Journal of Biology, Agriculture and Healthcare
ISSN 2224-3208 (Paper) ISSN 2225-093X (Online)
Vol.5, No.1, 2015

Survey of District Sialkot for the Infestation of Parthenium hysterophorus

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Abstract
A detailed survey of District Sialkot was conducted during August-October 2009-2010 to investigate the infestation level of *Parthenium hysterophorus* in the area. Three tehsils of Sialkot were selected for sampling. 53 sites were surveyed and analyzed to evaluate the extent of infestation of *P. hysterophorus*. The sampling sites were categorized as waste lands, edges of agricultural fields, fallow lands and waterways. Maximum infestation of *P. hysterophorus* was found along roadsides which were calculated as 60%, along the crop fields its value was 56%, in fallow lands it was 54%, in the waste lands 50% infestation was calculated while minimum infestation was calculated along the water channels whose value was 46%. While studying tehsil wise infestation of *P. hysterophorus* maximum value was found in tehsil Daska which was 94.74%, in Tehsil Sialkot it was 92.31% and minimum value was found in tehsil Pasroor which was 91.67%.
Keywords: Parthenium, Survey, prevalence, waste lands, field banks, fallow lands, waterways.

1. Introduction

Parthenium (*Parthenium hysterophorus* L., Asteraceae) is an aggressive invasive alien weed species (Kohli *et al.,* 2006), native to the Americas but now widely spread in Asia, Africa and Australia (Evans, 1997). *Parthenium* is an annual herbaceous member of the Asteraceae, with a deep tap root and an erect stem that gradually changes into semi-woody with age. It branches itself out usually up to about 1-2 meter. It has bi-pinnated and pale green leaves covered with soft fine hairs (Prasanta *et al.,* 2005). Parthenium can grow and reproduce itself any time of the year. The weed affects not only the species diversity of native areas, but also their ecological integrity (Kohli *et al*., 2004). In Ethiopia, it was reported that individuals who remove *Parthenium* with hands in infested crops suffer from dermal allergy, fever, and asthma (Taye, 2002). It was reported that the photosynthetic characteristics of *Parthenium* leaf is mostly related to C3 type pathway and exhibits a photosynthesis rate of 25-35 ^{0}C and a high CO_2 level (Pandey *et al*., 2003). Low temperature considerably reduces plant growth, mainly flowering and seed production by reducing leaf area index, relative growth rate, net assimilation rate, and leaf area duration (Navie *et al*., 1996; Pandey *et al.,* 2003). Tamado *et al*., (2002) reported that germination of *Parthenium* seed occurred at the mean minimum (10 $^\circ$C) and maximum (25 $^\circ$C) temperatures as well as over a wide range of fluctuating (12/2 $^\circ$C- 35/25 $^\circ$C) temperatures. The spread of seeds plus their ability to remain viable in the soil for many years pose one of the most complex problems for control and this fact makes eradication difficult for many seed producing weeds (Monaco *et al.,* 2001). Weed seeds may also move with surface water, runoff, in natural streams and rivers, in the irrigation and drainage channels, and in irrigating water from ponds (Monaco *et al.,* 2001).

The weed grows fast and comfortably on alkaline to neutral clay soils (Dale, 1981). However, its growth is slow and less prolific on a wide range of other soil types (Adkins *et al.,* 2005; Rezene *et al*., 2005). *Parthenium* is a prolific seed producer. For example, in a highly infested field in India, a single plant produced 200, 000 seeds/m^2 (Joshi, 1991). The germination process of the weed involves several steps required to change the quiescent embryo to metabolically active embryo (Buhler *et al.,* 2000). For a seed to germinate adequate water, suitable temperature and composition of gases (O_2/CO_2 ratio) in the atmosphere, and light should be available.

The successful spread of *Parthenium* in so many parts of the world has mainly been attributed to its allelopathic properties, which enables it to compete effectively with crops and pasture species (Singh *et al.,* 2003; Batish *et al.,* 2005a, b). *Parthenium* is considered a noxious weed because of its allelopathic effect (Kohli *et al.,* 2006), its strong competitiveness for soil moisture and nutrients and the hazard it poses to humans (Wiesner *et al.,* 2007) and animals (Narasimhan *et al.,* 1977). Allelopathy has been suggested as a mechanism for the impressive success of invasive plants by establishing virtual monoculture and may contribute to the ability of particular exotic species to become dominant in invaded plant communities (Hierro, 2003). Recent research was conducted in order to study Prevalence, absolute frequency, relative frequency, absolute density, relative density and importance value of *Parthenium hysterophorus* and other weeds in District Sialkot and its surroundings.

2. Methodology

2.1 Survey of the area

The present survey was carried out to study the extent of *Parthenium hysterphorus* infestation in District Sialkot, Pakistan. Total 53 sites were visited in three Tehsils to evaluate the extent of infestation of *Parthenium hysterphorus* during the period of November to December 2009.

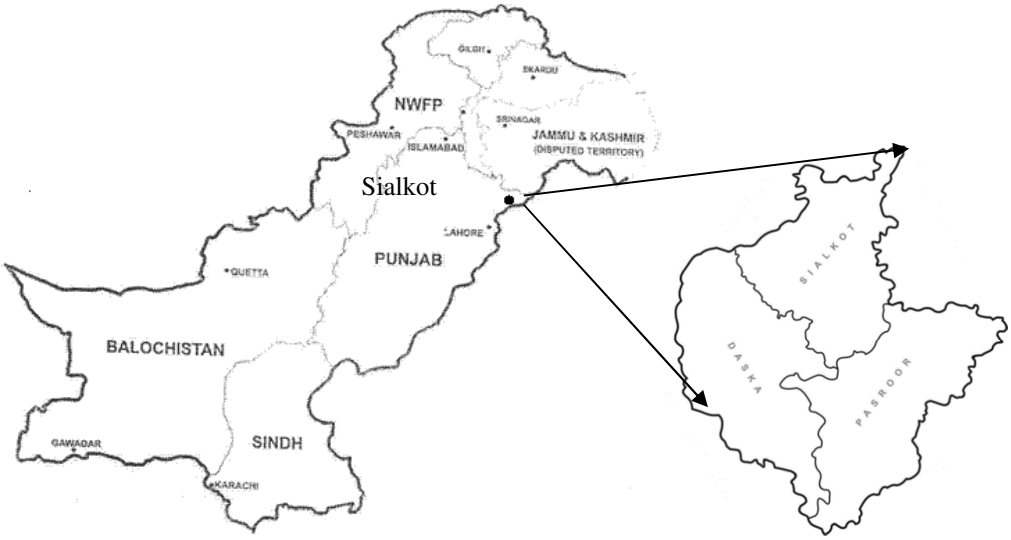


Figure 2.1 showing location of Sialkot on the map of Pakistan

The survey data about *Parthenium hysterophorus* and other weed species were recorded using 1x1 m^2 quadrate (The quadrate method originated with Frederick Edward Clements (1874-1945) (Pound & Clements, 1898). Ten quadrates were randomly thrown at each sampling site then the numbers of plants of all the species in a single quadrate were recorded. Following formula was used to calculate the percentage prevalence of Parthenium.

Results:

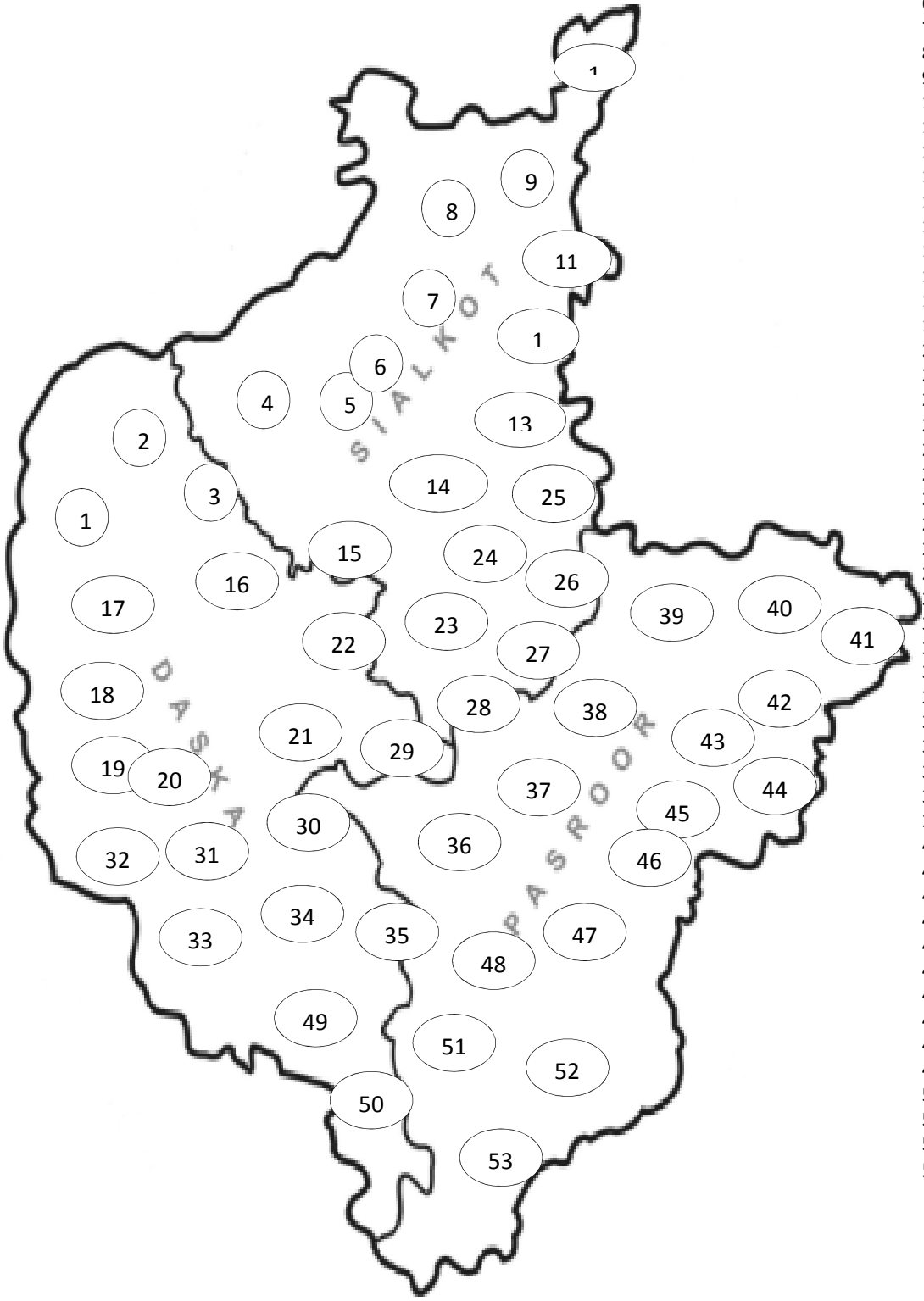
4.1 Survey of the area

4.1.1. *Parthenium hysterophorus* infestation on waste lands

Table 2.1: Table showing the surveyed sites from all the three Tehsils of Sialkot

Tehsils	Sites visited, District Sialkot				
	wasteland	Crop field	Along waterway	Fallow land	Along roadside
Daska	Galotian, Adamkey Cheema, Bharoki, College road Daska.	Kotli loharan, Gohada, machi khokhar.	Bombawala, kundan Sian, Daska kalan, Dhedo wali, Dhado basra.	Jamkay Cheema, Bambanwala, khajuriwala, kuwainki.	Kajau, Kuwainki, Adamotra, jaiserwala.
Pasroor	Baba colony, kot koul ram, Satrah.	Dala sidhowa,. Siranwali,	Satrah, Pinnahwala, Ahmadabad.	Ada khohala, Gujargoraya. Narowal road.	Khajuriwala, adasuleman, lalpul stop, pikhi sindowa
Sialkot	Sahala, shahkot mor, uggoki, sajeetgarh, dalowala.	Paki garhi, Adamotra, sodhra, thathi, pathachowk.	uggoki, bhawani, uggoki, sahalia, kundan pur.	Bhelomahar, dhabeg wala,Pandorian, kajlial, Thathi.	Faiz pura, mandi mankay, Marala, Paki garhi, kothi bhuta.

Figure 2.2 representing surveyed sites



1. Galotian
2. Adamkey Cheema
3. Bharoki
4. Sahala
5. shahkot mor
6. Uggoki
7. sajeetgarh
8. dalowala
9. Paki garhi
10. kothi bhuta
11. sodhra
12. thathi
13. pathachowk
14. Bhawani
15. Sahalia
16. College road daska
17. Kotli loharan
18. Gohada
19. machi khokhar
20. Bombawala
21. kundan Sian
22. Daska kalan
23. Kundan pur
24. Bhelomahar
25. dhabeg wala
26. Pandorian
27. Kajlial
28. mandi mankay
29. Dhedo wali
30. Dhado basra
31. Jamkay Cheema
32. Bambanwala
33. Khajuriwala
34. Kuwainki
35. Kajau
36. Baba colony
37. kot koul ram
38. Satrah
39. Dala sidhowa
40. Siranwali
41. Satrah
42. Pinnahwala
43. Ahmadabad
44. Ada khohala
45. Gujargoraya
46. Narowal road
47. Khajuriwala
48. Adasuleman
49. jaiserwala
50. adamotra
51. lalpul stop
52. pikhi sindowa
53. Ada jattan

3. Results

3.1.1. *Parthenium hysterophorus* infestation on waste lands

All waste lands from where data was recorded indicated average moderate infestation of 46%. Chichriali exhibited high *Parthenium* infestation (52%). Baigowala (27%), Sajeet garh (14%), Harna (19%) and Dongarpur (24%) showed low *Parthenium* infestation. *Parthenium hysterophorus* infestation on waste lands was calculated and represented in figure 3.2.

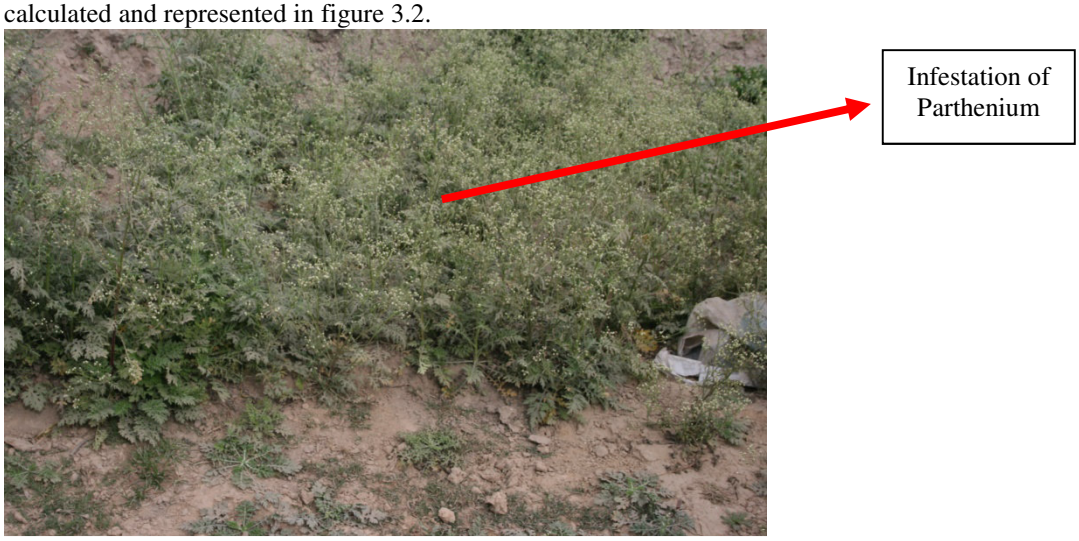


Fig 3.1 Infestation of *P. hysterophorus* on waste lands of Sialkot

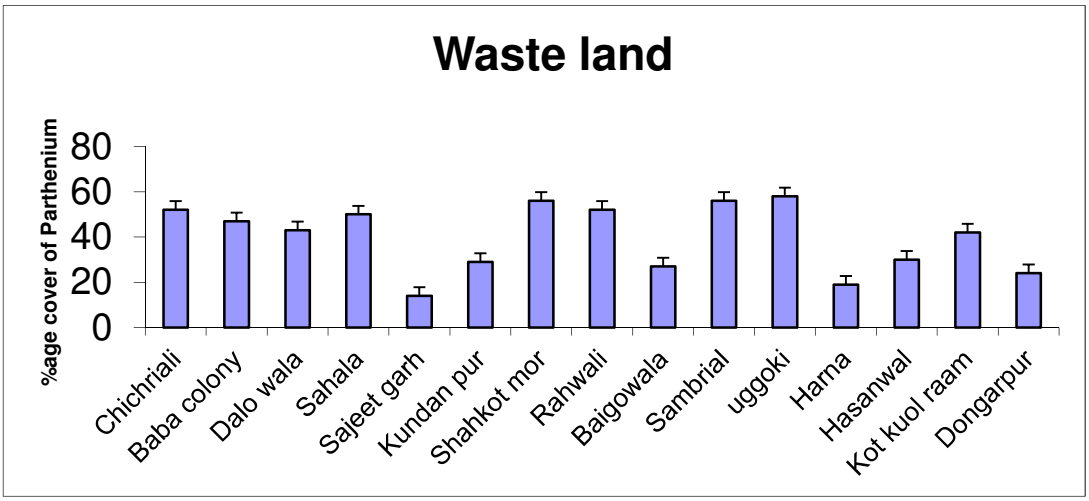


Fig 3.2 Infestation of *P. hysterophorus* in waste lands of Sialkot

3.1.2 *Parthenium hysterophorus* infestation along road sides

Roadsides of District Sialkot exhibited variable infestation frequencies with maximum value of 60% and minimum value of 2%. However average infestation of Parthenium was recorded as 34.07% (fig. 3.4).

Fig 3.3 Infestation of *P.hysterophorus* along roads of Sialkot

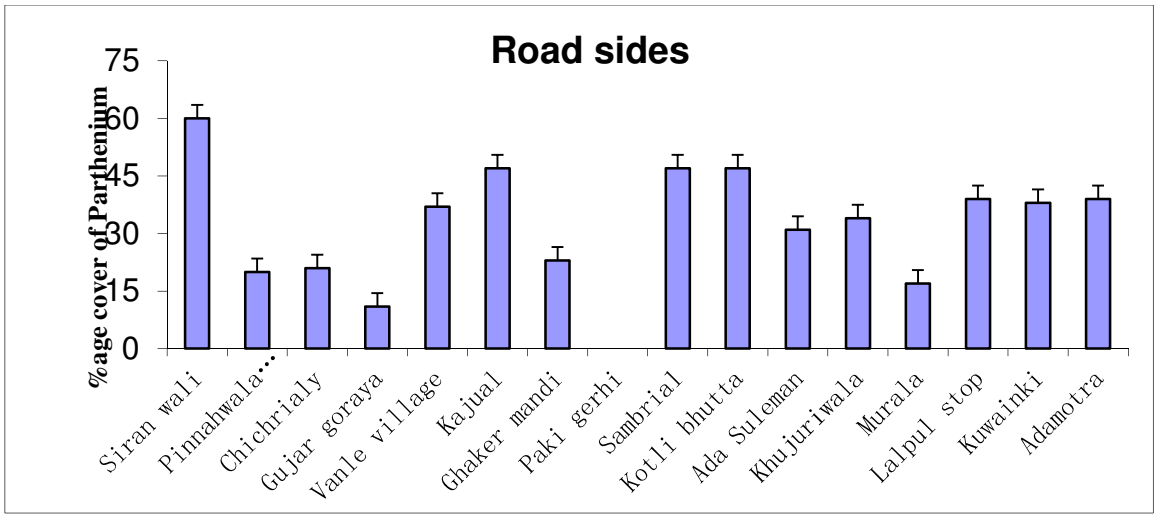


Fig 3.4 Infestation of *P.hysterophorus* along roads of Sialkot

3.1.3 *Parthenium hysterophorus* infestation along water ways

Variable infestation frequencies were recorded along the water ways in district Sialkot with maximum value of 46% and minimum value of 1%. Water ways of District Sialkot exhibited lowest average *Parthenium* infestation (26%).

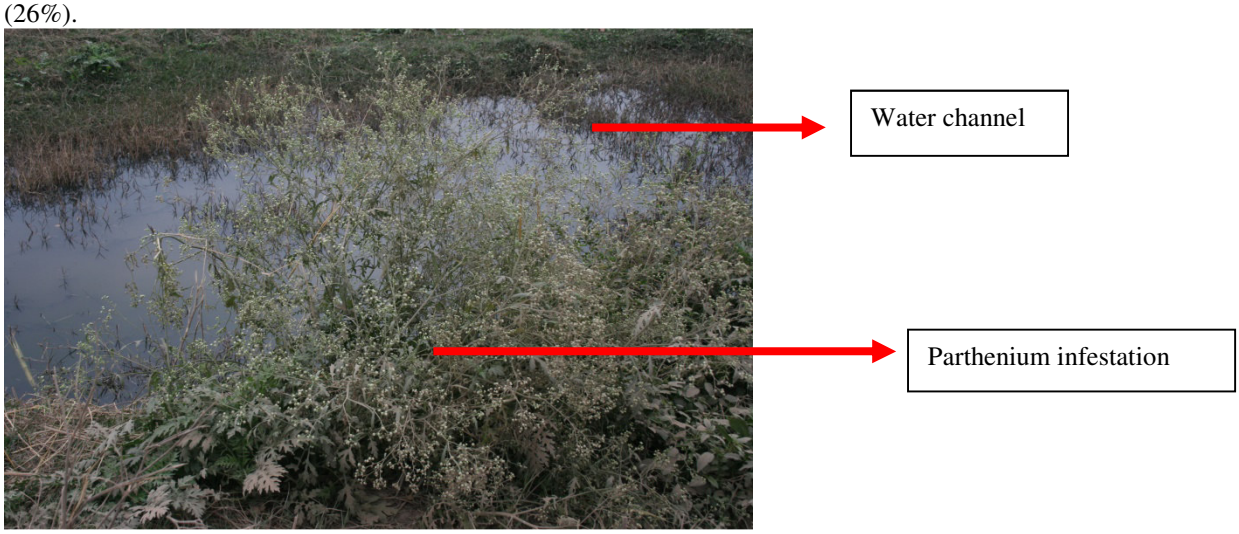


Fig 3.5 *Parthenium hysterophorus* infestation along water ways

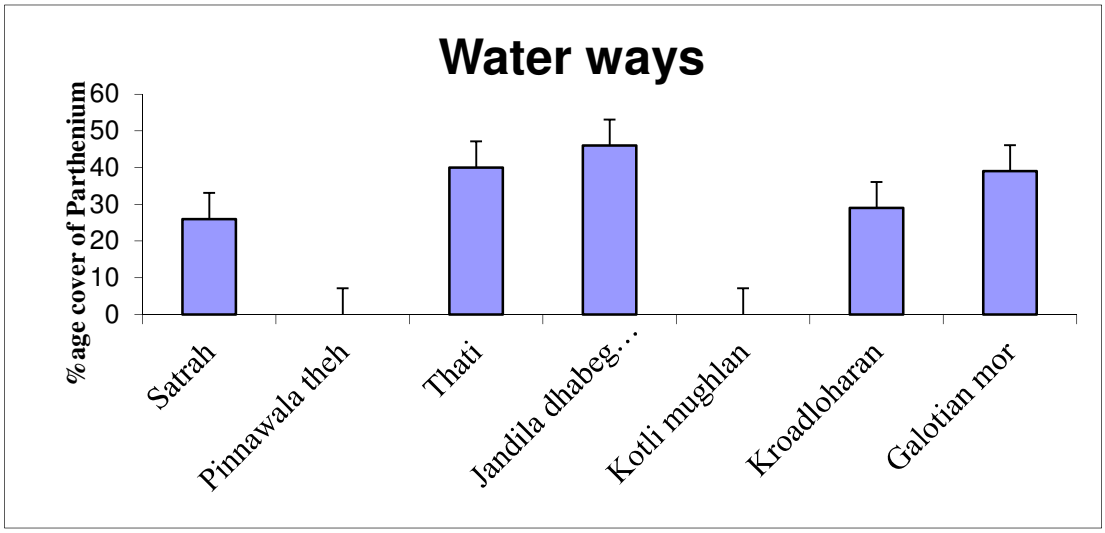


Fig 3.6 Infestation of *P.hysterophorus* along water ways of Sialkot

3.1.4 *Parthenium hysterophorus* infestation along field edges

The crop fields of Sialkot have moderate *Parthenium* infestation (avg. 35%) but most of infestation was found on the edges of crops. Maximum *Parthenium* infestation was recorded in Malappar (56%) and Sodhera (49%) at the edges of rice field. Adha, Dala Sinduwa, Kotli loharan, Pikhi Sinduwa, Wazir abad bypass, Gohadpur and Nadir had moderate infestation of *Parthenium* ranged from 31-45%. At some sites invasion inside the maize field was also found while at all other sites *Parthenium* was found on the edges of rice and *Trifolium* sp. fields. In Daska, rice field bank of Machi-khokhar had low infestation (16%) of *Parthenium* and area of Bolawal had negligible infestation (1%) (Fig.3.8).

Fig 3.7 Infestation of *P.hysterophorus* in agro feilds of Sialkot

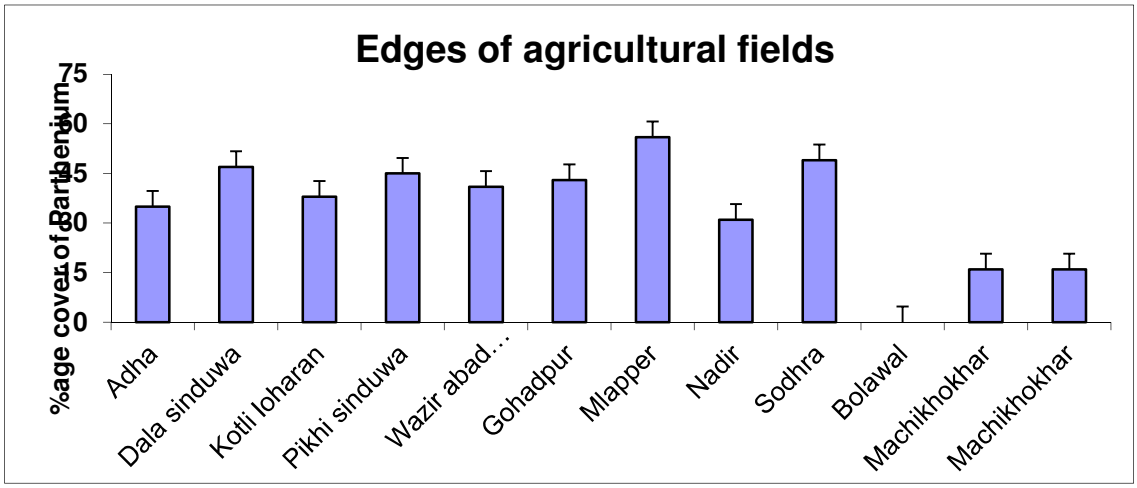


Fig 3.8 Infestation of *P.hysterophorus* in agro feilds of Sialkot

3.1.5 *Parthenium hysterophorus* infestation in fallow lands

The average *Parthenium* infestation upto 49% was recorded in fallow lands. Satrah located at Pasroor road and was highly infested site (54%). In Shairpur and Jaisarwala *Parthenium* invasion was moderate (31% and 44%) (Fig. 3.10.)

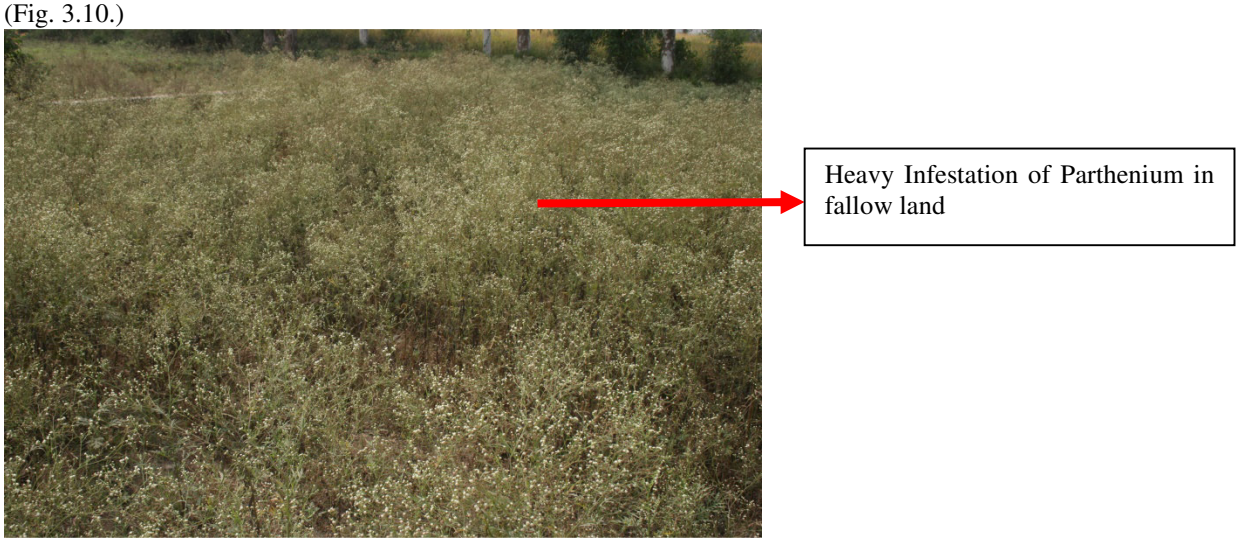


Fig 3.9 Infestation of *P.hysterophorus* in fallow lands of Sialkot

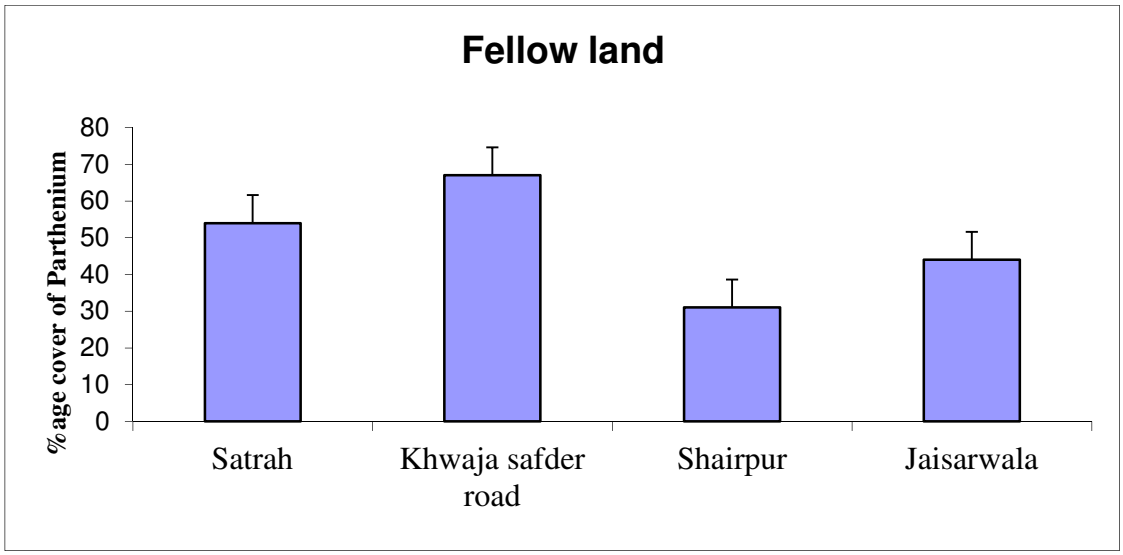


Fig 3.10 Infestation of *P.hysterophorus* in fallow lands of Sialkot

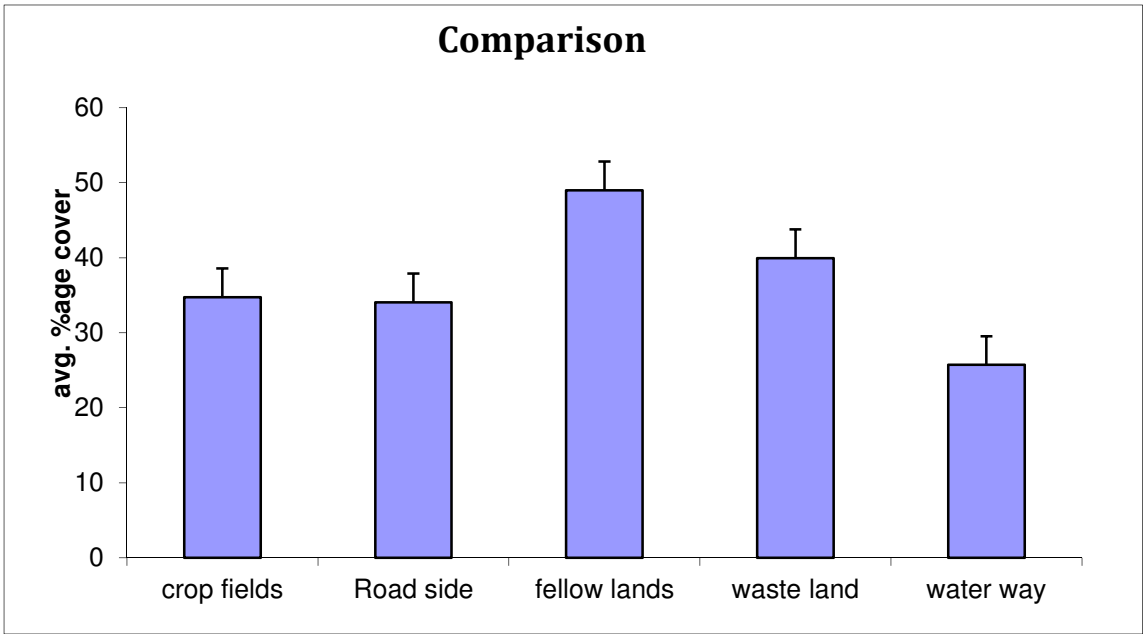


Fig 3.11 Comparison of P. hy*sterophorus* infestation at different locations

The comparative result depict that maximum infestation of Parthenium was found in fallow lands with 49% infestation. Waste lands, Crop fields and roadside represented 40%, 35% and 34% respectively. Minimum infestation was found along the waterways which was 26%.

4. Discussions

The present study has shown that *P. hysterophorus* has become a major weed of this area. Navie *et al.,* (1996) is of the view that seed dispersal is through mechanized farming and vehicles. All the localities of District Sialkot have been occupied by this weed especially fallow lands and roadsides. This study has revealed that *P.hysterophorus* is dominating not only our fallow lands and waste lands but edges of crop fields, waterways and roadsides as well. The highest dominance of this weed may be attributed due to its aggressiveness and allelopathic effect on neighboring plants (Adkins & Sowerby, 1996; Kohli, 1985). Navie *et al.,* (1996) declared that ecology of this weed including the size and seed bank persistence in the soil, high viability of the buried seeds, quick germination rate and innate dormancy mechanism of its seed contributes towards its aggressiveness. Joshi (1991) found that *P. hysterophorus* is a prolific seed producer with up to 25000 seeds per plant and it has massive seed bank in the abandoned fields. From the past research it is very clear that *Parthenium* should be managed in order to save indigenous flora because if established it will be devastating to our crops animals as well as humans.

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