INTERNATIONAL JOURNAL OF AGRICULTURE & BIOLOGY
1560–8530/2002/04–3–383–384
http://www.ijab.org

Allelopathic Effect of Sorghum Water Extract on the Germination and Seedling Growth of *Trianthema portulacastrum*

M.A. RANDHAWA, Z.A. CHEEMA† AND MUHAMMAD ANJUM ALI
Department of Continuing Education and †Agronomy, University of Agriculture, Faisalabad–38040, Pakistan

ABSTRACT

A laboratory trial to investigate the alleopathic effects of sorghum water extract on the germination and seedling growth of *Trianthema portulacastrum*, was carried out in Weed Science Laboratory, Department of Agronomy, University of Agriculture, Faisalabad. The trial was replicated four times in completely randomized design with five concentrations of sorghum water extract such as 0, 25, 50, 75 and 100%. The germination of *Trianthema portulacastrum* was recorded for 10 days and then root and shoot lengths were recorded. The results revealed that sorghum water extract at higher concentration (100%) reduced the germination of *Trianthema portulacastrum* by 15 to 20%. Root and Shoot length of *Trianthema portulacastrum* was also significantly suppressed at higher concentrations (i.e. 75 and 100%) of sorghum water extract. While lower concentration (25%) of the extract promoted shoot length of *Trianthema portulacastrum*.

Key Words: Allelopathy; Sorghum water extract; *Trianthema portulacastrum*

INTRODUCTION

Trianthema portulacastrum (horsepurslane) is one of the serious weeds of cotton and maize crops in Pakistan. It could reduce crop yields by 32% (Balyan & Bhan, 1989) and the losses may be greater if weed is not properly checked. The common weed control methods include hand hoeing, inter-row tillage and use of weedicides. Hand hoeing is costly while inter-row tillage and weedicides can not be used during rains. Further more, herbicides may enhance soil and environmental pollution.

The search for natural weed control methods is emphasized world over. Allelopathy has been recognized as now a days natural weed control approach (Hardwood, 1979; Rice, 1984). Different crops possess allelochemicals, which could be utilized for suppressing weeds (Putnam & Defrank, 1979). Sorghum is a potential allelopathic crop, which possesses a number of allelochemicals at maturity (Lehle & Putnam, 1982). The suppressive effects of sorghum on different weed species as *Chenopodium album*, *Phalaris minor*, *Cyperus rotundus*, *Senebiera didyma* and *Rumex dentatus* have been observed (Cheema & Ahmad 1992).

The present study was initiated to investigate the allelopathic effects of sorghum on the germination and seedling growth of "horsepurslane"

MATERIALS AND METHODS

To study the allelopathic effects of sorghum water extract on seed germination and seedling growth of *Trianthema portulacastrum*, a trial was carried out in Weed Science-Allelopathy Laboratory, Department of Agronomy, University of Agriculture, Faisalabad.

Field grown sorghum plant sticks were harvested at maturity and dried under shade for a few days. The well dried plants were chopped into about 5 cm pieces with fodder cutter. Chopped plant material was dried in an oven at 70°C for 48 h. The oven dried material was ground in a grinder and passed through a 40 mesh screen. The ground herbage was soaked in distilled water for 24 h at room temperature (30°C±4) in the ratio of 1 g herbage: 20 mL water (Hussain & Gadoon, 1981). The water extract was obtained by filtering the mixture (herbage and water) through a Whatman # 42 filter paper and used afresh either as such or diluted with distilled water to prepare different concentrations according to the treatment.

Petri dishes were given a thorough washing with detergent using hot water as precautionary measure against pathogens and pollutants. *Trianthema portulacastrum* seed was cleaned manually and physical purity was ensured.

Sorghum water extract (S.W.E) was diluted with distilled water to prepare solutions of different concentrations (v/v): 25, 50, 75 and 100% and in control treatment only distilled water was used. Ten seeds of *Trianthema portulacastrum* were grown in each Petri dish of a 9 cm diameter replicated four times in completely randomized design. Filter paper (Whatman) # 42 was used as medium of germination. Four ml of solution was applied to the dishes and the control treatment received 4 mL of distilled water. The outer filter paper was removed just before the initiation of germination. Both treated and control Petri dishes were kept continuously moist by applying distilled water whenever needed. The dishes were kept at room temperature (30°C±4) for seed germination in the Weed Science Laboratory. Germination counts were recorded daily for a period of 10 days and root and shoot length was recorded with a measuring tape.

RESULTS AND DISCUSSION

The germination of *Trianthema portulacastrum* was influenced differently by various concentrations of S.W.E. (Table I). The highest concentration of S.W.E. (100%) significantly suppressed the germination. Although germination was initiated on the same day in all the treatments yet it was 30% less than control and remained at this level till the day 4 and 15% less up to 10th day (Table I). The germination in other concentrations (25, 50 and 75%) of the S.W.E. initially was suppressed but later on gradually increased and became at par with control on 10th day (Table I). The suppression in germination of *Trianthema portulacastrum* at higher concentration (100%) of the S.W.E. indicates the inhibitory allelopathic effects of sorghum on this weed. This supports our previous findings that sorghum water extract inhibited germination of certain weed species (Cheema & Ahmad, 1992).

Root length of *Trianthema portulacastrum* was affected by sorghum water extract (Table I). The higher concentrations (100, 75 & 50%) significantly reduced the root length, however, lower concentration of extract did not effect the root length. The root length decreased as the concentration of the extract was increased. The root growth reduction by S.W.E. could be attributed to inhibitory effects of sorghum allelopathic substances present in the extract.

Shoot length of *Trianthema portulacastrum* was also significantly influenced by S.W.E.. The lower concentration (25%) of S.W.E. promoted the shoot length while higher concentrations (100 & 75%) inhibited the shoot growth and maximum inhibition was found in 100% S.W.E. These results are in line with findings of Purvis *et al.* (1985) and Cheema (1988) who reported that lower concentration of S.W.E. show promoting effect while higher concentration of S.W.E. had inhibitory effects.

Table I. Allelopathic effect of sorghum water extract on the germination and seedling growth of *Trianthema portulacastrum*

Parameters	SWE (0%)	SWE (25%)	SWE (50%)	SWE (75%)	SWE (100%)
Germination percentage	75ab	80a	75ab	70bc	60c
Root length (cm)	3.01ab	3.15a	2.70b	2.40c	2.31c
Shoot length (cm)	2.24b	2.82a	2.20b	2.11b	2.02bc

SWE= Sorghum water extract

CONCLUSION

It can be concluded that sorghum water extract at higher concentrations suppressed the germination, root and shoot growth of *Trianthema portulacastrum* and this suppression was possibly due to the presence of allelochemicals in sorghum plant. Although it was a preliminary laboratory study yet it provided encouraging results and basis for future research.

REFERENCES

Balyan, R.S. and V.M. Bhan, 1989. Competing ability of maize, pearlmillet, mungbean and cowpea with carpet weed under different weed management practices. *Crop Res. Hisar.,* 2: 147–53 (*Maize Absts.,* 6: 3690; 1980).

Cheema, Z.A., 1988. Weed control in wheat through sorghum allelochemicals. *Ph.D. Thesis,* Deptt. Agron., Uni. Agri., Faisalabad, Pakistan.

Cheema, Z.A. and S. Ahmad, 1992. Allelopathy: A potential tool for weed management. *Proc. Nat. Sem. Plant Health and Care in Agri. Prod.* Dec. 28–29, 1988. *Uni. Agri.,* Faisalabad. pp: 151–6.

Guenzi, W.D., T.M. McCalla and F.A. Norstadt, 1967. Presence and Persistence of Phytotoxic substances in wheat, oat, corn and sorghum residues. *Agron. J.,* 59: 163–5.

Hardwood, R.R., 1979. Natural weed controls are looking good. *New Farm,* 1: 56–8.

Hussain and Gadoon. 1981. Allelopathic effects of Sorghum vulgare Pers. Oecologia (Berl) 51: 284–288.

Lehle, F.R. and A.R. Putnam, 1982. Quantification of allelopathic potential of sorghum residues by novel indexing of Richard's Function fitted to cumulative cress seed germination curves. *Plant Physiol.,* 69: 1212–6.

Purvis, C.E., R.S. Jessop and J.V. Lovett, 1985. Selective regulations of germination and growth of annual weeds by crop residues. *Weed Res.,* 25: 415–21.

Putnam, A.R. and J. Defrank, 1979. Use of cover crops to inhibit weeds. *Proc. IX Int. Cong. Plant Prot.,* pp. 580–2.

Rice, E.L., 1984. *Allelopathy,* 2nd Ed. Academic Press, Inc. Orlando, Florida, U.S.A.

(Received 22 April 2002; Accepted 19 June 2002)