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A Brief Review on *Parthenium Hysterophorus*

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Abstract:- We are currently dealing with a widespread Parthenium hysterophorus infestation. It can be found in stocks near railway tracks, in bare lands, in agriculture fields, orchards, and forests, and it has infiltrated much of the Indian continent. We are aware of Parthenium hysterophorus's noxious properties and wish to control its infestation. However, simply limiting its growth will suffice. It cannot be removed, but it can be managed through its various applications. Recently, a great deal of research has been conducted. The utilization properties of Parthenium will be investigated further. Several researchers have concluded that this review article discusses some of the properties and potential applications of Parthenium. Parthenium hysterophorus L. is an annual or ephemeral herb in the Asteraceae family (tribe: Heliantheae). Asteraceae member Parthenium hysterophorus Linn is used to treat a variety of ailments. Common names for it include Congress Weed, Carrot Weed, and Wild Feverfew. The Scourge of India is a noxious weed that was accidentally introduced into India via imported food grains in 1956 and is now one of the most feared weeds. The plant is used to treat wounds, ulcers, fever, anemia, and heart problems.

Keywords:- *Parthenium hysterophorus, weed, agricultural system, economics.*

I. INTRODUCTION

Weeds are unwelcome in a given situation and can be harmful, dangerous, or economically damaging, posing a serious threat to primary production and biodiversity. Invasive alien species are defined as species that are intentionally or unintentionally introduced from outside their native country to other countries by human activity. They've established self-replicating populations in the wild, causing visible changes in nearby, simulated, and biological systems [1]. They have a negative impact on agricultural and forest productivity. The most common invasive alien weed that outcompetes native species and harms biodiversity is *Parthenium hysterophorus*. An invasive alien species (IAS) is a species that has established self-reproducing populations in the wild after being introduced from outside its natural range of distribution (other countries or regions of the country) by either intentional or unintentional human activity, causing obvious changes in local, artificial, or natural ecosystems [2]. Invasion is regarded as the second most serious threat to biodiversity, after habitat destruction. *Parthenium hysterophorus* is an invasive alien weed that has become a major weed in Australia, Africa, and many other parts of the world. It is also known as *Parthenium* weed, congress weed, carrot weed, or white top [3]. It was most likely brought to Bangladesh recently from India. The weed has also been discovered in Jessore, Faridpur, Norail, Magura, Rajshahi, Natore, Sirajgonj, Manikgonj, Dhaka, and Mymensingh districts. Many parthenium weeds are now spreading via vehicles and agricultural commodities (Fig. 1). Despite the fact that a number of studies on the effects of *Parthenium* weeds have been conducted in various countries, So far, very little *Parthenium* research has been conducted in Bangladesh. *Parthenium* is only mentioned a few times in Bangladesh. Despite the fact that other countries have conducted numerous studies on the effects of *Parthenium* weed, no or few studies have been conducted in the United States. There has been a very little investigation in Bangladesh. The majority of Bangladeshis are also unaware of the *Parthenium* problem. Its primary effects are on agriculture and Natural ecosystem production and biodiversity, as well as human and animal health, are all affected. There was no single method that was used exclusively. Despite having a measurable impact (O'Donneli), integrated management approaches are ineffective in management [5].

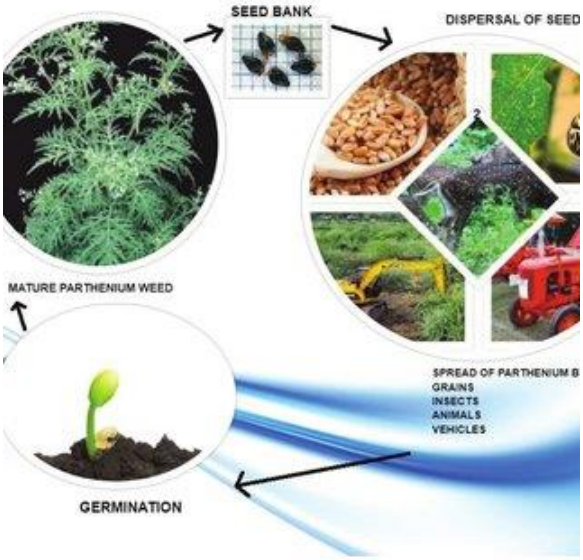

Fig 1:- Dispersion of *Parthenium* hysterophorus

Because *Parthenium* weed cannot reproduce vegetatively from plant parts, the seed is the only way for it to reproduce and spread (Fig. 2). Plants can flower and set seed four weeks after germination because they are stressed and small in the summer. Buried seeds have been found to be far more durable than surface-planted seeds [6].

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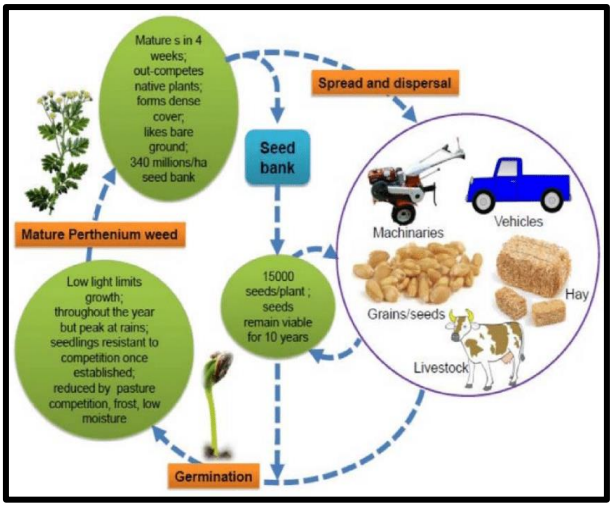

Fig 2:- Reproduction of *Parthenium hysterophorus*

Chemical control must be applied when the plants are small and have not produced seed, and when grasses are actively growing and seeding to recolonize the infested area (e.g. in early summer). According to studies, after six years, 50% of seed buried 5 cm below the surface is still viable. However, unlike other weed species, *Parthenium* weed can produce flowers and seeds at any time of year if conditions are favorable [4].

A. Botanical Aspects of Parthenium hysterophorus

Parthenium hysterophorus L. (Asteraceae family; Common names include bitter weed, false ragweed, feverfew, *Parthenium* weed, Ragweed, white top, and others; vernacular names include Kanika Ghani, Bethu Ghani, and Padke phul. Flower heads on a corymb, phyllaries 10 in 2 series, ovate, dull-white, 3-4 mm in diameter; stem highly branched; leaf simple with profusely dissected leaflets; The disc florets are numerous and dull white; there are four stamens and one another, and the ovary is sterile ray floret: only 5 ray florets per flower head, no corolla, stamens, or stigma, style is short, ovary oval, and dorsoventrally flattened. Cypsela fruit, flat and triangular in shape, with thin, white spoon-shaped appendages, with 5 cypselas per flower head [7].

B. Colonization and spread

The most common habitats for *Parthenium* weed are alkaline clay loam to clay soils on downs, floodplains, and softwood, brigalow, and gidgee scrub country. *Parthenium* weed is a highly competitive plant with a high colonization rate [8]. It will colonize overgrazed or weak pastures with little ground cover, cultivated lands, disturbed and bare areas such as roadside and track edges, and heavily stocked areas such as stockyards and watering holes. Water, farm and industrial machinery, feral animals, humans, vehicles, stock fodder, and stock, grain, and seed movement all contribute to the spread of *Parthenium* seed. *Parthenium* weed is native to the subtropical regions of South and North America. Following the introduction, the weed has the potential to rapidly multiply and form mono-specific thickets, as well as degrade biodiversity in Argentina, Mexico, the West Indies, and the southern United States [9]. It has spread to many African, Asian, and Pacific countries, becoming a major weed in India and Australia. Bangladesh is known to be infested. There are fifteen species of *Parthenium hysterophorus* L. in North America and the West Indies. One of the species introduced to the Indian subcontinent was *Parthenium hysterophorus* L. [10].

C. The reproductive capacity of Parthenium weeds under different climatic conditions

Parthenium hysterophorus is a drought-tolerant plant that grows in areas with more than 500 mm of summer rainfall per year. Germination can take place at temperatures ranging from 10oC to 25oC; and Groves (1980), can germinate at temperatures as low as 10°C and as high as 36°C. In temperatures ranging from 12 to 25°C23, the viability of *Parthenium* weed seeds was also found to be greater than 90%. According to Tamada et al. 2002a, after 26 months in the soil, the viability of *Parthenium* weed seeds was greater than 50%, and the 'half-life' of seeds in the soil was approximately 3-4 years [11].

D. Allelopathic properties of Parthenium hysterophorus

Parthenium weed's (*Parthenium hysterophorus* L.) allelopathic properties are largely classified as secondary plant metabolites, and its ability to inhibit the growth and development of other species is well documented. The most common effects of allelochemicals are leaching, volatilization, root exudations, and decay of fallen parts via biotic or abiotic means. *Parthenium hysterophorus* has both positive and negative allelopathic effects on a variety of crops and other plant species [12].

Allelochemicals released by *Parthenium* that affect many plant species include sesquiterpene lactones and phenolics. Caffeic, vanillic, ferulic, chlorogenic, and anisic acids are the most abundant phenolics, and parthenium is the most abundant sesquiterpene lactone. These two synergistically acting allelochemical groups significantly reduce seed germination and subsequent growth in many crops. Parthenin, a pseudoguanolide sesquiterpene lactone found in various parts of the weed, is largely responsible for this.

II. PROBLEMS CREATED BY PARTHENIUM WEED

Parthenium weed endangers primary production, including livestock and grain enterprises, as well as human and animal health [13].

A. Impact on agricultural viability

Parthenium weed is a serious problem in pastures and crops. Aqueous extracts of the shoot, leaf, flower, and root of *Parthenium* weed had an allelopathic effect on soybean and haricot bean seed germination, germination rate, shoot, and root growth, and seedling dry matter production; leaf aqueous extracts of *Parthenium hysterophorus* had a significant inhibitory effect on seed germination and seedling growth of three cereal crops, Oryza sativa, Triticum aestivum, and *Parthenium* aqueous extract inhibits seed germination and

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seedling vigor in Zea mays, according to Devi and Dutta (2012). *Parthenium* pollen and other plant parts have allelopathic properties that inhibit seed germination and fruit development such as chili, tomato, and brinjal [14]. It was also reported to have resulted in significant crop losses. In India, it is a major weed of upland rice, causing more than 40% yield loss in rice and other crops. Because of the weed's aggressive nature, pasture production may be reduced by up to 90%. A variety of agricultural crops, including chickpea, mustard, and linseed, have been shown to be killed by the weed's allelopathic effects. In Ethiopia, sorghum grain yield losses of 40 to 97% have been reported if *Parthenium* is not controlled throughout the season. The accumulation of *Parthenium* pollen clusters on maize floral parts reduces grain filling by 50%. It was concluded that increasing the concentration of *Parthenium* ash has a negative effect on Phaseolus mungo germination, radical, and plumule length, and thus burning *Parthenium* in agricultural fields can reduce Phaseolus mungo productivity [15]. *Parthenium* also inhibits the activity of nitrogen-fixing and nitrifying bacteria such as Rhizobium, Actinomycetes, Azotobactor, and Azospirilum, which affects legume nodulation. The insect mealy bug uses the weed as a secondary host. Another unintended consequence is that it could serve as an alternate host for the scarab beetle, a sunflower pest in central Queensland. An agromyzid pest of Texas bell pepper growing regions is Liriomyza tripoli. It also acts as an alternate host for many plant diseases. The bacterial pathogen Xanthomonas compestris PV. Phaseoli could be transmitted from the weed to Phaseolus vulgaris via reciprocal infection during the pre-flowering and pod-formation stages. The bacterial wilt pathogen was discovered on *Parthenium hysterophorus* in India. As a result, these products' sales and movement are restricted. The weed has lethal allelopathic effects on rice, wheat, chickpea, mungbean, soybean, and mustard, according to preliminary research at Bangladesh Agricultural University, Mymensingh. According to a BAU study, the weed has a higher nitrogen exploitation capacity than rice. *Parthenium* in cropped land has the potential to nearly double cultivation costs while also limiting the sale and movement of contaminated produce [16].

B. Impact on biodiversity

It is a threat to the country's biodiversity. It is known to have a significant impact on natural communities because it causes their displacement, causing an imbalance in the natural and agricultural ecosystems. This weed, along with rubber vine, is regarded as the two most serious threats to biodiversity in the Einasleigh uplands bioregion [17]. It has been reported that it is changing the entire habitat of native Australian grasslands, open woodlands, river banks, and flood plains. In Southern India, similar invasions of national wildlife parks have recently occurred. A preliminary survey revealed that the weed has infested a large area of land in Jessore district, near the BARI sub-station, particularly along roadsides. The plant has also been identified in Faridpur, Norail, Magura, Rajshahi, Natore, Sirajgonj, Manikgonj, Dhaka, and Mymensinghdistrictst [18].

C. Impact on Animal Health

To humans and animals, all parts of the *Parthenium* plant are toxic at any stage of development. The main components of toxic are 'parthenin' and other phenolic acids that are lethal to humans and animals, such as caffeic acid, vanillic acid, anisic acid, p-anisic acid, chlorogenic acid, para hydroxybenzoic acid. Due to its unpleasant odor, it can taint sheep meat and make dairy milk unpalatable. Milk from livestock grazing Parthenium-invaded grazing land could be harmful to humans [19]. If consumed, it can cause dermatitis with pronounced skin lesions on all animals, including horses and cattle, mouth ulcers with excessive salivation, eye irritation in working dogs, loss of condition in farm animals, and death due to rupturing and hemorrhaging of internal tissues and organs. *Parthenium* has been estimated to cost the cattle industry in Queensland, Australia, $16.5 million per year in control costs and pasture loss. [20].

D. Impact on Human Health

Parthenium weed has been linked to health problems in some people who live or work in close proximity to it [20]. Individuals who come into contact with *Parthenium* may develop sensitivity to the plant, which may manifest as an allergic reaction. Contact with any part of the *Parthenium* plant (such as airborne pieces of dried plant material, pollen, or even the root) can lead to sensitivity and the risk of allergic reactions. A person with allergies, on the other hand, may have an allergic reaction to *Parthenium* even if they are not allergic to the plant itself. Severe contact dermatitis, phytophoto dermatitis that develops on contact and is exacerbated by sunlight, and hay fever are all reactions to *Parthenium* (allergic rhinitis), and aggravated asthma (allergic bronchitis). If *Parthenium* pollens are inhaled, they can cause allergic rhinitis, which can progress to bronchitis or asthma if the pollens enter the respiratory tract during breathing is more toxic because it contains a cyclopentene group, which can cause chromosomal damage in animal cells, uncouple phosphorylation, and inhibit key cellular enzymes. Wiesner et al. discovered that *Parthenium* causes general illness, asthmatic problems, skin irritations and pustules on handballs, skin stretching and cracking, and stomach pains in humans [20]. According to a Queensland survey, 10% of property workers in infested areas have developed visible allergic symptoms to parthenium. *Parthenium hysterophorus* posed serious human health risks in Pune around three decades ago. Hundreds of thousands of cases of allergic contact dermatitis with some fatalities have been reported. After 1-10 years of exposure to the weed, 10-20% of the population will develop severe allergenic reactions. Hay fever, asthma, and dermatitis can all be caused by plant dust and debris, as well as pollen6 years period, aero pollen sampling in Bangalore (Southern India) revealed that 40-60% of the pollen count was from *Parthenium hysterophorus*. *Parthenium hysterophorus* pollen extracts were found to be allergenic in 34% of allergic rhinitis and 12% of bronchial asthma patients from Bangalore. *Parthenium* pollen is now a major cause of allergic rhinitis in Bangalore, affecting 7% of the population and sensitizing 40%. Subsequent research in Northern India (Punjab) revealed that a significant proportion of patients with bronchial asthma are sensitized to

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Parthenium hysterophorus. In New Delhi, out of 63 patients with airborne contact dermatitis, 62 showed a positive reaction to the *Parthenium* weed. *Parthenium* weed may have a more sinister effect on human health since it has been hypothesized that parthenium-contaminated animal feed leads to tainted milk and that the hepatotoxic parathenin reacts synergistically with copper in sing Indian childhood cirrhosis (ICC). According to McFadyen 1995 after 1-10 years of exposure to weed, 10-20% of the population will develop severe allergenic reactions. There may be hay fever, and asthma can be caused by dust and debris from the plant as well as pollen [18].

III. MANAGEMENT OF PARTHENIUM HYSTEROPHORUS

Because of its negative impact on natural and agroecosystems, it is critical to control the problematic weed *Parthenium hysterophorus* before it spreads. There are numerous methods for controlling the *Parthenium* weed. Manual and mechanical control, chemical and biological control, and weed management through proper utilization are the methods used. According to an Australian Weeds Committee report, effective broad-scale management of partheniumeds necessitates an integrated approach that includes prevention and eradication programs, the establishment and implementation of management zones, and the protection of key environmental, social, and economic assets in areas where the weeds are already common [21].

A. Prevention and weed seed spread

As with most weeds, prevention is far less expensive and simpler than cure. The movement of vehicles, machinery, livestock, road other produce, and seed for sowing pose a high risk of spreading *Parthenium* weed in Bangladesh. Spread can be reduced by using vendor declarations, ensuring that produce and livestock are free of *Parthenium* weed seed, and implementing inspection and awash-down procedures. Some countries that regulate grain imports from Australia, for example (Malaysia, Indonesia, India, New Zealand, Vanuatu, Brunei, Eritrea, and Kenya), require certification that the products are of *Parthenium* weed seed. Property hygiene is critical. Owners of clean properties should take precautions to prevent visitors from infested areas from driving through their properties. If you have *Parthenium* weed on your property, make sure it does not spread beyond the boundary or further within the property [22].

B. Pasture management

The most effective method of controlling large-scale *Parthenium* weed infestations is grazing management. Maintain healthy pastures with high levels of ground and grass crown cover. This may necessitate the rehabilitation of poor pastures, followed by an effective grazing maintenance program [22].

C. Burning

Burning is not recommended as a *Parthenium* weed control strategy. However, research suggests that if the pasture is allowed to recover before resuming grazing, burning for pasture management (e.g., woody weed control) should not result in an increased infestation. Stocking recently burned areas known or suspected to contain *Parthenium* reduces pasture competition and favors parthenium, resulting in a more serious infestation [23].

D. Herbicide control

- *Non-Crop areas*

Parthenium weed should be sprayed early in the season before it sets seed. For at least two years, treated areas should be closely monitored. Small and/or isolated infestations should be treated as soon as possible. Herbicide control will include a knockdown herbicide to kill existing plants and a residual herbicide to prevent future germinations. Spraying may be necessary several times during the growing season to prevent seed production. Herbicide treatment will be required in conjunction with pasture management for severe infestations. Spraying at the right time ensures that *Parthenium* weed is removed when the plants are small and before seeding. Grasses should be actively growing and seeding in order to recolonize infested areas. In open wastelands, uncultivated areas, and along railway lines and roadsides, the spraying of a solution of common salt at 15-20% concentration has been found effective [23].

E. Biological control

Even if various chemicals effectively control weeds over time, their continued use creates pollution hazards in the ecosystem as a result, the weed management strategy must be shifted away from chemical methods. Weed control through biological means is less expensive, permanent, and pollution-free [24]. *Parthenium* is primarily a weed of waste and fallow land, so bio-control is the most cost-effective and practical method of weed control. A these-effective, environmentally safe, and ecologically viable method of controlling *Parthenium* is biological control. The combined effects of biological control agents reduced *Parthenium* weed density and vigor while increasing grass production. A number of insect species and two rust pathogens have been introduced to control *Parthenium* weed; a selection of these is listed below [24].

Epiblema moth that has colonized all *Parthenium* weed areas. The larvae of the moth feed inside the stem, forming galls that stunt plant growth, reduce competitiveness, and reduce seed production. Listronotus setosipennis is an Argentine stem-boring weevil that has had limited success in controlling *Parthenium* weed infestations Z*ygogramma bicolorata* is a Mexican defoliating beetle that is extremely effective where it is found. It appears in late spring and remains active until late autumn. Within three years of its introduction in India, it had become abundant, resulting in a significant reduction in *Parthenium* density in local areas. Smicronyx lutulentus (Mexico) lays eggs in flower buds, and the larvae eat the seed heads. Conotrachelus albocinereus (Argentine stem-galling weevil) produces small galls and is still establishing itself in Queensland. Bucculatrix Parthenialarvae (a Mexican leaf-mining both feeds, leaving clear windows in the leaf. This is Mexica-boriatand is

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establishing itself in favorable locations in the northern Central Highlands [25].

Several attempts have been made in the past to control weeds using fungal products or mycoherbicides (Wilson, 1969). Puccinia abrupta is a xaMexicanter rust that infects and damages leaves and stems. It is currently spread out from Clermont to the south. A night temperature of less fefew6 degrees and 56 hours of leaf wetness are isuiinsuredw). Where the weather conditions are favorable, sporadic outbreaks occur. Puccinia melampodii is a MenMicanr rust that weakens plants by damaging their leaves during the summer growing season. It is now established and spreading in a number of locations ranging from Charters Towers to Injune in the south. Other significant disease-causing microorganisms found on *Parthenium* weed include Alternaria alternata, A. Bianchimacrospora, Colletotrichum gleosporioides, C. capsici, Rhizoctonia solani, Fusarium oxyspoum, F. monilmoniliformium, Phoma herbarum, Sclerotium rolfsii, Phyllody phytoplasma and Sclerotinia sclerotiorum [26].

F. Enhancing the effectiveness of biological control through competition from beneficial plants

Biological control agents and competitive plants can be used in a complementary manner to achieve better management of *Parthenium* weed and the result is better than either option alone. It has been indicated that selected pasture species viz., purple pigeon grass, buffelgrasserfly pea, Kangaroo grass and bull Mitchell grass are likely to be useful at displacing *Parthenium* weed at displacing *Parthenium* in the infested region. Such displacement plants are known to work well with the already released biological control agents and together they can reduce *Parthenium* weed productivity by as much as 69%. However, climate change studies with elevated CO2 levels indicated that this displacement ability may be reduced in the future [26].

G. Manual control

Hand pulling in small areas is not advised. There is a health risk from allergic reactions, as well as the risk that mature seeds will fall off and spread the infestation. Manual removal, on the other hand, is rarely effective or cost-effective due to the rapid re-growth that necessitates repeated removals for season-long control. Ploughing and Plowing in before the plants and or other plants may be effective [27].

H. Allelopathic potential of plant species in controlling P. hysterophorus

Many efforts have been made to control P. hysterophorus since it was first discovered as a harmful weed in India. Allelopathy has gained popularity in recent decades as a method of controlling invasive plant species. Several studies using plant extracts yielded promising results in controlling the growth and physiology of P. hysterophorus. Cassia uniflora was discovered to be a potential growth inhibitor of P. hysterophorus. Reported that 5 years after introducing C. uniflora to a heavily infested *Parthenium* weed site, the population of mature *Parthenium* weed plants was reduced by 84%. According to a survey, Cassia sericea Sw., C. Tora L., Tentoria purpurea L., and Croton bonplandianum Baill restricted *Parthenium* invasion in many Indian states. Later, they attempted to discover the association of other weeds with P. hysterophorus, and they discovered approximately 27 weed species associated with P. hysterophorus. Among all weeds, P. hysterophorus and Cassia tora L. were the most sociable and formed large colonies in arable soil habitats. Kumar and Soodan (2006) discovered that *Parthenium-infested* with natural vegetation cover has a Shannon-Weaver index value of 2.544 and the weed has an insignificant presence with an IVI of.83%, compared to *parthenium*-infested natural vegetation cover, which has an ash index value of 0.18 with an IVI of 79.10%. Anjum et al. (2005) concluded that aqueous extracts of Imperata cylindrica L. have the potential to control P. hysterophorus germination and seedling growth. All concentrations of root and shoot aqueous extracts significantly suppressed germination. Extracts of 10% Imperata cylindrica significantly reduced the early seedling growth of P. hysterophorus. The inhibitory potential increased as the extract concentration increased. Shoot extract was found to be more effective than root extract as an inhibitor [27].

Many authors recently conducted experiments with various leaf extracts/leachates to determine their efficacy in controlling P. hysterophorus. Leachates from a variety of other plants, including Eucalyptus spp., neem, mulberry, and acacia, have also been tested for their allelopathic effects on *Parthenium hysterophorus*. Most of the positive, ones demonstrate significant inhibition of the *Parthenium* weed at various stages of growth; and are being considered as potential biological control agents. Recent research with marigold (Targets erectus) Erectusational Research Centre for Weed Science in Jabalpur (Madhya Pradesh) has shown that in field trials, this plant can easily outcompete P. hysterophorus in a mixed stand, most likely due to allelopathy. Thapar and Singh (2003) investigated the allelopathic potential of Amaranthus viridis le Viridishates against P. hysterophorus. The maximum inhibition of *Parthenium* biological activities was caused by leachate of Amaranthus Viridisridis after 9 days. The chlorophyll and protein content of leaves was significantly reduced at higher concentrations of leaf leachates in a shoot-cut bioassay. The treatment of the seeds with leaf leachates had a significant effect on germination. At 100% A. viridis 9-day leachate reduced seed germination by 49.41%. Swain et al. (2004) investigated the allelopathic effect of A. spinosus on this weed using standard bioassay and biochemical techniques involving seedling and mature plant germination and growth. They concluded that aqueous leachates derived from the leaf, stem, and root had a strong inhibitory effect on P. hysterophorus growth and multiplication. In high concentrations (20% w/v), leaf leachates were found to be the most toxic, reducing germination by 95%, total chlorophyll content by 82.4%, and protein content by 65.5%. Post-emergence application of leaf leachates had a negative impact on *Parthenium* growth, causing wilting and seedling chlorosis within 24 hours of application. Knox and Paul (2007) investigated the herbicidal potential of *Parthenium*

leaf leachates from Cymbopogon citratus, Withania somnifera, and Calotropis procproceedey discovered that treating *Parthenium* shoots with Cymbopogon citratus leaf leachates had a significant effect. The phytotoxic damage rating in 9-day leaf leachate of 100% concentrations of Cymbopogon citratus was found to be 3.66, followed by 3.00 and 2.00 in Withania somnifera and Calotropis prospectively [28].

Knox et al. (2011) attempted to determine the allelopathic effect of Cassia occidentalis (Caesalpiniaceae) on the vegetative and reproductive establishment of *Parthenium hysterophorus*. At higher concentrations of shoot leachates, they observed a significant reduction in germination percentage, shoot cut bioassay, seedling bioassay, and chlorophyll of P. hysterophorus. After 9-days, root leachates of 100% C. occidentalis were responsible for the greatest inhibition of nitrogen percentage and protein content of Parthenium, indicating that biomolecular interaction plays a significant role in controlling the population dynamics of this noxious weed with enormous seed production potential. Under laboratory conditions 5, 0, 15, and 2,0% w/v concentrations of aqueous, methanol, and n-hexane shoot and root extracts (on a fresh weight basis; Javaid et al. investigated the allelopathic or bio-herbicidal activity of Withania somnifera (L.) Dunal against the noxious weed *Parthenium hysterophorus*.

IV. UTILIZATION OF PARTHENIUM

A. Use as a Traditional Medicinal plant

Parthenium hysterophorus was accidentally introduced into India in 1910 with cereal grain germplasm and is now considered an invasive weed in our country. Parthenium's noxious effects on not only human health but also livestock and native plant species have been well documented. In humans, it causes serious side effects such as asthma, bronchitis, dermatitis (allergic reaction), and hay fever. Regardless of this issue, it has been used in industry for its noxious, insecticidal, nematicidal, and herbicidal properties, as well as for composting (Sastri and Kavathekar 1990). The root bisque is used as a treatment for amoebic dysentery. Sub-lethal doses of *parthenium* help to reduce cancerous activity in mouse cells. Investigations also revealed that *Parthenium* can be used to cure hepatic amoebiasis, neuralgia, and certain types of rheumatism. In America, it is applied externally to the skin remedy for a wide variety of diseases. In Jama' relaxation is used to kill the flea in animals [14].

B. *Antifungal:*

Parthenium, as previously stated, has antifungal properties against various fungal species. This property of the *Parthenium* can be used to treat fungal diseases in humans and animals. Rai and Rai investigated the antifungal potential of various *Parthenium hysterophorus* extracts against human pathogenic fungi. Fungi associated with dermatitis are sensitive to the sequestoterpene lactone found in *Parthenium* hysterophorus, which can be used to treat skin diseases [20].

C. Antioxidant:

Methanolic extracts of *Parthenium hysterophorus* demonstrated a strong antioxidant effect. As a result, it can be used as a natural antioxidant. It is a naturally occurring antioxidant that, if commercially available, can replace synthetic antioxidants that are harmful to human health. After research revealed that synthetic antioxidants are more carcinogenic than naturally produced antioxidants, it is more valuable to produce anti-oxidants naturally [29].

D. Antitumor:

The methanolic extract of *Parthenium hysterophorus* flower demonstrated antitumor activity in mice with transplantable lymphocytic leukemia. The levels of neoplastic markers like glutathione, cytochrome P-450, glutathione transferase, and UDP-glucuronyl transferase changed significantly, which slowed tumor progression and increased animal survival [30].

E. Antimicrobial:

Parthenium hysterophorus has potent antimicrobial and antifungal properties. It inhibits the growth of rhizosphere flora like Rhizobium, azotobacter, and Rhizospirrilum, as well as bacterial and fungal growth like A. Niger, F. oxysporum, C. Albicans aureus, and E. coli [16].

F. Larvicidal:

Synthetic insecticides are widely used to control insects and their larvae, but they are not an environmentally friendly way to kill insects and their larvae because they are not safe for humans, have negative effects on the environment, are non-biodegradable, and are hazardous to livestock. It can cause bio-magnification, which leads to biodiversity loss. *Parthenium* research has revealed its larvicidal properties, which can be used to control the larvae of various insects such as mosquitos and aphids, which both harm human health and crop plants. *Parthenium* aqueous extract has larvicidal activity against Aedes aegypti larvae and other mosquito larvae. This weed's leaf extract significantly reduced Lipaphis erysimi's reproductive capacity and lifespan. More research, however, is required to explore the larvicidal components of *Parthenium* and their commercialization [18].

G. Parthenium's compost:

Parthenium hysterophorus is a good source of micro and macronutrients and can thus be used instead of compost. These macro and micro elements are abundant in this weed, and as a result of this property, it can be used to supply crop plants. However, because this plant contains a high concentration of essential oils and phenolics, which have a negative impact on crop plant growth, yield, and reproduction capacity, it cannot be used directly. Although *Parthenium* can be used to make compost and bio-fertilizers, it performs best when combined with Eichhornia crassipes. *Parthenium* combined with Eichhornia not only reduces the harmful effects of *Parthenium* but also increases its available nutrient content. Micro-composting significantly reduces the phenolic components of Parthenium, as well as the percentage of heavy metals and toxic substances. *Parthenium* compost, which is suitable for organic farming, has a

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significant increase in selected macronutrients (N, P, K) and a decrease in organic carbon. [7].

H. Pesticidal effects:

Because of the presence of phenolic compounds such as *Parthenium* has insecticidal activity. Parthenon primary volatile compound of *Parthenium* and has phytotoxic and insecticidal activity against a variety of insects and their larvae, including Spodoptera litura, Callosobruchus, and Meloidogyne incognita. Parthenonoline adducts, saturated lactones, and propenyl derivatives demonstrated remarkable phytotoxic and nematicidal activities. [9].

I. Heavy metal and dye removal:

Parthenium hysterophorus can be used in phytoextraction or heavy metal removal. *Parthenium* treated with HCl was discovered to be effective in the removal of Ni and dye-absorptivity from industrial wastes. Although it is pH dependent, nickel removal was significant at pH 5.0, and its dye-absorbing ability can replace commercially available adsorbents. Heavy metals that can be experimentally absorbed by *Parthenium* include Ni, Cd, Cu, CO, and Zn, among others. Cresol (a phenol derivative) adsorption ability of *Parthenium* activated carbon was comparable to commercial-grade activated carbon. Because heavy metals and dyes have carcinogenic properties, they are harmful to human health and must be removed. *Parthenium* has the potential to be a better, more environmentally friendly, and less expensive dye and heavy metal absorbent resource. [12].

J. Parthenium hysterophorus substrate for enzyme production:

Xylans are almost as common in plant cell walls as cellulose and contain primarily -d-xylose units linked together, as cellulose. The hydrolytic enzyme Xylanases cleaves Xylans. The end products of xylan degradation can be used as an energy source (biofuel), a sugar substitute, in the textile industry, in bakery products, and the clarification of fruit extracts. It can also be used in the paper industry. Dwivedi et al. (2009) discovered that *Parthenium hysterophorus* can be used as a raw material for the production of xylanase. The high level of enzyme production using *Parthenium hysterophorus* as a raw material confirms the feasibility of using this weed as an alternative carbon source for cost-effective enzyme production. [17].

K. Parthenium hysterophorus as a substrate for biogas production

At a time when we are facing an oil crisis, there is a need for alternative energy sources, and bio-wastes are one such source that has received a lot of attention. Plants that can be used as an alternate energy source (for Jatropha) are likely to be future feedstock for methane generation. *Parthenium hysterophorus* can be used to generate biogas. It can be used with cattle manure and applied to batch digesters to anaerobically digest at room temperature. Biogas is produced when *Parthenium* is anaerobically digested with cattle manure. *Parthenium hysterophorus* can be used as a substrate for biogas production, which will not only control this weed but also provide a useful and environmentally friendly alternative to limited energy sources. [12].

V. CONCLUSION

It can be concluded from the present review article that we cannot decline the allelopathic and negative impacts of *Parthenium hysterophorus* on crop plants and livestock. This weed spread more rapidly compared to other weeds. It covers many agricultural lands as well as apartments. It is necessary to use lands properly for agriculture as well as forestry. It is necessary that we can use every resource of nature for improvement. We can control this weed through its management and it would happen. We have the proper knowledge about the beneficial and harmful effects of *parthenium.* When we have proper knowledge we use it in differing from the prospect perspective discussed above. This is not about the *Parthenium* although it should be applied to other weeds also.

REFERENCES

[1]. Adkins, S and Shabbir, A., 2014. Biology, ecology and m, management of the invasive *Parthenium* weed (*Parthenium hysterophorus* L.). *Pest Manag. Sci.;* 70(7): 1023-1029.
[2]. Akter A and Zuberi, MI., 2009. Invasive alien species in Northern Bangladesh: Identification, Inventory and Impacts. *Intl. J. Biodiverse Conserved*; 1(5): 129-134.
[3]. Annapurna, C, and Singh, J S., 2003. Variation of *Parthenium hysterophorus* in Response to Soil Quality: Implications for Invasiveness. *Weed Research*; 43 (3): 190–198.
[4]. Bailey LH, 1960. *Manual of cultivated plants*, Macmillan, New-new York
[5]. Bhowmik, PC and Sarkar, D., 2005. *Parthenium hysterophorus* L.: Its World Status and Potential Management. *International Conference on Parthenium Management, Bangalore*; 1-6.
[6]. Datta, S and Saxena, DB. 2001. Pesticidal parthenium (from *Parthenium* hysterophorus) and related *manganage. Sci*; 57: 95-101.
[7]. Dogra et al., 2011. Distribution, Bi, ology, and Ecology of *Parthenium hysterophorus* L. (Congress Grass) an invasive species in the North-Western Indian Himalaya (Himachal Pradesh). *African Journal of Plant Science*; 5(11): 682-687.
[8]. Dominguez, XA and Sierra, A., 1970. Isolation of a new diterpene parthenin from *Parthenium hysterophorus. Planta Medica;* 18:275-277.
[9]. Dwivedi et al., 2009. *Parthenium* sp. as plant biomass for the production of alkali-tolerant xylanase from mutant Penicillium oxalicum SAU- 3.510 in submerged fermentation. *Biomass Energy*; 33:581-588.
[10]. Ellis, JL, Swaminathan, MS., 1969. Notes on some interesting plants from south India. *Journal of the Bombay Natural History Society;* 66: 233-234.
[11]. Gunaseelan, V N., 1987. *Parthenium* as an additive with cattle manure in biogas production. *Biol. Wastes*; 21: 195–202.

ISSN No:-2456-2165

[12]. Gunaseelan, VN. 1998. Impact of anaerobic digestion of inhibition potential of *Parthenium* soils. *Biomass Bioenergy*; 14:179–184.
[13]. Isman, MB. 2000. Plant essential oils for pest and disease management *Crop Protection*; 19:603- 608.
[14]. Javaid, A and Anjum, T, 2005. *Parthenium hysterophorus* L. — a noxious alien weed. *Pakistan Journal of Weed Science Research*; 11:1–6.
[15]. Joshi, S., 1991. Biological control of *Parthenium hysterophorus*. (Asteraceae) by Cassia uniflora Mill (Leguminosae) in Bangalore, India. *Tropical Pest Management*; 37: 182-186.
[16]. Kathiresan et al., 2005. Ecology and control of *Parthenium* invasion in the command area. *Conference on Parthenium Management. Bangalore, India:* 77-80.
[17]. Khaket et al., 2015. *Parthenium hysterophorus* in current scenario: A toxic weed with industrial, agricultural, and medicinal applications. *J. Plant Sci*; (10): 42-53.
[18]. Khan et al., 2011 Nutritional investigation and biological activities of *Parthenium* hysterophorus. *AF. J. Pharm. & Pharmacol*; 5 (18): 2073-2078.
[19]. Khosla, S N, and Sobti, S N.,1981, Effective control of *Parthenium hysterophorus* L. *Pesticides*;15:18-1 Kohli et al., 2006. Environmental threats of three tropical American invasive weeds (*Parthenium hysterophorus* L., Ageratum conyzoides L., Lant Camaramara L.) in India. *Biological Invasions*; 8:1501– 1510.
[20]. Kumar et al., 2011. Impact of *Parthenium hysterophorus* leaf extracts on the fecundity, fertility and behavioral response of *Aedesaegypti* L. *Parasitol. Res*; 108: 853-859.
[21]. Maintainerinar, S. 2014. Spread, maintain, ance, and management of *Parthenium. Indian Journal of Weed Science;* 46(3):205–219.
[22]. Kumar, S. and Varshney J G., 2007. Biological control of *Parthenium*: present and future, *National Research Centre for Weed Science*, Jabalpur, India; pp-157.
[23]. Kumar, S 2009. Biological control of *Parthenium* in India: status and prospects. *Indian Journal of Weed Science*; 41(1&2): 1-18.
[24]. Kumar, S., 2012. Current spread, impact, and management of *Parthenium* weed in India. *International Parthenium News*; 5: 1-6.
[25]. Kumari et al., 2014. Impact of *Parthenium hysterophorus* L. invasion on species diversity of cultivated fields of Bilaspur (C.G.) India. *Agricultural Sciences*; 5: 754-764.
[26]. Mishra, JS and Bhan, VM. 1994. Efficacy of sulfonylurea herbicides against *Parthenium* hysterophorus. *Weed News;* 1: 16.
[27]. Mukherjee, B, and Chatterjee, M., 1993. Antitumor activity of *Parthenium hysterophorus* and its effect in the modulation of bio-transforming enzymes in transplanted murine leukemia. *Planta Medica*; 59(6): 513-516.
[28]. Murthy et al., 1977. Parthenium, a new pernicious weed in India *University of Agricultural Sciences, Technical Series*; 17: pp- 66.
[29]. Navie S, 2003. *The biology of Parthenium hysterophorus L.* in Australia. Ph.D. Thesis, the University of Queensland, Brisbane, Australia.