

Distributions of Invasive Weed *Parthenium* (*Parthenium hysterophorus* L.) in the University Campus Peshawar, Pakistan

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Abstract

A survey was performed to measure the distribution of invasive parthenium (*P. hysterophorus*) weed in the university campus, Peshawar, the capital city of Khyber Pakhtunkhwa province in 2016. The University Campus included: The University of Peshawar, Islamia College University, The University of Agriculture Peshawar, Pakistan Forest Institute and the New Developmental Research Farm, The University of Agriculture Peshawar were the main studied areas. In the selected areas *P. hysterophorus* distribution was measured in the academic, residential and research farm areas. Moreover, the survey also investigated the impact of parthenium weed upon native weeds flora inside the University campus. A 1m² quadrat was used to collect the data. During the survey, a total of 32 weeds species were recorded belonging to 18 different families and 32 genera, the life cycle of 23 weeds were annual while 9 weeds have perennial life cycle. The data were recorded on absolute density (%), relative density (%), absolute frequency (%), relative frequency (%) and importance values (%) of parthenium weed and others flora. The data showed that parthenium weed was most dominant species having 76.8 m⁻² plants density in the NDF and (32.0 m⁻²) plants in Islamia University. However, the highest frequency (100%) of *P. hysterophorus* was observed for The University of Agriculture, while minimum (80%) occurred in Agronomy field. Moreover the relative frequency of *P. hysterophorus* was maximum (25%) seemed for Islamia College; whereas, its minimum (12.9%) at Agronomy field. Lastly, the Importance Value of Parthenium indicates the highest (45.98%) at Dairy farm followed by (40.33 %) at Horticulture field's area. In conclusion, the Parthenium weed become more problematic and replaces all the native flora in the non-crop area specially *Dicanthium annulatum* a native grass specie on the on the ridges of the field being replaced by parthenium. Due to no proper management and high growth rate, nowadays it becomes as super weed in the KPK and especially in the Pakistan. So, the management of Parthenium weed requires the call attention from the Govt. policy maker and proper quarantine inspection to conserve the native flora and field crops to get maximum crop yield.

Keywords: *Parthenium hysterophorus*; Weed frequency; University campus; Native flora

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Abbreviations: D.F.A: Dairy Farms Area; A.F.A: Agronomy Farm Area; P.B.G.F: Plant Breeding Genetic Farm; H.F.A: Horticulture Farm Area; N.A.B: New Academic Block; F.I.C: Forest Institute Colony; F.I.J: Forest Institute Jangle Area; D.G: Dhobi Guard; I.C.S: Islamia Collegiate School; I.C.U: Islamia College University

Introduction

Parthenium hysterophorus L. weed is an annual plant belongs to family Asteraceae. The plant can achieved height up to 2 meters when germinated in healthy soil and also have the ability to produce flowers after 4-6 weeks of germination [1]. A healthy and mature plant can produce up to 15000 seed plant-1 which

could be transferred through moving water, animal's body, clothing vehicles, winds, machinery or birds [2]. In favorable environmental conditions, mostly the plant seeds germinate in two years [3], even though an important part of buried seeds have the ability to endure as dormant for numerous years [4]. For healthy germination of requiring alkaline to neutral clay soils [5], while could be grown on less effective on a various kind of soil natures. The water availability for this weed growth and germination comparatively more are inadequate by deprived rainfall [6].

Parthenium is a noxious and aggressive weed to South America and central tropical, and now days spreading to the subtropical and tropical content of the world [7]. In 1956, by chance the parthenium weed was introduced in India [8] and nowadays found everywhere of Indian sub-continent countries, like Pakistan. In Asia, the spreading of Parthenium weed very fast and reached to Vietnam, Taiwan and southern China [9], also reported in African countries like; South Africa, Kenya, Mozambique and Ethiopia and invasive for many Pacific Islands [10,11].

The invasive Parthenium creates problems for human health as well losses of agriculture yields. The *Parthenium hysterophorus* L. plant and its relative species have sesquiterpene lactones [12] which encourage the allergic dermatitis problems and other signs. Create problems as damage to human health, crop production, biodiversity and animal husbandry throughout the globe [13]. The invasive structure of Parthenium replacing the endangered local medicinal plant flora which utilized as medicine source [14]. Especially in India, Parthenium reduces the several crop yields up to 40% [15] while, up to 90% losses in forage production [9]. Another hand in Australia, found as a major threat to perennial grasslands in the central state of Queensland [1,4] whereas losses in beef production up to AU\$22.0 million per year [16]. Parthenium, now introduces himself as cropland weed in Pakistan [13]. For domestic animals it is inedible, but sometimes sheep and cattle will eat in feed limitation or rare.

Globally, the high costs of herbicides prohibit their use for Parthenium weed control. Management will be a success when growing fine pasture grass which has the capability to compete with Parthenium. In the more severe situation of the crop, Parthenium weed can be controlled by application of 2, 4- D or Atrazine [17]. Bio-agents is well substituted to the chemical for perennial grasslands, which is the natural management of Parthenium could be in progress especially in Australia etc.

This survey looks at the current occurrence of Parthenium weeds inside the primitivity of Peshawar University Campus and in the New Developmental Research Farm, The University of Agriculture Peshawar, Pakistan.

In spreading, soil as seed banks is reported for seed dormancy, seed longevity and the capability of weed to grow in the favorable environmental conditions. From the previous investigation, the dormancy of seeds in soil was resolute to be high (44639 seeds m⁻²) Queensland [18] and soil seed bank persistency reached to 65-87%. The seedling of Parthenium invasive weed rapid growing

observed from soil samples as compared to other plants species. Keeping in view the importance of this invasive weed in term of suppressing native flora a comprehensive survey was conducted in the University campus with the following objectives.

- To identify the weed flora of University campus, Peshawar
- To find out the most infested university among the three studied universities regarding weeds population
- To compute the infestation of invasive Parthenium weed around the University Campus, Peshawar.

Materials and Method

A survey was designed to investigate the Parthenium weed distribution in The University campus Peshawar Khyber Pakhtunkhwa, during November 2016. The survey sites, University Campus and The New Developmental Farm, the University of Agriculture Peshawar were selected. Two residential sectors, the University Campus and The New Developmental Farm (NDF) were randomly selected. In the surveyed areas, Parthenium weed was mapped in occurrence and distribution of wastelands as well crop field's flora. A study was conducted in order to study the influence of Parthenium on the occurrence of native weeds inside the Campus and New Developmental Farm, the University of Peshawar. The data collection was done from undisturbed zones along the field and vacant plots. Data were collected from various selected points inside the Campus (University of Peshawar, Islamia College University and The University of Agriculture) and inside the New Developmental Farm. At each point, five quadrats (1 m²) were randomly placed and each time Parthenium distribution, as well as other plant species coming inside the quadrants, were counted and recorded. Frequency and density of Parthenium and other plant species were estimated by using the following formula [19].

$$\text{Absolute Density, AD(\%)} = \frac{\text{Total number of individual of a particular species in all quadrants}}{\text{Total number of quadrats placed}}$$

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

$$\text{Absolute frequency, AF(\%)} = \frac{\text{Number of quadrats in which species occurs}}{\text{Total number of quadrats}} \times 100$$

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

$$\text{Importance value, IV(\%)} = \frac{\text{RF} + \text{RD}}{2}$$

In selected locations, two areas along the field were randomly selected and then surveyed. The placement of five (1x1 m²) quadrats was randomly done in a horizontal pattern, in each location. In placed quadrats, the spaces among each quadrat were depending upon the availability of the area along the field and any obstructions that may have been present. The identification of collected weed was done in the Department of Weed Science, The University Of Agriculture Peshawar, Pakistan (**Figure 1**).

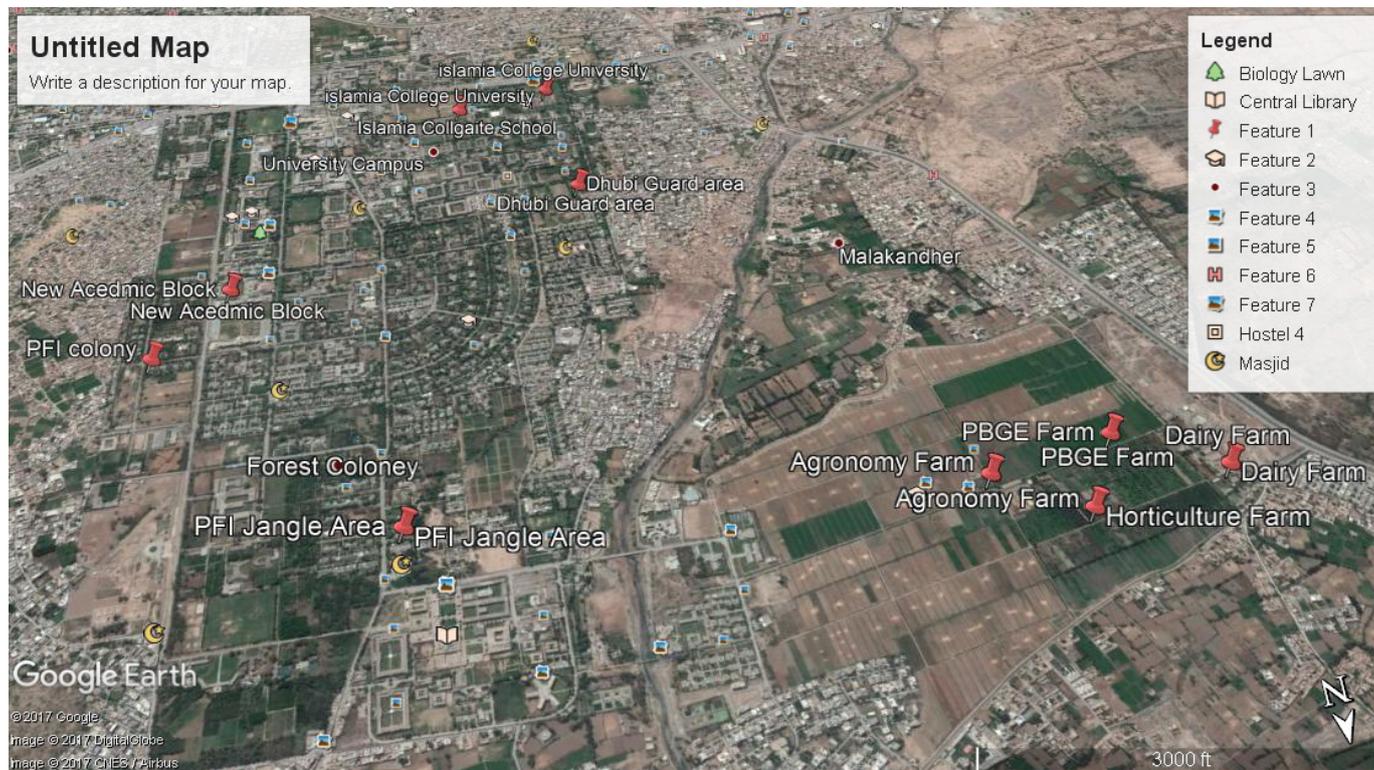


Figure 1 Map with GPS Coordinates of the (studied area), where the distribution of parthenium and other weeds flora in the university campus, Peshawar.

Results and Discussion

Interestingly in the total of 32 Weeds species were identified and collected, belonging to 18 families and 32 genera. 23 weeds have annual life cycle and 9 weeds have perennial. Distribution of annual weed nature shows that few of the annual weeds were found the road sides while majority in the fields as the field have average rotation of two crops mostly which flourish the growth of annual weeds while the perennial weeds mostly grown on the ridges, the only dominant species in all the field area non field area mostly ridges was parthenium which mostly displayed the native species specially *Dicanthium annulatum* a native weeds specie become extinct now a days on the ridges and road sides. Moreover the study also shows that parthenium is susceptible to field disturbance and other field relative operations i.e tillage, ploughing. Most of the crop with great density have no parthenium weed recorded while crop growing on the ridges with free spaces invaded by parthenium i.e maize fields. The overall distribution and frequency of all the weeds recorded were as shown in the table listed below (Table 1).

Absolute weed density

The data in illustrates that the variability in weed dynamics throughout the 10 studied sites. In absolute weed density resultant data, the utmost distribution of Parthenium weed (76.8 m²) was confirmed at Dairy farm, the University of Agriculture. Whilst, the distribution of Parthenium at Agronomy field, New Academic Block, Horticulture fields, and Plant Breeding and Genetic engineering fields were infested with the amount of

(59.2, 58.4, 50.4 and 44.8 m²) respectively. However, except of Parthenium weed, the infestation of *Cynodon dactylon L.*, at Islamia Collegiate School with 100 plants m² were noted. In studied sites, the calculated mean of all weed species bring to light, the *Cynodon dactylon L.* 50.56 m² was most predominant species. Apart from that, the Parthenium (48.08 m²) and Oxylis weed species infesting to the extent of 10.48 m² and all other areas which possessed the equal number. Moreover, the lowest absolute weed density in studied sites occurred at the Islamia Collegiate School, Islamia College University, Daubi Guard and New Academic Block as the amount of (32, 36.8, 38.4 and 41.6 m²). The Parthenium weed acceleration was observe in non-cropping area as well up to some extend in agriculture growing sites which inhibits the crop yields as well as replace other native flora. These findings are agreement of [20,21] who report that the distribution of invasive Parthenium, damage the agriculture crops and its production as well as agitate the ecosystem and cause human health (Table 2).

Relative weeds density (%)

As regards to relative weed density data (%) of all studied sites at the University Campus Peshawar, The aggrandize percent of relative weeds density (48.48%) for Dairy farm area, (35.20%) Horticulture field area, New Academic Blocks (33.33%), Agronomy field area (30.19%) and Forest Institute jungle area (25.24%) of flora comprised of *Cynodon dactylon L.* weed species respectively. However, relative density even surpassed the *Cynodon dactylon L.* at Islamia College University (36.41%) and Forest Institute colony

Table 1 Taxonomy and life cycle of collected and identified weeds in the university campus.

S.No	Scientific name	Common name	Family	Life cycle
1	<i>Parthenium hysterophorus L.</i>	Parthenium weed	Asteraceae	A
2	<i>Taraxicum officinale L.</i>	Com. Dandelion	Asteraceae	P
3	<i>Silybum marianum L.</i>	Milk thistle	Asteraceae	A
4	<i>Cyperus rotundus L.</i>	Purple nut sedge	Cyperaceae	A
5	<i>Cynodon dactylon L.</i>	Bermuda grass	Poaceae	P
6	<i>Euphorbia helioscopia L.</i>	Mad women's	Euphorbiaceae	A
7	<i>Poa annua L.</i>	Annual blue grass	Poaceae	A
8	<i>Sorghum helepense L.</i>	Johnson grass	Poaceae	P
9	<i>Conyza spp L.</i>	Canadian horse	Asteraceae	A
10	<i>Plantago lanceolata L.</i>	Rebwort	Plantaginaceae	A
11	<i>Convolvulus arvensis L.</i>	Field bind weed	Convolvulaceae	P
12	<i>Rumex crispus L.</i>	Curly dock	Polygonaceae	P
13	<i>Broussonetia papyrifera</i>	Paper mulbary	Moraceae	P
14	<i>Sonchus oleraceus L.</i>	Sow thistle	Asteraceae	A
15	<i>Xanthium strumarium</i>	Common	Asteraceae	A
16	<i>Melilotus parviflora</i>	Sweet-clover	Fabaceae	A
17	<i>Anagallis arvensis L.</i>	Chick weed	Primulaceae	A
18	<i>Oxalis corymbosa L.</i>	Wood sorrel	Oxalidaceae	A
19	<i>Cronopus didimus L.</i>	Swinecress	Brassicaceae	A
20	<i>Dicanthium annulatum</i>	Ring beard grass	Poaceae	A
21	<i>Calendula arvensis L.</i>	Field mari gold	Asteraceae	A
22	<i>Malvestrum spp.</i>	Mallow	Malvaceae	A
23	<i>Ranunculus spp.</i>	Butter cup	Ranunculaceae	A
24	<i>Ammi visnaga L.</i>	Besnaga	Apiaceae	A
25	<i>Amaranthus viridis L.</i>	Slender Amaranth	Amaranthaceae	A
26	<i>Medicago denticulate L.</i>	Burclover	Fabaceae	A
27	<i>Chenopodium album L.</i>	Common lambs-	Chenopodiaceae	A
28	<i>Alternanthera denticulate R.Br</i>	Lesser joy weed	Amaranthaceae	P
29	<i>Eleusine indica L.</i>	Goose grass	Poaceae	A
30	<i>Datura alba L.</i>	Jimson weed	Solanaceae	P
31	<i>Fumaria indica L.</i>	Common	Papaveraceae	A
32	<i>Dactyloctenium aegyptium L.</i>	Coaster finger	Poaceae	A

A= Annual and P= perennial

Table 2 Absolute weeds density for the selected site for Peshawar University Campus.

Weed Species Botanical Names	Weed Species Common Names	The University of Agriculture				University of Peshawar				Islamia College University	
		D.F.A	A.F.A	P.B.G.F	H.F.A	N.A.B	F.I.C	F.I.J	D.G.	I.C.S	I.C.U.
<i>Parthenium hysterophorus L.</i>	Parthenium weed	76.8	59.2	44.8	50.4	58.4	41.6	42.4	32	38.4	36.8
<i>Taraxicum officinale L.</i>	Common dandelion	10.4	1.6	0	24.8	0	12.8	12	2.4	0	0
<i>Silybum marianum L.</i>	Milk thistle	18.4	0	0	0	0	0	0	0	0	0
<i>Cyperus rotundus L.</i>	Purple nut sedge	16.8	0	0	15.2	32.8	0	4.8	0	0	0
<i>Cynodon dactylon L.</i>	Bermuda grass	12.8	55.2	41.6	24	28	80	46.4	100	64	53.6
<i>Euphorbia helioscopia L.</i>	Mad women's	8.8	12	8.8	5.6	0	0	0	8.8	0	0
<i>Poa annua L.</i>	Annual blue grass	7.2	6.3	0	8	0	0	4	0	0	0
<i>Sorghum helepense L.</i>	Johnson grass	7.2	10.4	8	0	24	0	0	0	0	0
<i>Conyza spp L.</i>	Canadian horse	0	14.4	33.6	0	0	0	0	3.2	0	0
<i>Plantago lanceolata L.</i>	Rebwort	0	5.6	0	8	2.4	6.4	0	5.6	0	0
<i>Convolvulus arvensis L.</i>	Field bind weed	0	10.4	13.6	0	7.2	0	20.8	5.6	7.2	4
<i>Rumex crispus L.</i>	Curly dock	0	1.6	0	0	0	3.2	0	7.2	15.2	20.8
<i>Broussonetia papyrifera</i>	Paper mulbary	0	1.6	0	0	0	0	0	0	0	0
<i>Sonchus oleraceus L.</i>	Sow thistle	0	1.6	0	0	0	12.8	0	0	3.2	0
<i>Xanthium strumarium</i>	Common	0	6.4	0	0.8	0	0	0	0	0	0
<i>Melilotus parviflora</i>	Sweet-clover	0	4.8	0	0	0	0	0	0	0	0

Weed Species Botanical Names	Weed Species Common Names	The University of Agriculture				University of Peshawar				Islamia College University	
		D.F.A	A.F.A	P.B.G.F	H.F.A	N.A.B	F.I.C	F.I.J	D.G.	I.C.S	I.C.U.
<i>Anagallis arvensis L.</i>	Chick weed	0	2.4	0	0	0	0	0	0	0	0
<i>Oxalis corymbosa L.</i>	Wood sorrel	0	0	24.8	0	0	32.8	0	9.6	37.6	0
<i>Cronopus didimus L.</i>	Swinecress	0	0	3.2	0	0	0	0	0	0	0
<i>Dicanthium annulatum</i>	Ring beard grass	0	0	0	6.4	12.8	0	0	0	0	17.6
<i>Calendula arvensis L.</i>	Field mari gold	0	0	0	0	0	7.2	0	0	9.6	0
<i>Malvestrum spp.</i>	Mallow	0	0	0	0	0	2.4	4	11.2	0	0
<i>Ranunculus spp.</i>	Butter cup	0	0	0	0	0	22.4	0	0	18.4	4.8
<i>Ammi visnaga L.</i>	Besnaga	0	0	0	0	0	6.4	12	0	0	0
<i>Amaranthus viridis L.</i>	Slender Amaranth	0	0	0	0	0	0	3.2	0	0	0
<i>Medicago denticulate L.</i>	Burclover	0	0	0	0	0	0	0	20	12.8	0
<i>Chenopodium album L.</i>	Common lambs-	0	0	0	0	0	0	0	3.2	0	0
<i>Alternanthera denticulate</i>	Lesser joy weed	0	0	0	0	0	0	0	4	0	0
<i>Eleusine indica L.</i>	Goose grass	0	0	0	0	0	0	0	0	31.2	9.6
<i>Datura alba L.</i>	Jimson weed	0	0	0	0	0	0	0	0	5.6	0
<i>Fumaria indica L.</i>	Common	0	0	0	0	0	0	0	0	10.4	0
<i>Dactyloctenium aegyptium L.</i>	Coaster finger	0	0	0	0	5.6	0	0	0	0	0

(33.44). Whereas, the depressed percent of relative density of Parthenium (15.0%) was infested at the Islamia Collegiate School. The means data further showed the *Cynodon dactylon L.* was the more occurred species with 36.41% relative density and the Parthenium weed 25.00% and Oxylis Species 4.5%. In studied survey, observed the Parthenium distribution become more rapidly day by day due to its strong competitive nature. After *Cynodon dactylon*, the density of Parthenium is high as compare to others infested flora, it can be in non-cropping area as well as crop cultivated area. The dominance of Parthenium weeds on local flora, due to the rapid infestation in wastelands or undisturb area. May be due to its invasive potential, high growth rate, more allelopathic properties, large quantity of seeds production and short growth cycle [22]. Same situation was surveyed, in rainy season the distribution and infestation of Parthenium and *Achyranthes aspera L.* weed are more dominant [23] (Table 3).

Absolute frequency (%)

The configuration of local flora in the studied locations at the Peshawar University Campus and the New Developmental Farm, The University of Agriculture Peshawar and Islamia College University. In absolute frequency of local flora, the higher frequency 100% of Parthenium weed was noted at the studied areas, the University of Peshawar and The University of Agriculture and Islamia College University. In spite of fact that, the lower absolute frequency Parthenium occurred in Agronomy field area 80% were absorbed and then *Cynodon dactylon L.*, *Taraxicum officinale L.* and *Convolvulus arvensis L.* as the subsequent evenly infested species in the studied location. The absolute Frequency mean data of flora distribution showed the Parthenium and Johnson grass as more frequent weeds and then *Euphorbia helioscopia*, *Poa annua*, and *Plantago lanceolata* respectively. The Parthenium is an alien weed, commonly distributed in neo-tropical and pan-tropical distributed, Pakistan. The absolute frequency and spreading is very fast in degraded areas, wetlands, along the water bodies, railway tracks and roadsides as well as

nowadays reported in crops cultivated field. Also, have negative effects on animal husbandry, crop production and native flora as well human health [24] (Table 4).

Relative frequency (%)

The distributed weeds relative frequency is a good statistic that indicates the infestation of weeds in the investigated location. The mean data of relative frequency show that the domination of *Parthenium hysterophorus L.* (20.28%) was calculated followed by *Cynodon dactylon L.* (15.55%) and *Taraxicum officinale L.* (5.92%) across all sites. The highest relative frequency of Parthenium occurred in Islamia College University area which is (25%) and then *Cynodon dactylon L.* also occurred in the same site. Tabulated data furthermore illustrates the Parthenium weed distribution was almost same in all the studied sites; though its relative frequency (12.9%) was lowest recorded at Agronomy field area (The University of Agriculture Peshawar) where there were a good weed management practices in Agronomy field. Moreover, Chickweed was noted with low (3.22%) relative frequency at Agronomy field. In survey, it was observe that the Parthenium weed relative frequency is low in cropping area due weed good management practice while, high in non-cropping area due undisturbed area. The highest relative frequency of Parthenium in the non-cropping area are too high as compare to agricultural cropping where always up to some extend weed management practices are in running [19]. This could have been predicted and is most likely due to this weed's highly competitive and allelopathic habit [25]. The displacement of native species may also be due to this weed's highly adaptive nature and because it is poorly grazed by cattle. Similar results to those being reported here for a decline in species richness follow in parthenium weed invasion have also been seen in India and Ethiopia [26,27] (Table 5).

Importance value (%)

The distributions of local flora at everywhere, the Importance

Table 3 Relative weeds density (%) for the selected sites of Peshawar University Campus.

Weed Species Botanical Names	Weed Species Common Names	The University of Agriculture				University of Peshawar				Islamia College University	
		D.F.A.	A.F.A.	P.B.G.F	H.F.A	N.A.B	F.I. C	F.I.J	D.G.	I.C.S.	I.C.U
<i>Parthenium hysterophorus L.</i>	Parthenium weed	48.48	30.58	25.11	35.2	33.3	17.39	25.2	15.04	15.14	25
<i>Taraxicum officinale L.</i>	Com. Dandelion	6.57	0.83	0	17.3	0	5.35	7.14	1.13	0	0
<i>Silybum marianum L.</i>	Milk thistle	11.62	0	0	0	0	0	0	0	0	0
<i>Cyperus rotundus L.</i>	Purple nut sedge	10.61	0	0	10.6	18.7	0	2.86	0	0	0
<i>Cynodon dactylon L.</i>	Bermuda grass	8.08	28.51	23.32	16.8	15.9	33.44	27.6	46.99	25.24	36.61
<i>Euphorbia helioscopia L.</i>	Mad women's	5.56	6.19	4.93	3.91	0	0	0	4.14	0	0
<i>Poa annua L.</i>	Annual blue grass	4.55	3.31	0	5.59	0	0	2.38	0	0	0
<i>Sorghum helepense L.</i>	Johnson grass	4.55	5.37	4.48	0	13.7	0	0	0	0	0
<i>Conyza spp L.</i>	Canadian horse	0	7.44	18.83	0	0	0	0	1.5	0	0
<i>Plantago lanceolata L.</i>	Rebwort	0	2.89	0	5.59	1.37	0	0	2.63	0	0
<i>Convolvulus arvensis L.</i>	Field bind weed	0	5.37	7.62	0	4.11	2.68	12.3	2.63	2.84	2.72
<i>Rumex crispus L.</i>	Curly dock	0	0.83	0	0	0	1.34	0	3.38	5.99	14.13
<i>Broussonetia papyrifera</i>	Paper mulbary	0	0.83	0	0	0	0	0	0	0	0
<i>Sonchus oleraceus L.</i>	Sow thistle	0	0.83	0	0	0	5.35	0	0	1.26	0
<i>Xanthium strumarium</i>	Common	0	3.31	0	0.56	0	0	0	0	0	0
<i>Melilotus parviflora</i>	Sweet-clover	0	2.48	0	0	0	0	0	0	0	0
<i>Anagallis arvensis L.</i>	Chick weed	0	1.24	0	0	0	0	0	0	0	0
<i>Oxalis corymbosa L.</i>	Wood sorrel	0	0	13.9	0	0	13.71	0	4.51	14.83	0
<i>Cronopus didimus L.</i>	Swinecress	0	0	1.79	0	0	0	0	0	0	0
<i>Dicanthium annulatum</i>	Ring beard grass	0	0	0	4.47	7.31	4.68	0	0	0	11.96
<i>Calendula arvensis L.</i>	Field mari gold	0	0	0	0	0	3.01	0	0	3.79	0
<i>Malvestrum spp.</i>	Mallow	0	0	0	0	0	1	2.38	5.26	0	0
<i>Ranunculus spp.</i>	Butter cup	0	0	0	0	0	9.36	0	0	7.26	3.2
<i>Ammi visnaga L.</i>	Besnaga	0	0	0	0	0	2.68	7.14	0	0	0
<i>Amaranthus viridis L.</i>	Slender Amaranth	0	0	0	0	0	0	1.9	0	0	0
<i>Medicago denticulate L.</i>	Burclover	0	0	0	0	0	0	0	9.4	5.05	0
<i>Chenopodium album L.</i>	Common lambs-	0	0	0	0	0	0	0	1.5	0	0
<i>Alternanthera denticulate</i>	Lesser joy weed	0.00	0	0	0	0	0	0	1.88	0	0
<i>Eleusine indica L.</i>	Goose grass	0	0	0	0	0	0	0	0	12.3	6.52
<i>Datura alba L.</i>	Jimson weed	0	0	0	0	0	0	0	0	2.21	0
<i>Fumaria indica L.</i>	Common	0	0	0	0	0	0	0	0	4.1	0
<i>Dactyloctenium aegyptium L.</i>	Coaster finger	0	0	0	0	3.2	0	0	0	0	0

Table 4 Weeds Absolute Frequency (%) table for the selected sites of Peshawar University campus.

Weed Species Botanical Names	Weed Species Common Names	The University of Agriculture				University of Peshawar				Islamia College University	
		D.F. A.	A.F.A.	P.B.G.F.	H.F.A.	N.A.B.	F.I. C.	F.I.J.	D.G.	I.C.S.	I.C.U.
<i>Parthenium hysterophorus L.</i>	Parthenium weed	100	80	100	100	100	100	100	100	100	100
<i>Taraxicum officinale L.</i>	Common dandelion	60	20	0	80	0	60	40	20	0	0
<i>Silybum marianum L.</i>	Milk thistle	80	0	0	0	0	0	0	0	0	0
<i>Cyperus rotundus L.</i>	Purple nut sedge	60	0	0	60	100	0	20	0	0	0
<i>Cynodon dactylon L.</i>	Bermuda grass	40	100	80	60	60	80	60	100	80	100
<i>Euphorbia helioscopia L.</i>	Mad womems	40	20	20	40	0	0	0	40	0	0
<i>Poa annua L.</i>	Annualblue grass	40	20	0	20	0	0	20	0	0	0
<i>Sorghum helepense L.</i>	Johnson grass	40	60	40	0	100	0	0	0	0	0
<i>Conyza spp L.</i>	Canadian horse	0	60	80	0	0	0	0	20	0	0
<i>Plantago lanceolata L.</i>	Rebwort	0	60	0	40	20	20	0	20	0	0
<i>Convolvulus arvensis L.</i>	Field bind weed	0	60	80	0	40	0	80	40	40	20
<i>Rumex crispus L.</i>	Curly dock	0	20	0	0	0	20	0	40	60	80
<i>Broussonetia papyrifera</i>	Paper mulbary	0	20	0	0	0	0	0	0	0	0
<i>Sonchus oleraceus L.</i>	Sow thistle	0	20	0	0	0	40	0	0	20	0
<i>Xanthium strumarium</i>	Common	0	20	0	20	0	0	0	0	0	0

Weed Species Botanical Names	Weed Species Common Names	The University of Agriculture				University of Peshawar				Islamia College University	
		D.F. A.	A.F.A.	P.B.G.F.	H.F.A.	N.A.B.	F.I. C.	F.I.J.	D.G.	I.C.S.	I.C.U.
<i>Melilotus parviflora</i>	Sweet-clover	0	40	0	0	0	0	0	0	0	0
<i>Anagallis arvensis L.</i>	Chick weed	0	20	0	0	0	0	0	0	0	0
<i>Oxalis corymbosa L.</i>	Wood sorrel	0	0	60	0	0	40	0	20	40	0
<i>Cronopus didimus L.</i>	Swinecress	0	0	20	0	0	0	0	0	0	0
<i>Dicanthium annulatum</i>	Ring beard grass	0	0	0	20	40	40	0	0	0	60
<i>Calendula arvensis L.</i>	Field mari gold	0	0	0	0	0	20	0	0	20	0
<i>Malvestrum spp.</i>	Mallow	0	0	0	0	0	20	40	40	0	0
<i>Ranunculus spp.</i>	Butter cup	0	0	0	0	0	40	0	0	40	20
<i>Ammi visnaga L.</i>	Besnaga	0	0	0	0	0	20	40	0	0	0
<i>Amaranthus viridis L.</i>	Slender Amaranth	0	0	0	0	0	0	20	0	0	0
<i>Medicago denticulate L.</i>	Burclover	0	0	0	0	0	0	0	20	20	0
<i>Chenopodium album L.</i>	Common lambs-	0	0	0	0	0	0	0	20	0	0
<i>Alternanthera denticulate</i>	Lesser joy weed	0	0	0	0	0	0	0	20	0	0
<i>Eleusine indica L.</i>	Goose grass	0	0	0	0	0	0	0	0	80	20
<i>Datura alba L.</i>	Jimson weed	0	0	0	0	0	0	0	0	40	0
<i>Fumaria indica L.</i>	Common	0	0	0	0	0	0	0	0	20	0
<i>Dactyloctenium aegyptium L.</i>	Coaster finger	0	0	0	0	20	0	0	0	0	0

Table 5 Weeds Relative Frequency (%) for the selected sites of Peshawar University campus.

Weed Species Botanical Names	Weed Species Common Names	The University of Agriculture				University of Peshawar				Islamia College University	
		D.F. A.	A.F.A.	P.B.G.F.	H.F.A.	N.A.B.	F.I. C.	F.I.J.	D.G.	I.C.S.	I.C.U.
<i>Parthenium hysterophorus L.</i>	Parthenium weed	21.74	12.9	20.83	22.73	20	20	21.74	20	17.86	25
<i>Taraxicum officinale L.</i>	Comm. dandelion	13.04	3.23	0	18.18	0	12	8.7	4	0	0
<i>Silybum marianum L.</i>	Milk thistle	17.39	0	0	0	0	0	0	0	0	0
<i>Cyperus rotundus L.</i>	Purple nut sedge	13.04	0	0	13.64	20	0	4.35	0	0	0
<i>Cynodon dactylon L.</i>	Bermuda grass	8.7	16.13	16.67	13.64	12	16	13.04	20	14.29	25
<i>Euphorbia helioscopia L.</i>	Mad women's	8.7	3.23	4.17	9.09	0	0	0	8	0	0
<i>Poa annua L.</i>	Annual blue grass	8.7	3.23	0	4.55	0	0	4.35	0	0	0
<i>Sorghum hehlepense L.</i>	Johnson grass	8.7	9.68	8.33	0	20	0	0	0	0	0
<i>Conyza spp L.</i>	Canadian horse	0	9.68	16.67	0	0	0	0	4	0	0
<i>Plantago lanceolata L.</i>	Rebwort	0	9.68	0	9.09	4	0	0	4	0	0
<i>Convolvulus arvensis L.</i>	Field bind weed	0	9.68	16.67	0	8	4	17.39	8	7.14	5
<i>Rumex crispus L.</i>	Curly dock	0	3.23	0	0	0	4	0	8	10.71	20
<i>Broussonetia papyrifera</i>	Paper mulbary	0	3.23	0	0	0	0	0	0	0	0
<i>Sonchus oleraceus L.</i>	Sow thistle	0	3.23	0	0	0	8	0	0	3.57	0
<i>Xanthium strumarium</i>	Common	0	3.23	0	4.55	0	0	0	0	0	0
<i>Melilotus parviflora</i>	Sweet-clover	0	6.45	0	0	0	0	0	0	0	0
<i>Anagallis arvensis L.</i>	Chick weed	0	3.23	0	0	0	0	0	0	0	0
<i>Oxalis corymbosa L.</i>	Wood sorrel	0	0	12.5	0	0	8	0	4	7.14	0
<i>Cronopus didimus L.</i>	Swinecress	0	0	4.17	0	0	0	0	0	0	0
<i>Dicanthium annulatum</i>	Ring beard grass	0	0	0	4.55	8	8	0	0	0	15
<i>Calendula arvensis L.</i>	Field mari gold	0	0	0	0	0	4	0	0	3.57	0
<i>Malvestrum spp.</i>	Mallow	0	0	0	0	0	4	8.7	8	0	0
<i>Ranunculus spp.</i>	Butter cup	0	0	0	0	0	8	0	0	7.14	5
<i>Ammi visnaga L.</i>	Besnaga	0	0	0	0	0	4	8.7	0	0	0
<i>Amaranthus viridis L.</i>	Slender Amaranth	0	0	0	0	0	0	4.35	0	0	0
<i>Medicago denticulate L.</i>	Bur clover	0	0	0	0	0	0	0	4	3.57	0
<i>Chenopodium album L.</i>	Common lambs-	0	0	0	0	0	0	0	4	0	0
<i>Alternanthera denticulate</i>	Lesser joy weed	0	0	0	0	0	0	0	4	0	0
<i>Eleusine indica L.</i>	Goose grass	0	0	0	0	0	0	0	0	14.29	5
<i>Datura alba L.</i>	Jimson weed	0	0	0	0	0	0	0	0	7.14	0
<i>Fumaria indica L.</i>	Common	0	0	0	0	0	0	0	0	3.57	0
<i>Dactyloctenium aegyptium L.</i>	Coaster finger	0	0	0	0	4	0	0	0	0	0

Table 6 Weeds Importance Value (IV) for the selected sites of Peshawar University campus.

Weed Species Botanical Names	Weed Species Common Names	The University of Agriculture				University of Peshawar				Islamia College University	
		D.F. A.	A.F.A.	P.B.G.F	H.F.A.	N.A.B.	F.I. C.	F.I.J.	D.G.	I.C.S.	I.C.U.
<i>Parthenium hysterophorus L.</i>	Parthenium weed	45.98	28.19	33.39	0.33	36.67	28.7	34.36	27.52	25.43	37.5
<i>Taraxicum officinale L.</i>	Common dandelion	16.33	3.64	0	6.84	0	14.68	12.27	4.56	0	0
<i>Silybum marianum L.</i>	Milk thistle	23.2	0	0	0	0	0	0	0	0	0
<i>Cyperus rotundus L.</i>	Purple nut sedge	18.35	0	0	8.94	29.36	0	5.78	0	0	0
<i>Cynodon dactylon L.</i>	Bermuda grass	12.74	30.38	28.33	2.02	19.19	32.72	26.85	43.5	26.9	43.21
<i>Euphorbia helioscopia L.</i>	Mad women's	11.47	6.32	6.63	1.05	0	0	0	10.07	0	0
<i>Poa annua L.</i>	Annual blue grass	10.97	4.88	0	7.34	0	0	5.54	0	0	0
<i>Sorghum hehlepense L.</i>	Johnson grass	10.97	12.36	10.58	0	26.85	0	0	0	0	0
<i>Conyza spp L.</i>	Canadian horse	0	13.4	26.08	0	0	0	0	4.75	0	0
<i>Plantago lanceolata L.</i>	Reb worth	0	11.12	0	1.88	4.68	0	0	5.32	0	0
<i>Convolvulus arvensis L.</i>	Field bind weed	0	12.36	20.48	0	10.05	5.34	23.58	9.32	8.56	6.36
<i>Rumex crispus L.</i>	Curly dock	0	3.64	0	0	0	4.67	0	9.69	13.71	27.07
<i>Broussonetia papyrifera</i>	Paper mulberry	0	3.64	0	0	0	0	0	0	0	0
<i>Sonchus oleraceus L.</i>	Sow thistle	0	3.64	0	0	0	10.68	0	0	4.2	0
<i>Xanthium strumarium</i>	Common	0	4.88	0	4.82	0	0	0	0	0	0
<i>Melilotus parviflora</i>	Sweet-clover	0	7.69	0	0	0	0	0	0	0	0
<i>Anagallis arvensis L.</i>	Chick weed	0	3.85	0	0	0	0	0	0	0	0
<i>Oxalis corymbosa L.</i>	Wood sorrel	0	0	19.45	0	0	14.86	0	6.26	14.56	0
<i>Cronopus didimus L.</i>	Swine cress	0	0	5.06	0	0	0	0	0	0	0
<i>Dicanthium annulatum</i>	Ring beard grass	0	0	0	6.78	11.65	10.34	0	0	0	20.98
<i>Calendula arvensis L.</i>	Field marigold	0	0	0	0	0	5.51	0	0	5.46	0
<i>Malvestrum spp.</i>	Mallow	0	0	0	0	0	4.5	9.89	10.63	0	0
<i>Ranunculus spp.</i>	Butter cup	0	0	0	0	0	12.68	0	0	10.77	6.63
<i>Ammi visnaga L.</i>	Besnaga	0	0	0	0	0	5.34	12.27	0	0	0
<i>Amaranthus viridis L.</i>	Slender Amaranth	0	0	0	0	0	0	5.3	0	0	0
<i>Medicago denticulate L.</i>	Bur clover	0	0	0	0	0	0	0	8.7	6.1	0
<i>Chenopodium album L.</i>	Common lambs-	0	0	0	0	0	0	0	4.75	0	0
<i>Alternanthera denticulate</i>	Lesser joy weed	0	0	0	0	0	0	0	4.94	0	0
<i>Eleusine indica L.</i>	Goose grass	0	0	0	0	0	0	0	0	20.4	8.26
<i>Datura alba L.</i>	Jimson weed	0	0	0	0	0	0	0	0	8.25	0
<i>Fumaria indica L.</i>	Common	0	0	0	0	0	0	0	0	5.62	0
<i>Dactyloctenium aegyptium L.</i>	Coaster finger	0	0	0	0	5.6	0	0	0	0	0

Values of that play a key role. Among the studied locations, the mean of all the studied site the minimum (33.81%) IV was recorded for *Parthenium* followed by *Cynodon dactylon* (28.58%). Apart from that, the maximum Importance Value of 45.98% for *Parthenium* was founded at a Dairy farm and then 40.33% at horticulture field's area. Moreover, in the case of other than *Parthenium* weed, the *Cynodon dactylon* and *Convolvulus arvensis* were ranked as uppermost species in Islamia College and Forest Institute jungle as well as other all 10 studied areas. The collected data defecates the spreading of *Parthenium* weed in the studied locations, and its successful adjustable nature and it is quite inevitable to monitor the further infestation from infested

to uninfested locations. Recently, majority of the rangelands and crops cultivated areas are infested with this invasive, noxious *Parthenium* weed, due to its fast growth and easily adjustability and dominance on native flora [28]. The dormancy figure and fast infestation of *Parthenium* weed in forage, deceased up to 90%. Moreover, the presence of especially invasive weeds make land infertile and reduced the quality of grazing land, animal health, milk products as well meat [29,30]. *P. hysterphorus* had become a curse for the natural herbs of the Chhattisgarh plains in India. In Islamabad, the *Cannabis sativa* is exotic invasive species, was once the most dominant weed species among the herbaceous flora [31]. It is now being replaced by *P. hysterphorus*, which is a

very versatile species that exhibits characteristics such as strong Allelopathic effect and fast growing ratio [32] (Table 6).

Conclusions

The *Parthenium hysterophorus* L. weed become more problematic and replaces maximum native flora in the non-crop and

cultivated areas. Due to no proper management and high growth rate, nowadays it becomes as key invasive weed of the KPK and Punjab province. So, the proper management of *Parthenium* weed requires the call attention from the Government, Policy Makers and Agricultural researcher to conserve the local flora and to secure field crops from its infestation to achieve maximum crop yield.

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