

*Case Study*

**FARMERS' PERCEPTION ABOUT *PARTHENIUM HYSTEROPHORUS*  
L.- A CASE STUDY OF HANDIA AND PHULPUR TEHSILS OF  
ALLAHABAD DISTRICT, UTTAR PRADESH**

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**Abstract:** The study on awareness of *Parthenium hysterophorus* L. and its eradication was conducted in Handia and Phulpur tehsils of Allahabad district, Uttar Pradesh. Hundred farmers were interviewed in each tehsil and data were collected through questionnaire. The present study revealed that 75% farmers in Handia and 89% in Phulpur tehsils were aware about the adverse effects of *Parthenium hysterophorus* on the production of crop plants. It was observed that awareness and knowledge about the *Parthenium* weed was more in the farmers of Phulpur tehsil in comparison to Handia tehsil. In both of the tehsils, farmers had no idea about the biological methods to control the weed and other methods of utilization of *Parthenium hysterophorus*. Thus, there is an urgent need to raise the awareness of *Parthenium hysterophorus* and its eco - friendly management in the farmers of Handia and Phulpur tehsils of Allahabad district.

**Keywords:** Awareness, Farmer, Knowledge index, *Parthenium hysterophorus*.

### **Introduction**

Invasive alien species constitute one of the leading threats to natural ecosystem and recently it has been rated as the second biggest threat to biodiversity. *Parthenium hysterophorus* L. is an invasive alien species and these are such species whose introduction and spread threatens the environment, economy and society including human health (Kumari, 2014). *Parthenium hysterophorus* L. belongs to the family Asteraceae, is an erect and branched annual herb, known for environmental, medical and agricultural hazards. *P. hysterophorus* is widely known as white top, white head, congress grass and carrot weed etc. It is considered as a serious weed in several tropical and subtropical countries across the world. It is believed to have been introduced into India as contaminants in PL 480 wheat imported from the USA in 1950. *Parthenium* weed is widely prevalent in India (Singh *et al.*, 2008) and all the states of India have been infested with this weed (Dwivedi *et al.*, 2009). The chemical analysis of *Parthenium hysterophorus* has indicated that all the plant parts contain secondary metabolites

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such as alkaloids, parthenin, p - coumaric acid and caffeic acid being high in the leaves followed by inflorescence, fruit, root and stem (Narwal, 1994). *Parthenium hysterophorus* L. completes three generations in a year and it has remarkable power of regeneration (Dhawan and Dhawan, 1996). *Parthenium* is a noxious weed as it can grow anywhere and causes losses in the crop yield (Haseler, 1976; Aneja *et al.*, 1991). The sesquiterpene lactones namely parthenin and coronopilin present in the trichomes of leaves and stems of *Parthenium* weed are responsible for causing various allergies in human - beings (Wiesner *et al.*, 2007; Kushwaha and Maurya, 2012). The contact with living or dead plant parts of *Parthenium* weed results in dermatitis and presence of pollens in the air causes diseases like air borne contact dermatitis (Agarwal and D'Souja, 2009), fever and asthma (Shen *et al.*, 1976). The contact of animals with *P. hysterophorus* causes rashes on the body and udders of animals. Cattle fed on *Parthenium* mixed with green fodder develop toxic symptoms which may lead to death of the animals (Narasimhan *et al.*, 1977). The sesquiterpene lactone parthenin is responsible for bitter taste of the milk as cattle fed on grasses mixed with *P. hysterophorus* and intake of parthenin containing milk is harmful for human- beings (Narasimhan *et al.*, 1984). The control of *Parthenium* weed has been tried by various methods but no single option was adequate to control the weed hence there is a need to integrate various management options (Adkins and Shabbir, 2014; Kaur, 2014).

Handia and Phulpur tehsils of Allahabad district, Uttar Pradesh were selected for the present study due to the presence of dense colonies of *Parthenium hysterophorus* in these regions. Unfortunately, till today no functional large scale survey was conducted in Allahabad district to study the awareness and knowledge level of the farmers about *Parthenium* weed. In view of this fact, the present investigation was carried out to study the awareness and knowledge level of the farmers of Handia and Phulpur tehsils for identification of *Parthenium* weed, its adverse effects on the environment and preventive measures taken so far in the area. This study may help in the development of future strategies for the eco - friendly management of *Parthenium* weed.

## **Materials and methods**

### **Study site**

The systematic and extensive survey was conducted in Handia and Phulpur tehsils of Allahabad district, Uttar Pradesh, India during April - May, 2016 to assess the occurrence and distribution pattern of *Parthenium hysterophorus* in the district.

**Geographical position of the study site**

Allahabad is a central eastern district of Uttar Pradesh and it is located at 24° 47' and 25° 47' N latitude and 81° 09' and 82° 21' E longitude and stands at the confluence of the Ganga and Yamuna rivers. Allahabad has an area of about 5246 sq km and is 98 m above sea level. The Allahabad district comprises of eight tehsils namely Bara, Handia, Koraon, Karchana, Meja, Phulpur, Sadar and Soraon.

**Climate conditions of the study area**

Allahabad experiences three seasons in a year i.e. summer (March - June), rainy (July - September) and winter (October - February). The annual mean temperature is 25 - 33°C, the highest mean maximum temperature is 42.5°C recorded in May- June and the mean minimum temperature is 4.5°C recorded in January - February.

**Selection criteria of farmers**

The entire survey study was based on the interview and group discussion with the farmers of Handia and Phulpur tehsils of Allahabad district, Uttar Pradesh to assess their knowledge about the *Parthenium hysterophorus* plants available in the area. Due to large number of villages, Handia and Phulpur tehsils constitute a suitable area for the awareness related survey studies. Ten villages were selected from each tehsil and from each identified village ten farmers comprising of 6 male and 4 female were selected between the age - group of 30 - 65 years for the study. Total two hundred farmers were selected for the study from two different tehsils. During the survey, farmers were identified mainly on the basis of the following criteria: (1). a person who was resident of a tehsil (2). willingness of the farmers for participation in the study.

**Interview and group discussion with the farmers**

A brief group discussion was made with the farmers of Handia and Phulpur tehsils in their local language prior for data collection to get their consent and to explain them that their cooperation is a valuable contribution for the documentation of their knowledge about the *Parthenium* weed. During the investigation, farmers were asked to come to the field and other wasteland areas for identification of *Parthenium* plants. Questionnaire was used during the survey for collection of the information regarding the knowledge level of the farmers about the habit and habitat of *Parthenium hysterophorus* plant, occurrence of the *Parthenium* weed in the field, morphological features of *Parthenium* weed and their adverse impact on the environment, crop plants, domestic animals and human-beings (Appendix – I).

To measure the awareness and knowledge level of the farmers, a knowledge index was prepared by taking different parameters such as morphological features of *Parthenium* weed, life - cycle and adverse impact of *Parthenium* weed on human - beings and animals (Verma *et al.*, 2010). For each of the knowledge dimension different scores were given to the farmers who had knowledge about *Parthenium hysterophorus* weed. A low level score was assigned when the farmers had no knowledge or very less knowledge, a medium score was assigned when the farmers expressed their awareness and a high level score was assigned when farmers showed their complete knowledge about the hazardous weed *Parthenium hysterophorus*. The questionnaires were collected and responses and observations of the farmers were summarized in form of the Tables (1 - 9).

### Results and discussion

The systematic survey was conducted to assess the knowledge level of the farmers of Handia and Phulpur tehsils of Allahabad district, Uttar Pradesh about the *Parthenium* weed. During the survey of different villages, it was observed that agriculture was the main occupation of the rural people of Handia and Phulpur tehsils. The information about the *Parthenium hysterophorus* was collected by conducting interview and group discussion with the farmers including both male and female participants between the age group of 30 - 65 years.

### Socio-economic status of the farmers

The majority of the farmers approximately 52% in Handia and 43% in Phulpurtehsil had no formal education and they were illiterate. In Handia tehsil, 21% had primary school level education up to 5<sup>th</sup> standard, 13% had secondary school level education and only 4% of the farmers had college level education whereas in Phulpur tehsil, 22% farmers had primary school level education up to 5<sup>th</sup> standard, 16% and 12% had secondary and higher secondary level education and only 7% of the farmers had college level education. It was observed that literacy ratio was more in the farmers of Phulpurtehsil in comparison to Handia tehsil (Table - 1).

**Table 1: Educational status of the farmers in Handia and Phulpur tehsils of Allahabad district, Uttar Pradesh**

S. No.	Educational status of the farmers	Number of farmers	
		Handia tehsil	Phulpur tehsil
1.	Illiterate	52 ± 0.19	43 ± 0.08
2.	Primary level	21 ± 0.07	22 ± 0.02

3.	Secondary level	13 ± 0.04	16 ± 0.06
4.	Higher secondary level	10 ± 0.03	12 ± 0.02
5.	Graduation	4 ± 0.01	7 ± 0.02

Values are mean of three replicates ±sem

In Handia tehsil, most of the farmers (59%) had small - land holdings and 10% had large - land holdings where as in Phulpur tehsil 52% had small - land holdings (Table-2).

**Table 2: Land - holdings of the farmers in Handia and Phulpur tehsils of Allahabad district, Uttar Pradesh**

S. No.	Land holdings of the farmers	Number of farmers	
		Handia tehsil	Phulpur tehsil
1.	Small	59 ± 0.10	52 ± 0.08
2.	Medium	31 ± 0.02	35 ± 0.03
3.	Large	10 ± 0.05	13 ± 0.10

Values are mean of three replicates ±sem.

Approximately 74%, 13% and 10% of the farmers in Phulpur tehsil informed that *Parthenium* has been invading the area from the last 6 -10, 11 - 15 and 16 - 20 years, respectively while in Handia tehsil 6% of the farmers told that *Parthenium* has been invading in the area from the last 1 - 5 years. In both of the tehsils majority of the farmers said that the rapid spread of *Parthenium* weed has been noticed during last ten years (Table - 3).

**Table 3: Knowledge of the farmers regarding the invasion period of *Parthenium hysterophorus* L. in Handia and Phulpur tehsils of Allahabad district, Uttar Pradesh**

S. No.	Time - period (Years)	Number of farmers	
		Handia tehsil	Phulpur tehsil
1.	1- 5 years	6 ± 0.07	3 ± 0.01
2.	6 - 10 years	71 ± 0.22	74 ± 0.13
3.	11 - 15 years	12 ± 0.01	13 ± 0.02
4.	16 - 20 years	11 ± 0.04	10 ± 0.01

Values are mean of three replicates ±sem

### Knowledge of the farmers about the morphological features of *Parthenium hysterophorus* L.

Knowledge of the farmers of Handia and Phulpur tehsils about the morphological features of *Parthenium hysterophorus* weed was analyzed by six features of *Parthenium* plant viz. habitat, shape and size of the plant, height of the plant, shape of the leaves, colour of the flower and life - cycle of the plant etc (Table-4). The data presented in the Table - 5 reveal that most of the farmers in Handia and Phulpur tehsils were aware about the characteristic features of *Parthenium* weed but they got the knowledge about the weed from their own analysis or fellow farmers. Similar findings were also reported by Singh et al. (2002) and Kapoor (2012).

**Table 4: Knowledge of the farmers regarding the morphological features of *Parthenium hysterophorus* L. in Handia and Phulpur tehsils of Allahabad district, Uttar Pradesh**

S. No.	Morphological features	Number of farmers	
		Handia tehsil	Phulpur tehsil
1.	Habitat	85 ± 0.72	91 ± 0.82
2.	Shape and size of plant	81 ± 0.57	89 ± 0.28
3.	Height of the plant	76 ± 0.91	84 ± 0.62
4.	Shape of the leaves	82 ± 0.30	85 ± 0.17
5.	Colour of the flower	78 ± 0.12	83 ± 0.34
6.	Life cycle of the plant	69 ± 0.07	72 ± 0.05

Values are mean of three replicates ± sem

**Table 5: Mass media resources by which farmers could get the information about *Parthenium hysterophorus* L. in Handia and Phulpur tehsils of Allahabad district.**

S.No.	Mass media resources	Number of farmers	
		Handia tehsil	Phulpur tehsil
1	Radio	4 ± 0.03	12 ± 0.09
2	Television	21 ± 0.24	44 ± 0.32
3	Fellow farmers	92 ± 0.65	95 ± 0.81
4	Krishivigyankendra	69 ± 0.17	78 ± 0.24
5	News paper	2 ± 0.02	7 ± 0.05

Values are mean of three replicates ± sem

**Knowledge of the farmers about the dispersion method of *Parthenium hysterophorus* L.**

Majority of the farmers had no knowledge regarding the dispersion methods of *Parthenium hysterophorus*. Only 79%, 81% and 20% farmers of Handia tehsil reported that *Parthenium* has been introduced in their fields through wind, water and animals respectively (Singh *et al.*, 2003). However, 86% and 84% farmers of Phulpur tehsil reported that wind and water were responsible for the spread of the *Parthenium* weed in their fields (Table - 6). The farmers of Handia and Phulpur tehsils informed that *Parthenium* weed is grazed by cattle in comparison to goat and sheep (Table - 7).

**Table 6: Knowledge of the farmers about the dispersion method of *Parthenium hysterophorus* L. in Handia and Phulpur tehsils of Allahabad district, Uttar Pradesh**

S. No.	Mode of dispersion	Number of farmers	
		Handia tehsil	Phulpur tehsil
1.	Wind	79 ± 0.51	86 ± 0.21
2.	Water	81 ± 0.34	84 ± 0.17
3.	Animals	20 ± 0.09	39 ± 0.06

Values are mean of three replicates ±sem

**Table 7: Knowledge of the farmers regarding the dispersion methods of *Parthenium hysterophorus* L. in Handia and Phulpur tehsils of Allahabad district, Uttar Pradesh**

S. No.	<i>Parthenium</i> is grazed by the animals	Number of farmers	
		Handia tehsil	Phulpur tehsil
1.	Cattle	88 ± 0.69	95 ± 0.71
2.	Goat	82 ± 0.24	93 ± 0.37
3.	Sheep	22 ± 0.19	41 ± 0.03

Values are mean of three replicates ±sem

**Knowledge of the farmers about the harmful effects of *Parthenium hysterophorus* L.**

*Parthenium hysterophorus* is hazardous weed and it causes different diseases in human - beings and animals (Worku, 2010). The harmful effects of *Parthenium* weed were analyzed under three categories such as allergic diseases in human - beings, harmful effects on the animals and negative impact on the agriculture and environmental biodiversity (Table - 8). In Phulpur tehsil, 42% villagers were aware about the human diseases caused by *Parthenium* weed and 37% farmers were aware regarding the poisonous effect of the weed on animals. Few farmers (5%) said that *Parthenium* creates negative impact on environmental

biodiversity. In Handia tehsil, few farmers (39%) had awareness about the diseases such as asthma, fever and allergy caused in human - beings by *Parthenium* weed but they had no idea about the adverse impact of *Parthenium* weed on biodiversity (Neelima *et al.*, 2010).

**Table 8: Knowledge of the farmers regarding the adverse impact of *Parthenium hysterophorus* L. on human - beings and animals in Handia and Phulpur tehsils of Allahabad district, Uttar Pradesh**

S. No.	Adverse impact of <i>Parthenium</i>	Number of farmers	
		Handia tehsil	Phulpur tehsil
1.	Human diseases	39 ± 0.75	42 ± 0.22
2.	Poisonous to animals	18 ± 0.31	37 ± 0.23
3.	Reduces the growth of crop plants	75 ± 0.59	89 ± 0.63
4.	Negative effect on biodiversity	54 ± 0.12	61 ± 0.09

Values are mean of three replicates ±sem

#### **Knowledge of the farmers about the eradication methods of *Parthenium hysterophorus* L.**

The data reveal that majority of the farmers were uneducated and 86% and 92% farmers in Handia and Phulpur tehsils adopted the manual methods such as uprooting, burning, slashing and hoeing for the control of *Parthenium* weed. According to Bhan *et al.*(1997) physical control methods of the weeds are expensive and offering only temporal relief because they have to be repeated and are not applicable everywhere. Farmers (65%) of Phulpur tehsil adopted chemical methods to control the obnoxious weed and they used to spray salt and glyphosate in their fields to check the growth of *Parthenium hysterophorus*. In both of the tehsils of Allahabad district farmers had no idea about the biological methods to control *Parthenium* weed or other methods of utilization of the weed in production of biofertilizers etc. (Table -9).



**Table 9: Knowledge of the farmers regarding the eradication methods of *Parthenium hysterophorus* L. in Handia and Phulpur tehsils of Allahabad district, Uttar Pradesh**

S. No.	Mode of eradication	Number of farmers	
		Handia tehsil	Phulpur tehsil
1.	Mechanical	86 ± 0.76	92 ± 0.65
2.	Chemical	58 ± 0.45	65 ± 0.32
3.	Biological	2 ± 0.03	5 ± 0.01

Values are mean of three replicates ±sem.

The present study reveal that most of the farmers of the tehsil had low level of knowledge about the harmful effect, mode of dispersion and eradication methods of *Parthenium* weed followed by medium level while only few farmers possessed knowledge about *Parthenium hysterophorus*. The knowledge level of the farmers of Phulpur tehsil was more in comparison to Handia tehsil. The interview with the farmers revealed that no *Parthenium* awareness campaigns had been carried out by the government or any other agency in the tehsil. The awareness and extension programmes are required to educate the farmers of the study area regarding the safe and eco - friendly management of *Parthenium* weed as well as other techniques for the utilization of the *Parthenium* weed as it can help in combating the problem on a large scale (Chinnusamy *et al.*, 2010).

### Conclusion

The present study revealed that *Parthenium* weed has spread rapidly and negatively impacting on agricultural production in both Handia and Phulpur tehsils of Allahabad district. During the study it was observed that most of the farmers got the knowledge about the *Parthenium* weed from their own analysis or fellow farmers. Therefore, government should facilitate *Parthenium* sensitization efforts in order to create *Parthenium* awareness among the masses not only for the study area but also in the other parts of the country. Media resources can play a significant role in raising awareness among the farmers of Handia and Phulpur tehsils of Allahabad district. Unless the control methods of *Parthenium hysterophorus* are put in place coupled with raising the awareness the war against *Parthenium* will not be won and the ill-effects of *Parthenium* weed on the environment will be felt across the country.

## **APPENDIX - I**

### **Questionnaire for survey conducted in Handia and Phulpur tehsils of Allahabad district, Uttar Pradesh:**

Name of the farmer

Age

Gender

Education

Location

### **Information was collected from the farmers about the infestation of *Parthenium hysterophorus* weed in the tehsil:**

1. How long have you lived in the area?
2. How much land do you own?
3. Can you recognize the *Parthenium* weed?
4. Which farm animals feed on *Parthenium* weed mostly?
5. What is the effect of *Parthenium hysterophorus* on animal health?
6. What is the effect of *Parthenium hysterophorus* on human health?
7. Does *Parthenium* weed affect crop yield? If yes, how much?
8. What is the effect of *Parthenium hysterophorus* on environment?
9. What is the effect of *Parthenium hysterophorus* on biodiversity?
10. Which control methods do you employ in your fields for the control of *Parthenium* weed?

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