The Journal of Animal & Plant Sciences, 21(3): 2011, Page: 542-545
ISSN: 1018-7081

PREVALENCE OF ALIEN WEED *PARTHENIUM HYSTEROPHORUS* L. IN GRAZING AND WASTELANDS OF DISTRICT ATTOCK, PAKISTAN

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ABSTRACT

Surveys of waste and grazing lands from 9 localities of the district Attock were undertaken during March-April, 2009 to study the distribution of alien weed parthenium (*Parthenium hysterophorus* L.) in comparison with the other weed species of the area. A total of 58 weed species belonging to 25 angiospermic families, were found growing in the studied area. Fourteen weed species, including parthenium were found to be growing in all the 9 surveyed sites exhibiting 100% prevalence. Parthenium was found to be the most frequently occurring species in the area with absolute frequency (AF) of 60% and relative frequency (RF) of 4.52%. Parthenium was also the most densely populated weed in the area exhibiting an absolute density (AD) of 19.4 and relative density (RD) of 0.67%. The second most frequently occurring and densely populated weed in the area was *Achyranthes asper* L.. The present study concludes that parthenium has become one of the major weeds in district Attock. There is an urgent need to take some appropriate measures to stop its further spread in the area.

Key words: Alien weed, Attock, Pakistan, *Parthenium hysterophorus*.

INTRODUCTION

After accidental introduction of pparthenium (*Parthenium hysterophorus* L.) in India in the mid-1950s through imported food grains, it has been documented as invasive weed in this continent (Chandras and Vartak, 1970). Then it has spread over most parts of the neighboring countries including Pakistan where this weed is rapidly spreading in parts of Punjab, Khyber Pakhtoon Khawa and Kashmir (Javaid and Anjum, 2005). It is now growing profusely in open spaces, grassland, wasteland and also sometimes in cultivated areas in different parts of the country (Riaz *et al*., 2007; Javaid *et al.,* 2009). The invasive nature of this weed is due to its ability to form huge monocultural stands with no other plant in the vicinity. That is why it has rapidly substituted local weed flora. Various reports have declared it as noxious weed due to its potential to decrease the crop productivity, fodder scarcity, biodiversity depletion and health problems for livestock and human causing hay fever, skin problems and asthma (McFadyen, 1995; Evans, 1997; Javaid 2010).

Attock is a part of Pothwar plateau located on the watershed of the Attock River and its adjoining hilly areas. The elevation of this area ranges between 1000 to 1145 feet above sea level. The major soil types are loamy eroded loess and shallow residual with some gullied land. Crop cultivation generally depends upon rainfall pattern. Land use type is largely for agricultural purposes without systematic irrigation systems and the intensity of cultivation is relatively low. Earlier studies regarding the distribution of parthenium have been carried out mostly in plains of Punjab including district Lahore, Sialkot, Sheikhupura, Hafizabad and Okara (Javaid and Anjum, 2005; Javaid *et al.,* 2005, 2006; Javaid and Riaz, 2007; Riaz and Javaid, 2007, 2010). Very few studies regarding the distribution of parthenium have been undertaken in Pothwar regions (Shabbir and Bajwa 2006; Riaz and Javaid, 2009). The present survey was, therefore, undertaken to study the distribution of parthenium in district Attock.

MATERIALS AND METHODS

The city of Attock is located at a latitude 33.77 N and longitude 72.36 E. It is bordered by Haripur and Swabi district of NWFP to the North of the district. This district is a junction between Punjab and NWFP provinces. Its total area is 6857 km^2 with elevation 9040 ft. The climate of the region presents extremes of heat and cold. There are four well defined seasons viz. winter (December - February), spring (March - April), summer (May - September) and autumn (October - November). The area receives highest rainfall during monsoon months of July and August.

Nine waste and grazing lands were selected in surroundings of Attock viz. City, Gulberg Town, Shamsabad, Faqirabad, Kamra, Burhan, Jalloo, Hassanabdal and Attock Cantonment during March-April 2009. At each of the 9 selected sites, a 1 ha area was demarcated. Sampling was done with a 1 m^2 quadrate. Ten quadrates were randomly thrown at each sampling

site. Data regarding prevalence, absolute frequency, relative frequency, absolute density and relative density of target weed *P. hysterophorous* and local weed flora were recorded by applying the following formulae following Javaid *et al.* (2009):

$$\text{Prevalence (\%)} = \frac{\text{No. of sites in which a species occurs}}{\text{Total No. of sites}} \times 100$$

$$\text{Absolute frequency (AF) (\%)} = \frac{\text{No. of quadrates in which a species occurs}}{\text{Total No. of quadrate}} \times 100$$

$$\text{[Relative frequency (RF) (\%) =]} \frac{\text{Absolute frequency value for a species}}{\text{Total absolute frequency values for all species}} \times 100$$

$$\text{Absolute density (AD)} = \frac{\text{Total No. of individuals of a species in all quadrates}}{\text{Total No. of quadrate}}$$

$$\text{Relative density (RD) (\%)} = \frac{\text{Absolute density for a species}}{\text{Total absolute density for all species}} \times 100$$

RESULTS AND DISCUSSION

A total of 58 plant species belonging to 25 angiospermic families were recorded from the studied area. Maximum number of species (10) belonged to family Asteraceae followed by Poaceae (9), Polygonaceae and Brassicaceae (4 each), Solanaceae and Papillionaceae (3 each), Amaranthaceae, Convolvulaceae, Euphorbiaceae and Malvaceae (2 each). There was one species of each of the rest 15 families (Table 1). Parthenium was found in all the nine studied sites exhibiting 100% prevalence. Among other 58 species, 14 showed 100% prevalence and 13 showed more than 70% prevalence. The species exhibited comparatively low prevalence were *Circium arvense*, *Dactyloctenium aegyptium*, *Erianthus munja*, *Polygonum barbatum*, *Rumex nepalensis* and *Datura alba* (40% each) (Table 1).

Parthenium was found to be the most frequently occurring species in the area with absolute frequency (AF) of 60% and relative frequency (RF) of 4.52%. The weed *Achyranthes asper* exhibited the second highest AF and RF of 58% and 4.44%, respectively. The least frequently occurring species in the area were *Capsella bursa-pastoris* and *Mazus goodenifolia* with AF of 4% each, and RF 0.30% and 0.03% respectively (Table 1).

The most densely populated weed in the area was *Parthenium hysterophorus* that exhibited an absolute density (AD) of 19.4 and relative density (RD) of 0.67%. *Achyranthes asper* was found to be the second most densely populated weed in the surveyed area with AD of 16.1 and RD of 0.55%. The other densely populated weeds which showed AD above 10.0 were *Calotropis procera* (16.0%), *Cynodon dactylon* (13.7%), *Dicanthium annulatum* (12.4%) and *Cannabis sativa* (14.8%). Other weed species with fairly high AD of less than 10 were *Eclipta alba, Amaranthus viridis, Coronopus didymus, Convolvulus arvensis, Cyperus rotundus, Euphorbia prostrata*, *Oxalis corniculata*, *Eragrostis poaeoides* and *Rumex dentatus* (Table 1).

Among the 58 species, 10 belonged to family Asteraceae. All these species exhibited 50–100% prevalence and AF frequency of 7-59% showing that the prevailing edaphic and environmental conditions of the area are highly conducive for the distribution and growth of Asteraceous species. The environment is especially well appropriate for the alien weed parthenium that exhibited 100% prevalence, 59% absolute frequency and a high absolute density of 19.4 plants m^{-2}. Although parthenium was introduced in India in 1950s through imported food grains (Evans, 1997), however, its presence in different parts of the Punjab, Pakistan was noticed only during the last 15-20 years (Javaid and Anjum, 2005). During this short period it has become most frequently occurring and densely populated weed in the studied area. It may attain a height of up to 2 meters under favorable conditions. Similar domination of parthenium at waste and grazing lands has also been reported in districts Lahore, Sheikhupura, Okara, Nankana Sahib, Hafizabad, Wah Cantt and Sialkot as well as in Capital city of Islamabad (Javaid *et al*., 2005, 2006; Shabbir and Bajwa, 2006; Javaid and Riaz, 2007, 2010). Many factors are responsible for rapid spread of parthenium in Pakistan. The most important factor is that this weed is an extremely prolific seed producer, with up to 25,000 seeds per plant (Navie *et al*., 1996), and with an enormous seed bank, estimated at 200,000 seeds m^{-1} in abandoned fields (Joshi, 1991). Furthemore, being a very fast maturing annual, generally plants commence flowering when they are 4 to 8 weeks old and may flower for several months. In addition, Parthenium exhibit allelopathy and inhibits the germination and growth of neighboring plants by releasing various allelochemicals such as water soluble phenolics and sesquiterpene lactones including parthenin and coronopilin (Kanchan, 1975; Picman and Picman, 1984). Generally animals do not eat parthenium and hence it is growing and spreading at a very fast rate. Lastly, the lack of natural enemies of this weed in Pakistan is also contributing to a large extent in the rapid spread of this weed in Pakistan. Due to its high reproductive and allelopathic potential, fast growth rate and lack of natural enemies, parthenium may confiscate the status of local dominating weeds from the Pothwar areas in near future. There is an urgent need to take appropriate measures to check further spread of this alien weed in the region.

Table 1: Prevalence, frequency and density of alien weed Parthenium and native weeds in District Attock.

Species	Family	P (%)	AF (%)	RF (%)	AD	RD (%)
Parthenium hysterophorus L.	Asteraceae	100	60	4.52	19.4	0.67
Carthamus oxyacantha (M.) Bieb.	″	70	10	0.84	2.0	0.06
Centaurea calcitrapa L.	″	80	20	1.37	2.5	0.08
Circium arvense L.	″	40	10	0.53	0.7	0.24
Conyza bonariensis (L.) Cronq.	″	70	20	1.37	3.5	0.12
Eclipta alba L.	″	100	30	2.37	7.9	0.27
Silybum marianum (L.) Gaertn.	″	90	26	1.99	4.7	0.16
Sonchus asper (L.) Hill	″	100	24	1.83	4.5	0.15
Launea nudicaulis Less.	″	70	16	1.22	2.6	0.09
Xanthium strumarium L.	″	50	22	1.68	4.8	0.16
Trianthema pentandra Bennei.	Aizoaceae	70	10	0.76	4.0	0.13
Achyranthes asper L.	Amaranthaceae	100	58	4.44	16.1	0.55
Amaranthus viridis L.	″	100	30	2.29	6.8	0.23
Calotropis procera Br.	Asclepiadaceae	100	49	3.75	16.0	0.55
Heliotropium indicum L.	Boraginaceae	70	16	12.2	2.80	0.09
Capsella bursa-pastoris (L.) Medik.	Brassicaceae	30	04	0.30	0.6	0.02
Coronopus didymus (L.) Smith	″	100	35	2.68	8.0	0.27
Lepidium sativum L.	″	80	29	2.22	4.0	0.13
Sisymbrium irio L.	″	60	10	0.76	2.0	0.06
Opuntia monacantha Haw.	Cactaceae	50	14	1.07	2.2	0.07
Chenopodium album L.	Chenopodicaeae	90	27	2.06	4.4	0.15
Convolvulus arvensis L.	Convolvulaceae	80	27	2.06	5.3	0.18
Cuscuta reflexa	″	60	10	0.76	1.7	0.05
Sedum hispanicum L.	Crssaulaceae	70	19	1.45	2.9	0.10
Cyperus rotundus L.	Cyperaceae	100	45	3.44	7.0	0.24
Euphorbia. prostrata L.	Euphorbiaceae	80	17	1.30	5.9	0.20
Croton sparsiflorus Morong	″	70	17	1.30	3.6	0.12
Malva parviflora L	Malvaceae	60	24	1.83	3.1	0.10
Malvestrum tricuspidatum (A.) Gray	″	70	20	1.53	3.8	0.13
Boerhavia diffusa L.	Nyctaginaceae	80	25	1.91	5.1	0.17
Oxalis corniculata L.	Oxalidaceae	80	32	2.45	7.8	0.27
Astragalus scorplurus Bunge.	Papillionaceae	50	11	0.84	1.3	0.04
Medicago sativa L.		60	07	0.53	0.8	0.02
Medicago laciniata L.	″	60	15	1.14	3.4	0.11
Melilotus sativa L.	″	60	16	1.22	3.3	0.11
Cenchrus biflorus Roxb.	Poaceae	100	48	3.67	1.52	0.52
Cynodon dactylon Pers.	″	100	56	4.29	13.7	0.47
Dactyloctenium aegyptium Beauv.	″	40	13	0.99	1.7	0.05
Dicanthium annulatum Stapf.	″	100	50	3.83	12.4	0.43
Eragrostis poaeoides Beauv.	″	100	42	3.21	9.1	0.31
Erianthus munja L.	″	40	08	0.61	1.0	0.03
Imperata cylindrica (L.) Beauv.	″	90	17	1.30	2.7	0.09
Poa annua L.	″	60	14	1.07	3.5	0.12
Sorghum helepense L.	″	70	15	1.14	3.3	0.11
Polygonum barbatum L.	Polygonaceae	40	06	0.45	1.1	0.03
Polygonum plebegum L.	″	50	15	1.14	2.3	0.07
Rumex dentatus L.	″	100	33	2.52	8.6	0.29
Rumex nepalensis sprenger.	″	40	07	0.53	1.1	0.03
Portulaca oleracea L.	Portulacaceae	80	21	1.60	3.9	0.13
Anagallis arvensis L.	Primulaceae	50	10	0.76	1.5	0.05
Mazus goodenifolia Horneum. (Penn.)	Scrophulariaceae	50	04	0.03	1.9	0.06
Solanum nigrum L.	Solanaceae	90	18	1.37	2.1	0.07
Datura alba Nees	″	40	13	0.99	0.6	0.02
Withania sominifera L.	″	90	15	1.14	4.0	0.13
Cannabis sativa L.	Urticacea	100	54	4.13	14.8	0.51
Lantana camara L.	Verbenaceae	70	09	0.68	1.5	0.05
Verbena tenuisecta L.	″	70	10	0.76	1.9	0.06
Tribulus terrestris L	Zygophyllaceae	80	28	2.14	5.30	0.18

P = Prevalence **AF** = Absolute frequency **RF** = Relative frequency **AD** = Absolute density **RD** = Relative density

REFERENCES

Chandras, G. S. and V. D.Vartak (1970). Symposium on problems caused by *Parthenium hysterophorus* in Maharashtra Region, India. PANS 16: 212-214.

Evans, H. C. (1997). *Parthenium hysterophorus:* a review of its weed status and the possibilities for biological control. Biocontrol News Inform. 18: 89-98.

Javaid, A. (2010). Herbicidal potential of allelopathic plants and fungi against *Parthenium hysterophorus* – a review. Allelopathy J. 25:331-344

Javaid, A. and T. Anjum (2005). *Parthenium hysterophorus* L. – a noxious alien weed. Pakistan J. Weed Sci. Res. 11: 1-6.

Javaid, A., R. Bajwa and T. Anjum (2005). Biological Control of *Parthenium* II: Allelopathic effect of *Desmostachya bipinnata* on distribution and early seedling growth of *Parthenium hysterophorus* L. Int. J. Biol. Biotechnol. 2: 459-463.

Javaid, A., S. Shafique and S. Shafique (2006). *Parthenium* weed – an emerging threat to plant biodiversity in Pakistan. Int. J. Biol. Biotechnol. 3: 619-622.

Javaid, A. and T. Riaz (2007). Spread of aggressive alien weed *parthenium hysterophorus* L. in district Okara, Pakistan. J. Anim. Plant Sci. 17.

Javaid, A., S. Shafique and S. Shafique (2009). Invasion of noxious alien weed *Parthenium hysterophorus* L. in grazing lands of Lahore, Pakistan. J. Anim. Plant Sci. 19: 149-153.

Joshi, S (1991). Interference effect of C*assia uniflora* Mill. on *Parthenium hysterophorus* L. Plant Soil 132: 213-218.

Kanchan, S. D. (1975). Growth inhibitors from *Parthenium hysterophorus* L. Curr. Sci. 44: 358-359.

McFadyen, R. E. (1995). Parthenium weed and human health in Queensland. Aust. Family Physician 24: 1455–1459.

Navie, S. C., R. E. McFadyen, F. D. Panetta and S. W. Adkins (1996). The biology of Australian weeds 27. *Parthenium hysterophorus* L. Plant Prot. 11: 76–88.

Picman, J. and A. K. Picman 1984. Autotoxicity in *Parthenium hysterophorus* and its possible role in germination. Biochem. Systemat. Ecol. 12: 287-292

Riaz, T. and A. Javaid (2007). Invasion of exotic weed *parthenium hysterophorus* l. In district Sheikhupura, Pakistan. Int. J. Biol. Biotechnol. 4: 163-166, 2007.

Riaz, T., S.N. Khan, A. Javaid and A. Farhan (2007). Weed flora of *Gladiolus* in Lahore, Pakistan. Pakistan J. Weed. Sci. Res. 13: 113-120.

Riaz, T. and A. Javaid (2009). Invasion of hostile alien weed *Parthenium hysterophorus* l. In Wah Cantt, Pakistan. J. Anim. Plant Sci. 19: 26-29.

Riaz, T. and A. Javaid (2010). Invasion of invasive parthenium weed in district Hafizabad, Pakistan. J. Anim. Plant Sci. 20: 90-93.

Shabbir, A. and R. Bajwa (2006). Distribution of parthenium weed (*Parthenium hysterophorus* L.), an alien invasive weed species threatening the biodiversity of Islamabad. Weed Biol. Manage. 6: 89-95.