

A review on *Parthenium hysterophorus*

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Abstract

The plant based, traditional medicine system continues to play an essential role in health care, for 80 percent of the world's inhabitants relying mainly on traditional medicines for their primary health care. *Parthenium hysterophorus* L., of the family Asteraceae (tribe: Heliantheae), is an erect and much branched annual or ephemeral herb. *Parthenium hysterophorus* Linn of Asteraceae family is used as remedy for a variety of ailments. It is commonly known as Congress Weed, Carrot Weed and Wild feverfew. The Scourge of India is an exotic weed that was accidentally introduced in India in 1956 through imported food grains and is now considered as one of the most feared noxious weed. The plant is used in the treatment of ulcerated sores, wounds, fever, anaemia and heart troubles. A decoction of the root finds use in treatment of dysentery and the lower concentrations of extracts might find use as antifungal agent. It is applied externally on skin disorders and decoction of the plant is often taken internally as a remedy for a wide variety of ailments. (1) 2. was reported to be one Of the seven most dangerous weeds of the world. It has achieved a major weed status in India an Australia within a relatively short period due to its fast multiplication, rapid growth and its ability to Compete with other native flora. There are many ways like mechanical, chemical, cultural and biological To control it, but it cannot be controlled by using a single approach. Integrated approach should be the Better way to manage this noxious weed. The aim of this review is to provide general information About the physiology, distribution, ill effects and management of *Parthenium* (2)

Keywords:-

Parthenium hysterophorus, Sesquiterpene lactone, Dermatitis, Biocontrol, Green manure, Bioremediation (3)

BOTANICAL DESCRIPTION:-

The genus name *Parthenium* is derived from the Latin word *Parthenice*, a reference to the plant now known as *Tanacetum Parthenium* (L.) Bernh. Or 'feverfew'; *hysterophorus* was Derived from the Greek *hystera* (womb) and *Pharos* (bear-Ing), referring to the prolific seeding habit of the plant (Par-Sons & Cuthbertson 1992). It is commonly called as bitter Weed, carrot weed, broom bush, congress grass (India); White top, escobar amarga and feverfew (Caribbean); false Ragweed and ragweed *Parthenium* (USA).

HEALTH BENEFITS OF PARTHENIUM:-

Pharmacologically active as analgesic in muscular rheuma-Tism, therapeutic for neuralgia and as vermifuge (Maishi etAl. 1998). This weed is also reported as promising remedy Against hepatic amoebiasis. Parthenin, the major constituent-Ent of the plant, exhibits significant medicinal attributes Including anti-cancer properties (Venkataiah et al. 2003). Ramos et al. (2002) had established the anti-tumour poten-Tial of *P. Hysterophorus* extracts in vitro and in vivo with Positive results in terms of tumour size reduction and over-All survival of cell lines. Aqueous extract of *P. Hysterophorus* Has hypoglycaemic activity against alloxan-induced dia-Betic rats (Patel et al. 2008). The methanol extract of the Flowers showed significant antitumour activity and parthenin

Exhibited cytotoxic properties against T cell leukaemia, HL-60 and Heal cancer cell lines (Das et al. 2007). Hence, flower Extract of this weed can be used for developing drug for Diabetes mellitus. *Parthenium hysterophorus* has been found To be pharmacologically active as analgesic in muscular Rheumatism, therapeutic for neuralgia and as vermifuge (Maishi et al. 1998). This weed is also reported as

PARTHENIUM HYSTEROPHORUS L.: HARMFUL AND BENEFICIAL ASPECTS- A REVIEW

Fig. 1: Parthenium weed: (A) Rosette stage of Parthenium plant; (B) Tap root system of Parthenium (Kaur et al. 2014).



Fig. 2: Parthenium plants at flowering stage (Photo Credit: Australian Weeds Committee 2012).

ECONOMIC IMPORTANCE OF PARTHENIUM

Parthenium is spreading at an alarming rate all over India (Kumar et al. 2009) and can adopt any climate very easily. In West Indies, this weed is used as a remedy against ulcer-Ated sores, certain skin disease, facial neuralgia, fever and Anaemia (Bhatt et al. 2012). Inflammation, eczema, skin Rashes, herpes, rheumatic pain, cold heart trouble, menstrual Disorders, difficulty during labour, stomach ache, toothache, Diarrhoea, neurologic disorders, urinary infections, dysen-Tery, malaria and insect bites are also treated (Barnes et al. 2007, Patel 2011). A preparation with ginger is effective for Treating migraines during the early pain phase (Kuhn &

Winston 2007). Its broad-spectrum ovicidal, antimicrobial, Larvicidal, nematocidal, herbicidal activities designate the Improvement of public health and crop production (Bhatt Et al. 2012). It is also used as an additive with cattle manure In biogas production (Patel 2011).

(4)

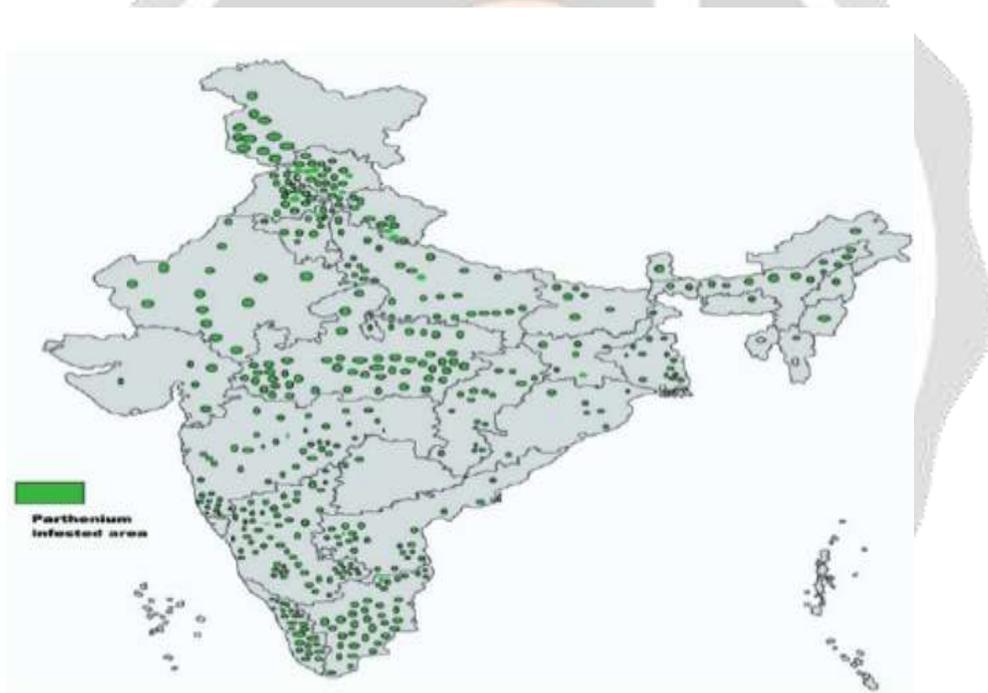
Origin and Distribution

of *Parthenium hysterophorus* is native to the region including Central America, Southern North America, Gulf of Mexico, West Indies, and Central South America. The weed has now spread all around the globe including main-land as well as island. In India and other countries of Asian continent such as China, Bangladesh, Nepal, Pakistan, etc, it has spread on alarming rate. Its spread and infestation are severe in some of the countries like Australia, South Africa, Ethiopia, India and Pakistan. It was introduced into Asia,

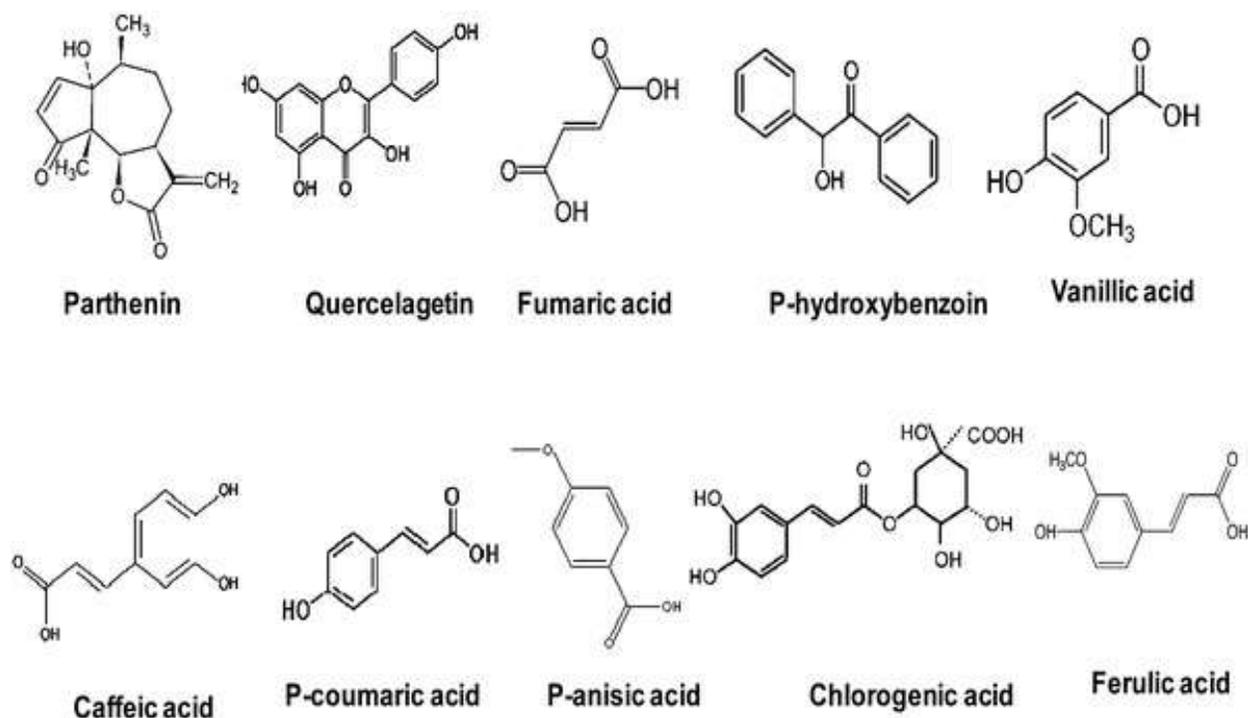
IN INDIA:-

Parthenium hysterophorus possibly entered India in 1910 (with infected cereals germplasm) however, went unrecorded until 1956. The weed was first revealed in India in 1955 (38) and now happens everywhere the (48) in around 35 million hectares of land (23). In India, this weed has serious problem in approximate all states like Karnataka, Andhra Pradesh, Haryana, Bihar, and Madhya Pradesh and Uttar-Pradesh (22). *Parthenium hysterophorus* occurred in all states of country and presenting a serious threat in many states those have large areas of agriculture land, non cropping areas and grazing land (25). At present time India has becomes one of the most infested countries of world Map showing sites known to be infested with *Parthenium hysterophorus* in different states of India (5)

Chemical analysis of *P. Hysterophorus*



Isolation and structural elucidation of the active principles of *P. Hysterophorus* is required to determine their chemical properties. Chemical analysis of *P. Hysterophorus* has indicated that all its parts including trichomes and pollen contain toxins called sesquiterpene lactones (SQL). Maishi et al. (1998) reported that *P. Hysterophorus* contains a bitter glycoside parthenin, a major sesquiterpene lactone. Other phytotoxic compounds or allelochemicals are hysterin, ambrosin, flavonoids such as quercelagetin 3,7-dimethylether, 6-hydroxyl kaempferol 3-0 arabinoglucoside, fumaric acid. P-hydroxy benzoic acid and vanillic acid, caffeic acid, p coumaric, anisic acid, p-anisic acid, chlorogenic acid, ferulic acid, sitosterol and some unidentified alcohols (Fig. 2). Parthenin, hymenin and ambrosin are found to be the culprits behind the menacing role of this weed in provoking health hazards (Lata et al. 2008). *Parthenium hysterophorus* from different geographical regions exhibited parthenin, hymenia, coronopilin, dihydroisoparthenin, hysterin, hysterophorin and tetraeurin A as the principal constituents of their sesquiterpene lactones (De La Fuente et al. 1997). Gupta et al. (1996) identified a novel hydroxyproline-rich glycoprotein as the major allergen in *P. Hysterophorus* pollen



(6)

Morphology

of the Plant. *P. hysterophorus* L. of the family Asteraceae (tribe: Heliantheae) is fast maturing, erect, an much branched annual or ephemeral herb. It shows two distinct phases in life: juvenile, rosette, or the vegetative stage and adult, mature, or the reproductive stage. The juvenile stage exhibits a rosette with large, dark green, simple, radicle, and pinnatisect small leaves lacking flowering. The large lower leaves are spread on the ground like a carpet, without allowing any vegetation underneath it. The adult stage is erect, much branched with deep tap root system that reaches up to 2 m in height. The stem is hairy, octangular, longitudinally grooved and becomes tough and woody as the plant matures into a hardy bush. Leaves are simple, alternate, pinnately or bipinnately dissected (Figure 1(a)), 20–30 × 12–25 cm, becoming smaller towards the apex of the branches. The stem and leaf surface is covered with four types of glandular and nonglandular, multicellular white trichomes. The flowers are creamy white, about 4 mm across, arising from the leaf forks. Enormous number of pollen grains, 624 millions/plant, are produced which are anemophilous, that is, wind pollinated. Each flower produces four to five black wedge shaped seeds (Figures 1(c) and 1(d)) that are 2 mm long with thin white scales and difficult to see by the naked eye. It is a very prolific seed producer, producing up to 25,000 seeds/plant, leading to large seed bank in the soil (7)

Crop yields

Parthenium can impact on crop yields through direct competition, as well as by inhibiting

Germination of a wide range of food and vegetable crops;

1 grasses such as *Eleusine* sp. and *Eragrostis* spp.; and important agroforestry tree species such as *Acacia*, *Casuarina*, *Eucalyptus* and *Leucaena* (Evans, 1997). Studies conducted using parthenium residues on

1 Affected crops include wheat, barley, maize, sorghum, chick pea, mungbean, soybean, sunflower, Ground nut, cotton, cabbage and potato.

The growth of chickpea and radish plants found that both burned and unburned residues had Toxic effects on seedling germination and dry weight, with the unburned residue more toxic When compared to the burned residue (Singh et. Al., 2003). Crop yield losses as high as 50% have been reported in different studies (Netsere, 2015). In Ethiopia, sorghum grain Yield was reduced from 40% to 97% due to parthenium invasions on croplands (Tamado, 2001; Tamado et al., 2002). In addition, at least 70% of farmers indicated that parthenium

Caused crop yield losses as high as 50%, and 73% of farmers thought that it affected soil Fertility negatively and therefore reduced crop yield (Beyene et al., 2013). In Pakistan, Substantial yield losses in wheat and maize have been reported (Khan et al., 2013). A yield Loss of 50% was recorded at an infestation rate of 20 parthenium plants per square metre. Indirect impacts occur as a result of the weed's ability to act as an alternative host to some Important pests and pathogens (Shabbir, 2013). Crops that are grown on marginal, less Fertile and non-irrigated lands are usually the most affected by parthenium invasions.(8)

Harmful Effects

Parthenium is considered as the number one dangerous Terrestrial weed because of its harmful effects both to humans And to biodiversity which are discussed below.

Effects on Human Beings.

The pollen grains, airborne Dried plant parts, and roots of parthenium cause various Allergies like contact dermatitis, hay fever, asthma, and born-Chits in human beings. The common allergens found in this Weed are parthenin, coronopilin, tetraneuris, and ambrosin. Pollens of parthenium cause asthma (allergic bronchitis),Especially in children playing outdoors and in adults and old-Age persons. Contact of plant with the body causes dermatitis And the spread of the problem all over the body causes great Discomfort Clinically the parthenium dermatitis is of five Types, as discussed below.

1.The classical pattern also known as airborne contact Dermatitis (ABCD) (Figures 3(a) and 3(b)) affects the face, Especially eyelids and/or neck, V of chest, cubital, and Popliteal fossae; (2) the chronic actinic dermatitis (CAD(Figure 3(c)) pattern involves the exposed areas such as fore-Head, rim of ears, cheeks, nape of neck, dorsae of forearms, And hands as lichenified papules, plaques, or papulonodules With relative sparing of nonsense exposed areas such as eyelids, Retro auricular areas and under surface of chin and depth Of the skin folds; (3) the mixed pattern (combination of Classical and CAD pattern) manifests as scattered infiltrated Scaly papules over the exposed parts and dermatitis over Eyelids, flexures of extremities and neck; (4) the photosensitive Lichenoid eruption pattern presents with pruritic, discrete, Flat, violaceous papules, and plaques over sun-exposed parts Such as forehead, ears, cheek, upper chest, and back, extensor Aspect of forearms and dorsae of hands stimulating photo-Sensitive lichenoid eruptions; (5) and the prurigo nodularis-Like pattern presents as multiple hyperkeratotic papules and Nodules over extremity with characteristic histopathologic Features similar to prurigo nodularis (Figure 3(d))



FIGURE 3: Four of the five types of symptoms of commonly known parthenium dermatitis; (a, b) airborne contact dermatitis; (c) chronic actinic dermatitis in a female; and (d) prurigo-like lesions over dorsa of hands.

(9)

Chemical control methods

Effective herbicides are registered for use against Parthenium but chemical control requires repeated, regular follow-up treatments (Lorraine and Lin, 2015). Generally, parthenium plants can effectively be controlled with glyphosate tank mixed with low concentrations of urea and common salt (Zelalem, 2013). Thus, treating 3000 ml of glyphosate with 150 ml of urea and 150 ml of common salt solutions and spraying at 6 to 8 leaf stage resulted in complete mortality of parthenium weed in short period of time by increasing the phytotoxicity of this herbicide. While spraying this solution at 50 and 75% flowering stages showed poor mortality rates on this weed. The growth of Parthenium can be suppressed using amino acid synthesis and photosynthesis inhibitors as compared to herbicides with other modes of action. In wasteland, non-cropped areas, along railway tracks, water channels and roadsides, the use of glyphosate and metribuzin has been shown promising results. On the other hand, the treatment should be accomplished at rosette stage to be effective. Parthenium weed control at rosette stage is highest with glyphosate (96%) followed by metribuzin 87% at 4 weeks after treatment (WAT) and control is lowest with pendimethalin (42.5%) at 4 WAT. Thus, glyphosate and metribuzin are recommended for the control of Parthenium weed in non-cropped areas (Haroon et al., 2012). Bactril Super @ 0.67 ml/L water can control Parthenium. However, huge amount of parthenium plants cannot be controlled economically by chemicals (Rezau Karim, 2012). Reddy et al. (2007) suggested that Norflurazon, Clomazone, Fluometuron, Flumioxazin, Chlorsulfuron, Chlorimuron, and Trifloxysulfuron could provide effective control of parthenium. Fernandez (2013) has shown that under field condition, Saflufenacil + dimethenamid-P and hexazinone were highly effective and rapid in controlling flowering parthenium, providing 100% control at all evaluation timings (3, 6, 9 weeks after treatment). While in greenhouse, aminocyclopyrachlor + chlorsulfuron, aminopyralid, hexazinone, saflufenacil + dimethenamid-P, 2,4 D provided 100% aboveground dry weight reduction of rosette parthenium at 21 DAT (10)

Biological control :-

The combined effects of biological control agents reduced the density and vigour of parthenium and increased grass production. There are currently a number of insect species and two rust pathogens that have been introduced to control parthenium—a selection of these are outlined below. *Epiblema Stenuana* is a moth introduced from Mexico established in all parthenium areas. The moth's larvae feed inside the stem, forming galls that stunt the plant's growth, reduce competitiveness and seed production. *Listronotus setosipennis* is a stem-boring weevil from Argentina but is of limited success in reducing parthenium

Infestations *Zygogramma bicolorata* is a defoliating beetle from Mexico which is highly effective where present. It emerges in late spring and is active until autumn. *Smicronyx lutulentus* (Mexico) lays eggs in the flower buds where the larvae feed on the seed heads. *Conotrachelus albocinereus* (stem-galling weevil from Argentina) produces small galls and is still becoming established in Queensland. *Bucculatrix parthenica* (leaf mining moth from Mexico) larvae feed on leaves, leaving clear windows in the leaf. *Carmenta ithacae* is a stem boring moth from Mexico which is becoming established at favourable sites in the northern Central Highlands. *Puccinia abrupta* var. *parthenicola* is a winter rust from Mexico that infects and damages leaves and stems. It is currently established over a wide area from Clermont south. It requires a night temperature of less than 16°C and 5–6 hours of leaf wetness (dew). Sporadic outbreaks occur where weather conditions are suitable. *Puccinia xanthii* var. *Parthenii-hysterophorae* is a summer rust from Mexico that weakens the plant by damaging the leaves over the summer growing season. It is currently established and spreading at a number of sites from north of Charters Towers to Injune in the south.

Pasture management

Grazing management is the most useful method of Controlling large-scale parthenium infestations. Maintain pastures in good condition with high levels Of ground and grass crown cover. This may require Rehabilitation of poor pastures, followed by a sound Grazing maintenance program.

Sown pasture establishment—Poor establishment of sown Pastures can allow parthenium colonisation. Pasture agronomy—Aerial seeding prior to scrub pulling is Normally b—High grazing pressure caused by drought Or high stock numbers decreases the vigour and Competitiveness of pastures and allows the entry and Spread of parthenium. Maintenance of correct stock Numbers is most important in controlling parthenium.

Pastures spelling—In situations of serious infestation, Pasture spelling is essential for rehabilitation. Total Spelling is much more effective than simply reducing the Stocking rate. However, overgrazing of the remainder of The property must be avoided. The most appropriate time for pasture spelling is The spring–summer growing period, with the first 6–8 weeks being particularly important. If the condition Of perennial grasses (native or sown) is low, spelling for The entire growing season may be required or introduced Grasses may need to be re-sown. Herbicide treatment can Hasten the rehabilitation process by removing a generation Of parthenium seedlings and allowing grass seedlings To establish without competition. In the presence of Parthenium, grass establishment is poor.

Fencing—

One of the main problems in controlling Parthenium is the large paddock size and the variability Of country within paddocks. The resulting uneven grazing Pressures encourage parthenium to colonise the heavily Grazed country. Ideally, similar land types should be Fenced as single units. Fencing can be used to great Effect to break up large paddocks, allowing more flexible Management such as pasture spelling or herbicide Application, options not available previously.

Burning—

Burning is not promoted as a control strategy for Parthenium. However, research suggests that burning for Pasture management (e.g. woody weed control) should not Result in an increased infestation if the pasture is allowed To recover prior to the resumption of grazing. Stocking Of recently burnt areas known or suspected to contain Parthenium decreases pasture competition and favours Parthenium, ultimately creating a more serious infestation. (17)

Habitat

Parthenium grows luxuriantly in wastelands, public lawns, orchards, forestlands, flood plains, agricultural areas (Figure 2(a)), urban areas, overgrazed pastures, industrial areas, playgrounds, roadsides, railway tracks, and residential plots (Figure 2(b)). Drought and subsequent reduced pasture cover create the ideal situation for the parthenium weed to establish itself. Although parthenium weed is capable of growing in most soil types, it is most dominant in alkaline, clay loam soils.



(a)



(b)

(11)

Pharmacological activities

Antifungal activity

As mentioned earlier Parthenium have antifungal effects on different fungal species. This Quality of Parthenium can be used to cure the human and animal fungal diseases. Antifungal Potential of different extracts of Parthenium hysterophorus against human pathogenic fungi Were investigated by (Rai, 1995). Fungi related to dermatitis found sensitives Sesquiterpene lactone found in Parthenium hysterophorus and it can use for the remedy of Skin diseases (Rai, 2003).

Antioxidant

Parthenium hysterophorus methanolic extracts showed high antioxidant effect. Therefore, it Can be utilized as natural antioxidants. It is naturally available antioxidant; if it will be Commercially available it can replace synthetic antioxidant which has harmful impacts on

Human health (Khan et al., 2011). It is more valuable to produce antioxidant naturally after The research that synthetic antioxidants have high carcinogenicity in comparison to naturally Produced antioxidant.

Antitumor

Parthenium hysterophorus's methanolic extract obtained from flower revealed antitumor Activity in mice having transplantable lymphocytic leukemia. Level of neoplastic markers like Glutathione, cytochrome P-450, glutathione transferase and UDP-glucuronyl transferase Adjusted significant consequently backing off the advancement of tumors and expanded Survival of animals (Mukherjee et al., 1993).

Antimicrobial

Parthenium hysterophorus exhibits strong antimicrobial and antifungal activity. It inhibits the Growth of rhizosphere flora such as Rhizobium, azotobacter, Rhizospirillum as well as it candid Inhibit bacterial and fungal growth such as those of A. Niger, F. Oxysporum, C. Albicans S. Aureus, and E. Coli etc. Larvicidal (12)

Pathogenesis

Parthenium dermatitis is an immuno-inflammatory disease, which upon contact sensitization by parthenium antigen propagates as a cell-mediated hypersensitivity immune response with early sensitization phase and a subsequent elicitation phase, if antigen exposure persists. [13]

The response is mediated by a series of cellular and molecular mechanisms. Epidermal langerhans' cells and other cutaneous dendritic cells transport the allergen from the skin to regional lymph nodes where it is presented to T-lymphocytes, and T-cell proliferation occurs with production of effector and memory cells. The reaction is characterized by the infiltration of T-lymphocytes into re-exposed skin sites and the development of cutaneous inflammation.

Akhtar et al showed that all the patients of parthenium dermatitis showed significantly ($P < 0.001$) elevated levels of TNF- α , IL-6, IL-8, and IL-17 levels as compared to healthy controls and decrease in the anti-inflammatory cytokines IL-4 ($P < 0.217$) and IL-10 ($P = 0.001$), suggesting the involvement of pro-inflammatory cytokines in the pathogenesis of parthenium dermatitis.¹⁴ Another study done on Indian cohort showed genetic predisposition to parthenium dermatitis due to lower-producing genotypes of interleukin-10.⁽¹³⁾

Lakshmi et al found that 12 out of the 14 patients of parthenium dermatitis showed a positive prick test. Serum IgE was elevated in all patients to varying degrees. They postulated that a combined immediate (Type I) and delayed hypersensitivity (Type IV) mechanisms may be similarly operational in the initiation and perpetuation of parthenium dermatitis, and that it may also induce exacerbation of lesions of sensitized subjects with atopic diathesis (15)

Impact of Parthenium

Impact on biodiversity

This weed can possibly upset the regular biological system, As it can develop all through the year in practically all Exceptional circumstances stifling local vegetation. Owing The shortfall of compelling normal foes, its allopathic Impact of Parthenium

Impact as well as photograph lack of care and thermo Obtuseness, it is a danger for regular variety. Quick spread Of Parthenium can upset regular environment since it has Extremely quick pervasion limit and allopathic potential Which can disturb any sort of normal biological system. Species extravagance, equity a neighbourhood biodiversity Step by step decline where this plant is available, this Present circumstance obviously demonstrates the local Biodiversity loss of weeds and other yield plants because of Parthenium pervasion. Its pervasion is combined with its Allopathic potential and the shortfall of its normal Inhibitors like microbe, bugs and their hatchlings, these are Some significant variable which are the explanation of its Rich development and spread . The centralizations of Allelochemicals viz. Coronopilin, caffeic corrosive, Parthenin, and p-courmaric corrosive which are available in Parthenium have serious allopathic impacts.

Impact on crop production

The Parthenium hysterophorus weed has plagued in a huge Area of India. This plant contains parthenin, hysterin, Hymenin, and ambrosin. Due to the presence of these Allelochemicals this weed affects various harvests and Person likewise. This toxic weed smother the advancement of adjacent plants By allopathy. Leachate and concentrate of leaves and Inflorescence forestal the germination and development of Related financially significant harvests. Kumari et al. (2014) Saw that physiological and biochemical boundaries Amazingly decreased when aquous concentrate of Parthenium were straightforwardly showered on the yield Plants. Parthenium has solid allopathic consequences for Different plants even it can cause 40-80% yield misfortune In horticultural harvests.

Impact on soil microflora

Parthenium is known to its inhibitory effect on growth and Activity potential of different bacterial species related to Nitrogen assimilation such as Rhizobium and Azotobacter And nitrifying bacteria like Nitrosomonas. Aqueous extract Of Parthenium has detrimental effects on the growth of Rhizobium, Nitrosomonas and Azotobacter. It reduced the Leghaemoglobin content of root nodules by which Rhizobium-legume symbiosis is affected. Leaf and root Leachates and their chemical component inhibit nitrate Production. Besides these it can inhibit the growth of algae And mycorhyzzae associated to crop plants because of its Fungicidal property (Megharaj et al., 1987). (16)

HOW IT IS SPREADS

Parthenium hysterophorus retain an extraordinary capability to spread grow and established well in wide range of environmental conditions (Monika, 2014). It completes life -cycle 90-120 days which helps in quick spreading (20). Its seeds can be dispersed through various methods such as water current, animals, movement of vehicles, machinery, livestock and the grains or seeds of crops. Further Parthenium has a relatively short life cycle, grows very quickly and survives under different habitats. Generally for long distances it spread through vehicle, agricultural instruments and with water flow. Parthenium produced enormous number of tiny seeds which are light weight and can survive as seed bank in soil for long time (7). These some abilities of Parthenium hysterophorus helps to spread rapidly resulted in infestation of Parthenium everywhere.

(18)



Figure 2: *Parthenium hysterophorus* (L.) plant and its Parts: (1) whole plant at maturity (2) Stem of plant (3) rosette habitat of young plant (4) leaves (5) a flowering twig (6) plant root (7) seeds (8) enclosure of seed respectively.

Essential oils as Herbicide

Essential oils of aromatic plants are being explored to find out possible herbicides. Lots of Researches are in progress. Some the literatures reviewed as per objective of this study Isman (2000) studied the utility of essential oils of aromatic plants and analyzed their Possible herbicidal activities. He mentioned that these essential oils could be the good Herbicides since they do not persist in soil or contaminate ground water and causes little or No mammalian toxicity. Tworkoski (2002) studied the different essential oils as herbicides and reported that these Oils can also be used as viable weed control technology under organic farming systems. He Also reported that these essential oils in proper concentrations are able to suppress the Germination and seedling development of different agricultural herbs. Fandohan et al. (2004) studied the effect of different essential oils on the growth of *Fusarium verticillioides* and also analyzed the major compounds present in the oils they Used. They reported that the essential oil from *Cymbopogon citrates* contains 16 compounds Including citral (neural and geranial) (47%) and myrcene (28%). Similarly oil from *Eucalyptus citriodora* contains 15 compounds citronellal being the chief compound (66%). Singh, et al. (2005) studied the effect of volatile oils from *Eucalyptus citriodora* on seed Germination of *Parthenium* weed and concluded that the oil at very low concentration has Weed suppressing ability and checks the germination and seedling development of the weed.(19)

COMPETITIVE DISPLACEMENT :-

Displacement potential Twenty selected pasture Species were grown individually with parthenium Weed, at different densities and in different combina-Tions for 40 days in a pot trial in a glasshouse. After this Time the above ground dry biomass was determined And, using the experimental design of Remained etAl. (1989) and the reciprocal yield model analysis of Spitters (1983), a displacement index (DI) value was Determined for each plant species against parthenium Weed. Twelve plant species were found to have a low Displacement ability (displacement indices <1.0) while Eight were more able to displace parthenium weed (>1.0, Table 3). A five times replicated pair of field Trials, each 1800 m², were established at two central Queensland sites evenly infested with parthenium Weed. The results showed that the three introduced Species (viz. Buffel grass, Rhodes grass *Chloris gaya* (20)

Integrated Pest Management (IPM)

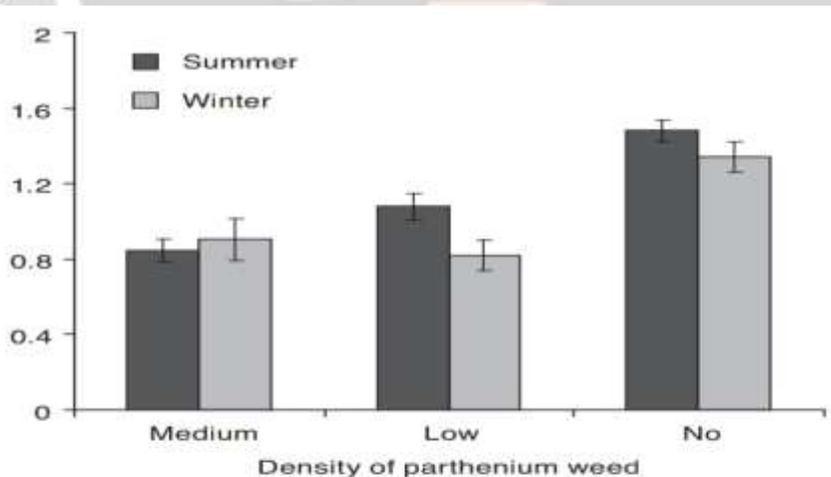


Figure 3. The Shannon index value of plant diversity in the above ground vegetation at a pasture in Kilcoy, Queensland, Australia where low is two plants m⁻² and medium is 16 plants m⁻².

In many locations parthenium weed is able to survive individually-applied management measures, And a more effective integrated approach is therefore required in these locations. A holistic IPM approach is Propounded in India to achieve sustainable management of parthenium weed (Mahadevappa, 1997), and Implemented in Australia through improved extension strategies (Navie et al., 1996; Chambal et al., 1997).Nav-Bahr and Bahar (2000)

proposed ploughing before flower set and burning when the plants are dry and Mature, application of atrazine or other herbicides like 2,4-D, paraquat, glyphosate, diuron and dalapon, Using Cassia services to displace parthenium weed, and biocontrol using *Zygomamabicolorata*. Under IPM, Two insects *Z. Bicolorata* and *E. Stenuana*, and two rust fungi, *Puccinia abrupta* var. *Parthenicola* and *Puccinia Xanthii* var. *Parthenii-hysterophorae*, have shown potential and are being used to control this weed.(21)

Conclusions :-

P. hystrophorus is one of the most common weeds in many areas throughout the world. The Parthenium plant is best known for its effects on natural ecology and its negative impacts on human and animal health. Thus far, various techniques have been used to control this toxic weed, such as mechanical, chemical, and biological control, but individually, these techniques have failed to stop *P. Hysterophorus* proliferation. To combat the spread of this weed, multi-pronged tactics are necessary. To address this problem, public awareness has to be developed, and a participatory approach to control the invasive weeds should be adopted. There is a need to encourage research on the use potential of this weed and to evaluate its efficacy in field trials. One of the most promising methods to control the weed is through proper use. It can be achieved through joint efforts of researchers, farmers, governmental and non-governmental agencies. The discovery of this weed's applications may also pave the path for the weed's indirect eradication. At present, although *P. Hysterophorus* is considered a weed, its new uses are coming to the forefront. Parthenium can be used as an herbicide, pesticide, insecticide, raw material, or additive in a variety of industries, including paper, pulp, and dye industries, to name a few. Various studies have also revealed that Parthenium has potent antioxidant (22)

The rapid spread of parthenium has been a risk to the biodiversity, sustainable production of many crops, human health and livestock. Control of parthenium is therefore crucial to boost productivity of many crops as well as to overcome the loss of biodiversity. The parthenium can be kept control by enhancing its use in different aspects. Over exploitation of the weed for the beneficial use should be promoted for the proliferation of the *P. Hysterophorus*. Research should be encouraged for the potential utilization of this weed. Parthenium as the raw material for the bio fuel is the future prospect. The increased utilization of weed as, insecticide, pesticide, composite and the raw material for enzyme production can change the weed from a curse to a boon for civilization.(23)

Reference :-

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