Mycopath (2013) 11(2): 81-84 **Research Article**

Herbicidal potential of *Azadirachta indica* leaves extract against *Achyranthes aspera* and *Senna occidentalis*

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Abstract

In vitro herbicidal potential of *Azadirachta indica* A. Juss. leaf extracts @ 2, 4, 6, 8 and 10 g 100 mL^{-1} was evaluated against *Achyranthes aspera* L. and *Senna occidentalis* L. Data revealed that all the concentrations inhibited seed germination and root, shoot growth with the most marked inhibition being achieved by the 10 g 100 mL^{-1} concentration. Germination was suppressed by 7-59% in case of *A. aspera* and by 3-41% in *S. occidentalis.* Shoot length was reduced by 2-12 mm and by 3-12 mm where as root length was declined by 5-23 mm and 2-11 mm for *A. aspera* and *S .occidentalis,* respectively. The herbicidal effect of the extracts against the test weeds seemed to be directly proportional with concentrations.

Keywords: *Achyranthes aspera, Azadirachta indica,* herbicidal potential, *Senna occidentalis.*

Introduction

Weeds constitute one of the major yields limiting pressure in agricultural fields (Kostov and Pacanoski, 2007). They not only directly compete with the crops for food and space but also harbour many pests that add up to their indirect losses to agricultural crops. A large number of synthetic chemicals possessing herbicidal activity are being used for the management of weeds. It create an alarming situation due to hazardous nature of chemical and their extensive uses may result in the deposition of chemical residues in the crops (Sukorini *et al.,* 2013). This negative aspect of synthetic herbicides urges scientists to discover alternative ways. Use of plant extracts for the management of weeds is an excellent substitute of herbicidal chemicals (Park *et al.,* 2008). The plants like alfalfa (*Medicago sativa*), asparagus (*Asparagus officinalis*), buckwheat (*Fagopyrum esculentum*), red clover (*Trifolium pretense*), rye (*Lolium perenne*), sunflower (*Helianthus annuus*), sorghum (*Sorghum bicolor*) and neem (*Azadirachta indica*) are reported to have strong herbicidal activity (Khaliq *et al.,* 2012; Javaid *et al.,* 2006; Turk *et al.,* 2005; Duke and Lydon, 1993). *Azadirachta indica* A. Juss (locally known as Neem) is a multipurpose tree plant. It has strong adaptability to various climates and habitats around the world with several local uses. Traditionally, all parts of *A. indica* have medicinal (human beings and livestock), antimicrobial (antifungal, antibacterial, antiviral) activity and insect (domestic insects, stored grains and crop pests) repellent properties (Al-Samarrai *et al.,* 2012). These properties are due to the presence of several chemical compounds that have been extracted and purified through aqueous or organic extraction methods. Many distinctive compounds with novel characteristics have been identified from *A. indica* including azadirachtin (anti-hormonal, repellent, anti-feedant,), gedunin (anti-malaria, vasodilator, anti-fungal), nimbidin (anti-arrhythmic, analgesic, anti-bacterial, anti-fungal, anti-ulcer), nimbidol (anti-pyretic, anti-tubercular, anti-protozoan), quecerетin (anti-protozoal), salannin (repellent), sodium nimbinate (diuretic, spermicide, anti-arthritic), and nimbin (anti-inflammatory) (Sukorini *et al.,* 2013; Park *et al.,* 2008). Conversely there are only few published reports about its herbicidal potential. Itani *et al.* (2005) screened 250 plant species in Hiroshima Prefecture, Japan through sandwich method. *A. indica* leaves are reported to inhibit the seedling growth of *Lactuca sativa* L. (lettuce) (Salam and Noguchi, 2010). *Achyranthes aspera* (prickly chaff-flower) and *Senna occidentalis* (coffee weed) are two weeds reported to rapidly expand their habitat and invade the agricultural as well as waste land areas of the Lahore district of Punjab, Pakistan. Prickly Chaff-flower seeds get attached with human and animals for dispersal and cause allergic reactions and severe irritation. Coffee weed is reported to become problematic in Australian pastures and legume crops. So there is

a need to manage these weed by exploring natural resources. The present study was carried out to investigate the herbicidal activity of aqueous extracts of *A. indica* leaves against *A. aspera* and *S. occidentalis.*

Materials and Methods

Fresh leaves of *A. indica* were collected from University of the Punjab, Lahore and surface sterilized with 1% sodium hypochlorite solution for one minute followed by 3-4 washings with distilled water. Fifty grams of leaves were blended with 50 mL of dist. water to obtain 1 g mL^{-1} stock solution and left for one hour. This stock solution (extract) was double filtered by passing through muslin cloth and Whatman filter paper No.1 and used to prepare 2, 4, 6, 8, and 10 g 100 mL^{-1} test concentrations as calculated. Petri plates (90 mm) were thoroughly washed, dried and then filter papers were adjusted. These plates were autoclaved at 121 °C temperature and 1.035×10^5 Pa pressure for 15 minutes. Germination test was performed in Petri dishes based on ISTA rules (2007). Twenty five healthy seeds of *A. aspera* and *S. occidentalis* were put in Petri dishes and 10ml *A. indica* extract was added to each individual Petri dish as per experimental design; distilled water was used as control treatment. All the treatments were replicated thrice and left for 15 days at 25 °C. At the end of the test period germination percentage, shoot and root length were measured. The experiment was conducted in completely randomized design and data was analyzed by Duncan's Multiple Range Test (Steel *et al.*, 1997).

Result and Discussion

In the present study herbicidal potential of aqueous extracts of leaves of *A. indica* was tested against seed germination and root/shoot length of *A. aspera* and *S. occidentalis*. Data for seed germination and shoot and root length was recorded 7 days growth. The results showed that all the extract concentrations of the test plant significantly inhibited seed germination of both the weeds. The lowest seed germination for both weeds was found at the highest tested (10 g 100 mL^{-1}) concentration while maximum germination was observed in control (no extract) treatment. Data analysis showed that inhibition in seed germination was directly proportional to the concentration of the aqueous extracts. At lower concentrations (2-6 g 100 mL^{-1}) seed germination was suppressed by 7-36% for *A. aspera* and by 3-20% for *S. occidentalis*. At higher (8-10 g 100 mL^{-1}) concentrations, germination was reduced by 40-59% and 20-41% for *A. aspera* and *S. occidentalis*, respectively (Fig. 1). The root and shoot length data showed that all the tested concentrations inhibited root and shoot length with the most marked inhibition being achieved by the 10 g 100 mL^{-1} concentration over control treatment. In general, 11-66% reduction was recorded in the seedling length for *A. aspera* while 10-61% in case of *S. occidentalis*. Root length was declined by 5-23 mm and 2-11 mm for *A. aspera* and *S. occidentalis* respectively (Fig. 2). Shoot length was reduced by 2-12 mm for *A. aspera* and by 3-12 mm for *S. occidentalis* (Fig. 3). Salam and Naguchi (2010) reported similar inhibition pattern

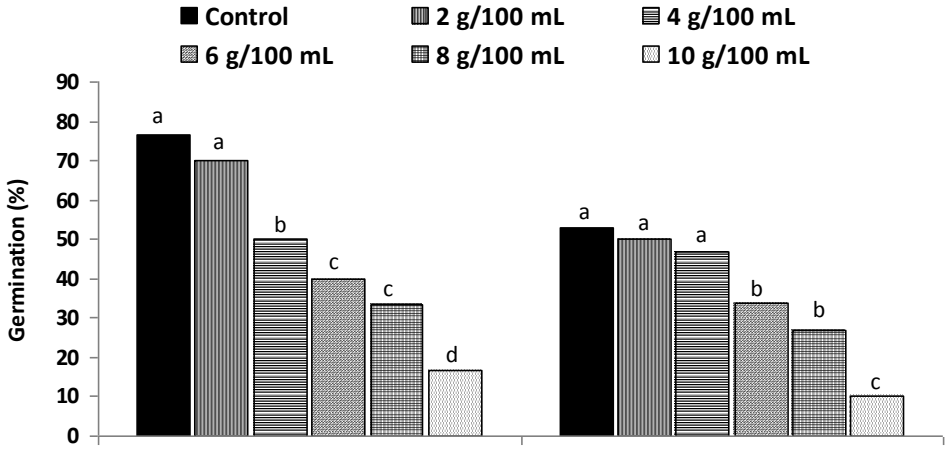

Fig. 1: Effect of neem extracts on the germination of *A. aspera* and *S. occidentalis* seeds. Vertical bars with different letters show significant differnce ($P \leq 0.05$) as determined by DMR test.

with aqueous methanol extracts of *A. indica* leaves against cress (*Lepidiumus sativum*), lettuce (*Lactuca sativa*), alfalfa (*Medicago sativa*), wild buckwheat (*Eriogonum fasciculatum*), timothy (*Phleum pretense*), bamyard grass (*Echinochloa crus-galli*) and *Echinochloa colonum*. This reduction in root shoot length is concurrence with the direct relation of concentration of aqueous extract (Babu and Kandasamy, 1997; Shafique *et al*., 2005). Ashrafi (2008) reported that aqueous, acetone and n-hexane extractions of *A. indica* leaves are involved in inhibition of germination and root/shoot growth of several plant species. This preliminary research suggests that *A. indica* contains potent herbicidal chemicals that showed inhibitory effects on the germination and root/shoot length of the test weeds and its organic fraction may further be needed to exploit against management of weeds in crops.

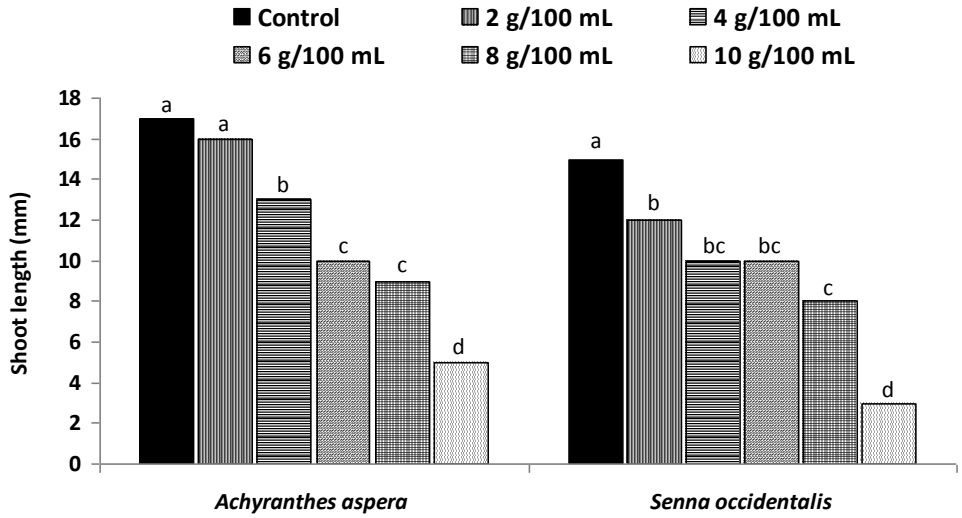

Fig. 2: Effect of *A. indica* extracts on shoot length of *A. aspera* and *S. occidentalis*. Vertical bars with different letters show significant differnce ($P \leq 0.05$) as determined by DMR test.

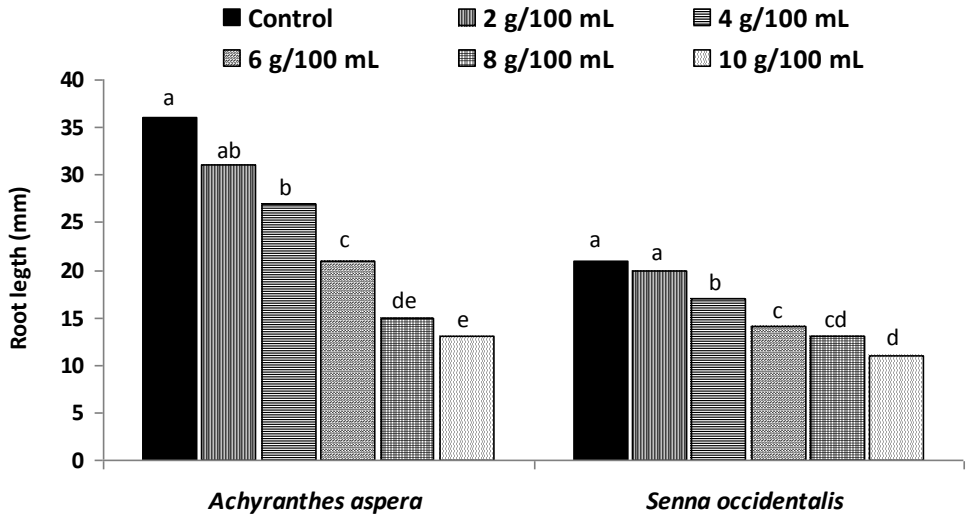

Fig. 3: Effect of *A. indica* extracts on root length of *A. aspera* and *S. occidentalis*. Vertical bars with different letters show significant differnce ($P \leq 0.05$) as determined by DMR test.

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