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An Overview of Parthenium Hysterophorus, With Reference to Kotli AJ&K

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Abstract:

Parthenium hysterophorus is most devastating weed. It is responsible for causing various serious diseases in humans including respiratory and other skin, eyes allergic problems. Besides this, it is a cause of economic loss and also a threat to biodiversity. It is due its high germination ability throughout the year, and to adopt wide range of habitats even extreme. Different methods are being employed for its management globally like Physical, Chemical and biological but it can't be controlled by using a single approach. Various control strategies are being used globally to reduce its population to manageable levels. But due to many limitations of conventional methods, its management is still a great challenge. Recently, beside its devastating effects, research in being done to use its phyto-chemicals for beneficial purposes. Like globally, it has also adversely affected the biodiversity, economy and climate of Kotli Azad Jammu And Kashmir. No significant work had been done at Government level, by authorities, by policymakers, by NGO's and also by universities due to lack of financial assistance. The aim of this review is to provide general information about its distribution, its ill effects and its management and also to pay attention of Government, authorities, policymakers, NGO's towards this not only in Kotli District but also at country level.

Key words

Allelopathic, Parthenium, Biodiversity, Kotli

Introduction

Parthenium hysterophorus is an allelopathic herbaceous weed.[1] It has different local/common names in various regions of the world few of them are; carrot grass, congress grass or Gajar Ghans.[2] famine weed,[3] Santa Maria feverfew,[4] white-top weed,[5] Santa-Maria,[6] bitter weed, star weed, white top, wild feverfew[7] etc. Parthenium hysterophorus belonging to family Asteraceae.[8] It is capable of growing in almost all types of soil round the year because it has very low water requirements and germination temperature ranges from 8 to 30°C.[9] It produces thousands of small white capitula each bears five seeds on reaching maturity. It is considered as, world's devastating and hazardous weeds. This weed has occupied abandoned landscape including residential areas, streets, roads, railway-tracks, canals, fields, gardens, playgrounds etc. This is due to its thousands of seeds producing capacity, ranging from 10,000 to 15,000 seeds per plant.[10] Its seeds also has a characteristic feature that they spread easily and germinate fast . It is considered as one of the most devastating weed among the world's top seven devastating weeds. [11] In the above mentioned characteristic of Parthenium, the climatic and adaphic status of Kotli Azad Jammu and Kashmir supports the fast growth and spread of it. It has many adverse effects on biodiversity, agriculture and health of man and on other animals. Parthenium or its pollens, in man, cause various respiratory problems like asthma, bronchitis and also causes allergic effects on skin, eyes and nose etc [1] beside this it is a great threat to economic loss and devastation of crops.[12] Recently, at global level, research is being done to get benefits from it due to presence of valuable phyto- chemicals in it such as oils, Flavonoids,[13] Phenols,[14] Alkaloids [15] etc.

Taxonomy

Kingdom	Planate
Phylum	Tracheophyta
Class	Magnoliopsida
Order	Asterales
Family	Asteraceae
Genus	Parthenium
Specie	Hysterophorus
Binomial name	Parthenium hysterophorus L. [16]

Pictures:

Figure 1, Rosette stage of Parthenium

Figure 2, Flowers of Parthenium

Figure 3, Mature Parthenium Plant

Figure 4, Population of Parthenium

Effects of Parthenium

Due to the occurrence of allelo chemicals in Parthenium, it is a great threat to loss of biotic as well as abiotic components of ecosystem which ultimately adversely effects the economic status of effected area. Its impact on biotic as well as abiotic components are discussed hare:

Effects on Man

Parthenium has many adverse effects on man due to its allelo constituents, such as parthenin and phenolic acids like caffeic acid, p-anisic acid, anisic acid, vanillic acid, parahydroxy benzoic acid and chlorogenic acid which are lethal to man.[17] When it come in contact with body parts it causes allergic reactions. When contacts with skin, causes hay fever, peeling skin, puffy eyes, swelling and itching of mouth and nose[1], and when inhelad, causes respiratory problems such as Asthma, Bronchitis, and Cough [18]

Effects on Animals

The allelopathic constituents of Parthenium such as parthenin and phenolic acids like caffeic acid, p-anisic acid, anisic acid, vanillic acid, parahydroxy benzoic acid and chlorogenic acid are lethal to animals. [17] Parthenium, in animals, causes various dermatitis, skin diseases, loss of skin pigmentation, mouth ulcers, extreme salivation and diarrhoea [19]. If this weed is taken in excess amount by animals it

can cause death. [20] It also changes the order of milk as well as reduces its production level. [10]

Effects on Agriculture

The Parthenium hysterophorus is spreading not only in already reported countries but also in new ones [21]. It contains parthenin, hysterin, hymenin, and ambrosin due to the presence of these allelochemicals it has strong allelo-pathic effect on crops [22]. It also have adverse impacts on legume plants by disturbing their symbiotic Nitrogen fixing bacteria such as Rhizobium, Azotobacter, Azospirillum and Actinomycetes. It reduces 40% productivity of legume crops. Its pollens inhibit the fruit setting in cereal and other crops [23]. It also effects seed germination and seedling growth of Oryza sativa, Triticum aestivum and Zea mays. Its pollens also reduces upto 50% yield of maize [24].

Effects on Biodiversity

Being incursive, P. Hysterophorus has threatens the ecological biodiversity [25]. Its impact on biodiversity is due to its competition with native flora for resources as well as due to its allelo-chemicals. It has capisty of growing in all types of soil and throughout the year because it has very low water requirements and a germination temperature of 8-30 ^{o}C.[9]It alter characterics of water, nutrient accumulation and their cycling.Loss of biodiversity has been observed due to displacement of native vegetation and interruption in natural succession in that natural ecosystem.[18]

Effects on Economy

As discussed above, Parthenium adversely effects the health of Man, also health and quantity as well as quality of products produced by plants and animals. In all such circumstances, directly or indirectly, the graph of the economy will go down. This situation is very alarming in under developing countries like Pakistan or in undeveloped countries.

Control of Parthenium

Various methods are being employed such as: physical, chemical, biological and integrated methods are being employed to manage or to eradicate Parthenium around the globe [26] as discussed below:

Physical control

Its uprooting before flowering or seed setting stage is most effective method. If its uprooting is done after flowering or seed setting it will effect large area. Its uprooting is easer in wet soil. Its contacts with skin cause allergic effects. This method is time consuming and not very effective. [27] Sometime its uprooting is burnt but it cause pollution that's why this method is not encouraged. [28]

Chemical control

It is most effective method to control Parthenium. Various chemical herbicides are being used such as, glyphosate, chlorimuron ethyl, atrazine, ametryn, metasulfuron, and bromoxynil are proved effective in controlling this weed.[29] The use of 2,4-D EE (0.2%) and metribuzin (0.25 and 0.50%) has proved very effective in the management of Parthenium. After 15 days of spraying (DAS), it completely kills Parthenium and inhibits it's any emergence [30]. Those chemicals/spray having a concentration of 20% sodium chloride, has been found most effective against Parthenium. [31]

Biological control

By plants

Most effective method of its control is by use of its competitive plant species that compete with it and destroy it. Various plant species like; Cassia obtusifolia, Cassia auriculata, Cassia tora, Croton sparsiflorus and Cannavis sativa etc are being used for its management. [32] It is one of the eco-friendly technique that has comparatively less hazardous effects on ecosystem.

By Insects

To control Parthenium, several insects have been tried. Zygogramma bicolorata and Epiblema strenuana, Platophalonidia mystica Listronotus setosipennis, Conotrachelus albocinereus, Bucculatrix parthenica, Carmenta ithacae and Smicronyx lutulentus etc are among the several insects that are used against parthenium. Z. bicolorata is leaves eating, L. setosipennis and S. lutulentus are seed feeding, B. parthenica is leaf mining, E. strenuana and C. albocinereus are stem galling C. ithacae and P. mystica are stem boring insects used against Parthenium. [33]

Figure 5, Carmenta ithacae

Figure 6, Epiblema strenuana

Figure 7, Smicronyx lutulentus

Figure 8, Zygogramma bicolorata, while attacking on Parthenium

Figure 9, Zygogramma bicolorata

Figure 10, Listronotus setosipennis

Figure 11, Bucculatrix parthenica

Positive Impacts of Parheium in Present and Future

In the present, besides its side effects, researchers are trying to get benefits from its valuable phyto-constituents. It contains oils, Flavonoids,[13] Phenolics,[14] , Terpenes and Alkaloids [15] are used for various useful purposes. Its phyto-constituents are used as anti-cancer[34] against various types of cancer such as Breast, Leukaemia, and Prostate as well. Its can be used against fungi, microbes insects and mosquito[35] due to its valuable constituents. It can be used as phytoremediation of heavy metals like Zn, Ni, Cd, Cu, Co, Pb, Hg and Zn etc.[36]. It can also be used as fertilizer to overcome the decency of micro and macro nutrients by vermi composting.

Discussion

Parthenium is ubiquitous because it has ability to adopt variety of habitats and germinate fast and pays adverse effects on the native flora and fana. It alters the climatic and adaphological characterics. Its allelochemicals are a great threat to natural biodiversity, it's the need of the hour that government, policy makers, economists, NGO's and other welfare socites should pay great attention towards its eradication and should support the researchers that they can find its beneficial aspects such as Anti-tumours, Anti Hepatitis Virus and also against other viral and bacterial diseases. It can also be mounded against various insects, pests, weeds, fungi, bacteria and viruses that destroy crops. One other its beneficial aspect is vermi-composting, which is alternative of fertilizers. It can also be used in the reclamation of heavy metals from the soil but in all such circumstances there is a need to pay attention by authorities otherwise we can not cope with its divesting effects on ecosystem.

Conclusion

From the present review article, it can be concluded that although its eradication is difficult but not impossible. The authorities should support and promote awareness to public, to eradicate it by eco-friendly ways, and should provide financial assistance to researchers that they can mound it for more beneficial purpose.

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