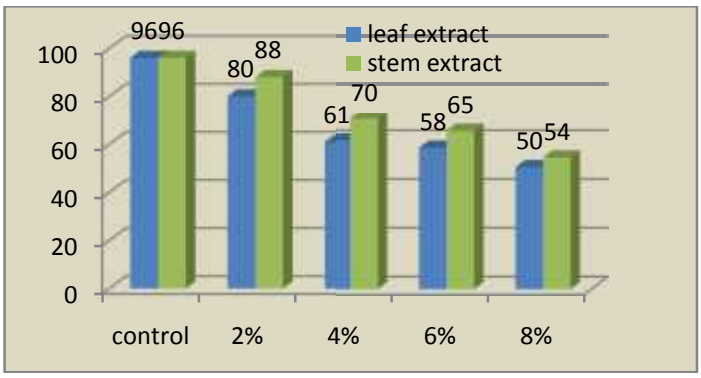

Fig. 1. Effect of different concentrations of *Parthenium hysterophorus* Lon germination (%) of Green gram (3DAS)

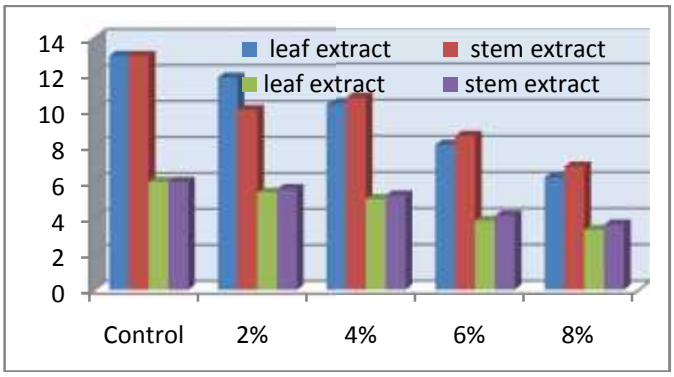

Fig. 2.. Effect of different concentrations of *Parthenium hysterophorus* L on Shoot and Root length of Green gram (cm/plant)

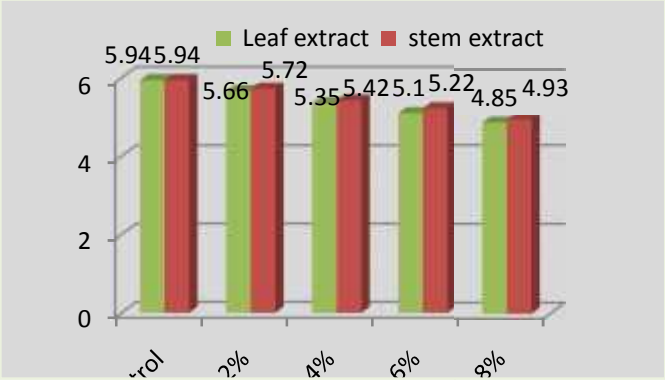

Fig. 3. . Effect of aqueous extracts of two weeds species on Sugarcontent (mg/g f. wt)of Green gram.

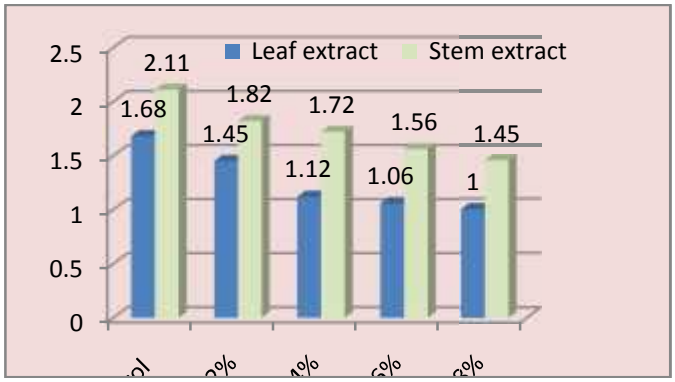

Fig. 4. . Effect of aqueous extracts of two weeds species on Amino acid content (mg/g f. wt)of Green gram.

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