A Review on The Pharmacological Properties and Other Aspects of *Parthenium Hysterophorus* (L.)

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Abstract
Parthenium hysterophorus is a pernicious weed across the globe. This weed grabs human interest for allergic metastasis issues, dermatitis, and mutagenicity in humans and stock. However several recent studies have pointed out novel uses of this notorious plant including several health benefits, like a cure for skin inflammation, rheumatic pain, diarrhoea , tract infections, dysentery, protozoal infection and aches while it has also been used ethnobotanically. Its potential as a nano-medicine is being disbursed with some preliminary success to this point. Removal of contaminating heavy metals and industrial dyes, control of aquatic weeds, employment as a substrate for industrial catalyst production, additives in Cattle manure for biogas production, as a biopesticide, as manure and compost area unit to name a few of the myriad of other potentials. The active compounds behind some of these properties are summarized. The aim of this critical review is to explore the beneficial aspects of *P. hysterophorus* which is otherwise an immense nuisance.
Keywords: Weed, Remedies Sesquiterpene lactone, Dermatitis, Biocontrol, Manure, Bioremediation

Introduction

Parthenium hysterophorus is an aggressive omnipresent annual non woody weed with no economic importance unraveled until currently. This erect, transient herb glorious for its vigorous growth and high fecundity particularly in hotter climates may be a native of north-east North American country and is endemic in America. it's unremarkably referred to as 'altamisa', carrot grass, bitter weed, star weed, white top, wild herb, the "Scourge of India" and congress grass (Akter & Zuberi, 2009) .

Taxonomy and Nomenclature

Domain: Eukaryota
Kingdom: Plantae
Phylum: Spermatophyta
Subphylum: Angiospermae
Class: Dicotyledonae
Order: Asterales
Family: Asteraceae
Genus: *Parthenium*
Species: *hysterophorus L.* .

Parthenium hysterophorus Linn is a much-branched, short-lived (annual), upright (erect) herbaceous plant that forms a basal rosette of leaves during the early stage of growth. It usually grows 0.5-1.5 m tall, but can occasionally reach up to 2 m or more in height. Mature stems are greenish and longitudinally grooved, covered in small stiff hairs (hirsute), and become much branched at maturity. During the early stages of growth, the simple, alternately disposed leaves have petioles nearly 2 cm long and form a basal rosette. The lower leaves are highly split and quite broad (3–30 cm long and 2–12 cm wide) (bi-pinnatifid or bi-pinnatisect).In comparison to the lower leaves, the leaves on the upper branches get smaller and have fewer divisions. Short, stiff hairs that are near to the

surface cover the undersides of the leaf (appressed pubescent). At the tops of the branches, a large number of tiny capitula are clustered in terminal panicles. Each capitulum is carried by a 1 to 8 mm long pedicel. The ray florets on these flower heads (4-5 mm across) measure 0.3–1 mm in length and are white or cream in colour. Additionally, they feature numerous (12–60) little white tubular florets in the centre, bordered by two rows of tiny bracts (involucre). Light brown coloration develops when seeds are ready to shed and are ripe. Though it can happen at any time of the year, the rainy seasons are when it happens most frequently. Each flower-head normally produces five tiny "seeds" (achenes) (capitulum). These 1.5–2.5 mm long achenes are made up of two straw-colored papery structures (r dead tube florets), a black seed crowned with two or three tiny scales (a pappus), and a flat bract.

Habitat

P. hysterophorus L. occurs in humid and sub-humid tropics, typically favoring heavier fertile soils, such as black, alkaline clay loams, but is able to grow on a wide variety of soil types from sea level up to 2400 m. Areas receiving less than 500 mm of rainfall annually are probably unsuitable, although the weed has strong adaptive methods to tolerate both moisture stress and saline conditions (Parker and Shabbir, 2008-2013). Although originally from the Caribbean, Central, and South America., *Parthenium hysterophorus* Linn has now naturalized itself in a number of places, including the Indian subcontinent, south-eastern Asia, tropical and subtropical Australia, the eastern United States, southern and eastern Africa, Madagascar, and numerous warm-weathered oceanic islands (Bashar et al, 2021) . This exotic weed is believed to have been introduced into Asian countries as contaminant in PL 480 wheat (Public Law 480 passed in 1954 to grant food grains to developing countries for eliminating starvation and malnutrition) from the USA in the Fifties. Presently, this invasive weed is wide rife in Asian countries (Singh et al. 2008). Roughly 2 million hectares of land in the Asian countries are plagued with this non woody menace (Dwivedi et al. 2009).

In the past century it has become one in all of the world's seven most devastating and unsafe weeds. This pernicious weed is commonly noticed on abandoned lands, developing residential colonies round the cities, railway tracks, roads, evacuation and irrigation canals, etc. This weed grows luxuriantly in established gardens, plantations and vegetable crops. Because of its high fecundity one plant will yield 10,000 to 15,000 viable seeds and these seeds will disperse and germinate over massive areas.

Fig., 1. *Parthenium hysterophorus* L. weed

However, this weed has also been observed to have certain medicinal properties and can also be used in a variety of ways to address a multitude of human problems which will be explored in this review.

Biochemical Composition

Upon isolation and assessment of the active molecules present in *Parthenium hysterophorus* Linn. , Sesquiterpene lactones, which are toxic, were found in all of *P. hysterophorus's* parts, including the trichomes and pollen, according to chemical research (SQL). According to Maishi et al. (1998), P. hysterophorus contains parthenin, a significant sesquiterpene lactone with a bitter glycoside. Hysterin, ambrosin, flavonoids such quercelagetin 3,7-dimethylether, 6-hydroxyl kaempferol 3-0 arabinoglucoside, and fumaric acid are further phytotoxic substances or allelochemicals.

In every sample of the extracts from all the parts, there were flavonoids, terpenoids, alkaloids, and cardiac glycosides. A range of 86.69-320.17 mg propyl gallate equivalent (PGE)/g and 55.47-253.84 mg PGE/g of total phenol were discovered in floral and root extracts, respectively (Kumar et al., 2013)

Vanillic acid, caffeic acid, p-coumaric acid, anisic acid, p-anisic acid, chlorogenic acid, ferulic acid, sitosterol, and a few unknown alcohols are among the compounds found in P-hydroxybenzo in (Fig. 2).

It is discovered that parthenin, hymenin, and ambrosin are to blame for this weed's dangerous function in posing health risks.

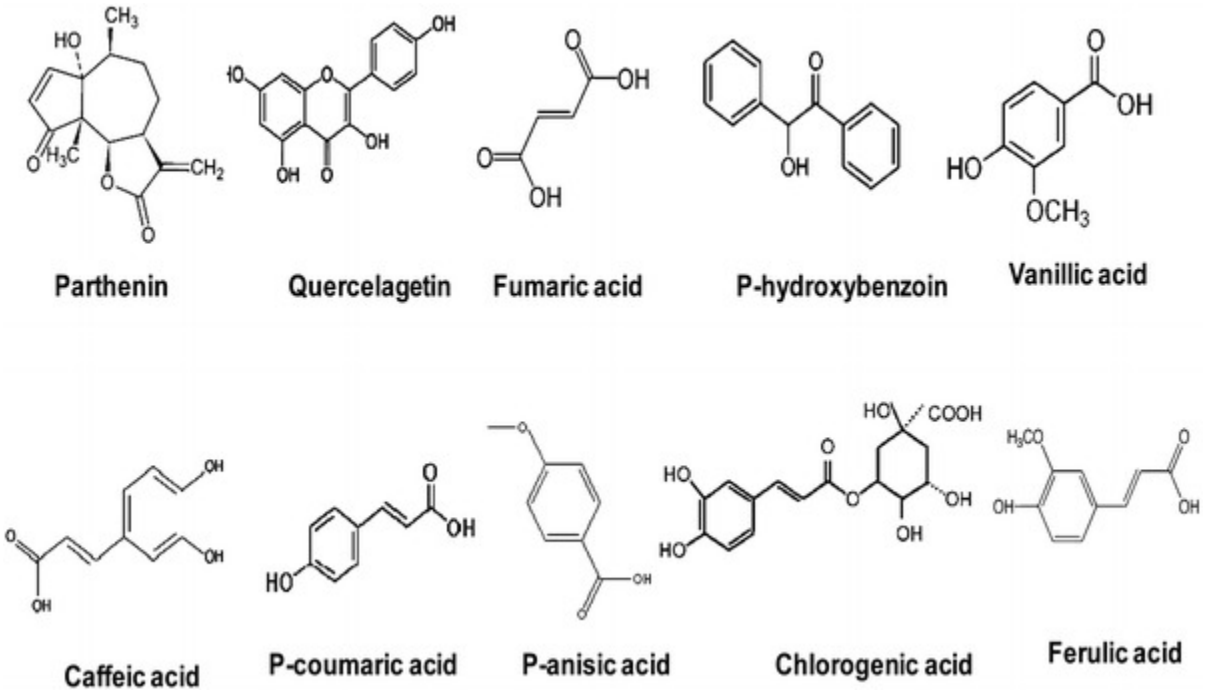

Fig., 2 Sesquiterpene lactones isolated from *P. hysterophorus* (Patel, 2011)

Pharmacological Uses of *Parthenium hysterophorus*

The concoction of *P. hysterophorus* has been utilized in ancient drugs to treat fever, diarrhoea, medicine disorders, tract infections, dysentery, protozoal infection and as agent (Surib-Fakim et al. 1996). Ethnobotanically, it's employed by some tribes as a remedy for inflammation, eczema, skin rashes, herpes, rheumatic pain, cold, heart hassle and gynecologic ailments as well as for addressing reproductive issues by some local communities of Trinidad and Tobago (Lans, 2006) . *Parthenium hysterophorus*

Linn. has been found to be pharmacologically active as analgesic in muscular rheumatism, therapeutic for neuralgy and as helminthic (Maishi et al. 1998). This weed is thus a promising remedy against a lot of diseases and disorders. Parthenin, the foremost constituent of the plant, exhibits important medicinal attributes like antitumor properties (Venkataiah et al. 2003). The alcoholic extract of the flowers showed important antineoplastic activity and parthenin exhibited Cytotoxic properties against Lymphocyte leukemia, HL-60 and HeLa cancer cell lines (Das et al. 2007). Previously, Ramos et al. (2002), (Kathpalia et al.,2022) had established the anticancer potential of *P. hysterophorus* extracts in vitro and in vivo with positive ends up in terms of tumor size reduction and overall survival of cell lines. Water based extract of *P. hysterophorus* has hypoglycemic activity against alloxan-induced diabetic rats (Patel et al. 2008). So, flower extract of this weed may be used for developing drug for Diabetes Mellitus.

Parashar et al. (2009) observed the production of silver nanoparticles by reducing silver ions suspended in the solution of silver nitrate complex employing the extract of *P. hysterophorus*. This discovery will promote this vesicant plant into a valuable weed for nanotechnology-based industries in future. Applications of such eco-friendly nanoparticles in antiseptic, wound healing and alternative medical and electronic applications makes this methodology probably exciting for the large-scale synthesis of alternative nanomaterials.

i. Antimicrobial activity

The antimicrobial effectiveness of *P. hysterophorus* has been reported by numerous researchers for the following pathogens: Escherichia coli (Madan et al., 2011*), Bacillus subtilis*, *Enterococcus* spp. (Fazal et al., 2011), *Staphylococcus aureus* (Barsagade and Wagh, 2010), *Pseudomonas aeruginosa* (Madan et al., 2011 ; Kumar et al., 2013; Kumar et al.,2022). It is thought that tannins, saponins, phenolic chemicals, essential oils, and flavonoids are responsible for plants' antibacterial power (Cowan, 1999). Parthenium contains five terpenoids, volatile oils, flavonoids, amino acids, sugars, and phenolic compounds, which may contribute to its antibacterial activity. The plant leaves extracts tested for antimicrobial potential showed varying degree of antimicrobial activities against the test bacterial and yeasts species. The antibacterial activities of the ethyl acetate, acetone and chloroform extracts compared favourably with these of two standard antibiotics (Amphotericin B and Ciprofloxacin) and have appeared to be broad spectrum as its activities were independent on gram reaction.

ii. Anti- oxidant effect of *Parthenium hysterophorus* extracts

Dried flower and root samples were sequentially extracted with non-polar and polar solvents using Soxhlet apparatus. The phytochemical screening was done using standard chemical methods and thin layer chromatography. Total phenolic content was determined spectrophotometrically. Reducing power and hydroxyl radical scavenging activity assays were used to measure antioxidant activity. Protection against membrane damage was evaluated by inhibition of lipid peroxidation (TBARS assay) in rat kidney homogenate. Flavonoids, terpenoids, alkaloids and cardiac glycosides

were present in all the extract. The total phenol contents in flower and root extracts were found to be in the range 86.69-320.17 mg propyl gallate equivalent (PGE)/g and 55.47-253.84 mg PGE/g, respectively. Comparatively better reducing power was observed in hexane fractions of flower (0.405) and root (0.282). Benzene extract of flower and ethyl acetate fraction of root accounted for appreciable hydroxyl radical scavenging activity (75-77%). Maximum protection against membrane lipid peroxidative damage among flower and root extracts was provided by ethanol (55.26%) and ethyl acetate (48.95%) fractions, respectively. Total phenolic content showed positive correlations with reducing power and lipid peroxidation inhibition (LPOI) % in floral extracts as well as with hydroxyl radical scavenging activity and LPOI % in root extracts.

iii. Anti-Cancer

In this context, the present study was aimed to synthesize silver nanoparticles (AgNPs) using the leaf extract of Parthenium hysterophorus and to evaluate its anticancer activity. The synthesized AgNPs were characterized by UV–Vis, FTIR, XRD and TEM. . The cytotoxic assay (MTT) of synthesized AgNPs against HepG2 liver cancer cells showed significant inhibition by reducing cell viability below 50% at 53 µg/ml concentration promising the anticancer effect. The wound healing assay was performed to confirm the proliferation of HepG2 cells and the inhibition of growth observed at 50 µg/ml concentration in the 24 h treatment of AgNPs when compared with the control. It was eventually concluded that the synthesized AgNPs showed promising antibacterial and anticancer activity against HepG2 liver cancer cells by promoting the inhibition of cell proliferation and migration on very low concentrations. (Sivakumar)

iv. Anti – epilepsy

The antiepileptic activity of ethanolic extract from the roots of *Parthenium hysterophorus* L. on maximal electroshock (MES) or pentylenetetrazole (PTZ) in male mice examined in this study. The extract of *Parthenium hysterophorus* L. (orally) was administered in mice at the doses of 250 and 500 mg/kg. The Extract suppressed hind limb tonic extensions (HLTE) induced by MES and also exhibited protector effect in PTZ induced seizures, at 500 mg/kg dose. Since the ethanolic extract of Parthenium hysterophorus delayed the occurrence of MES and PTZ convulsions, it is concluded that it interfere with gabaergic mechanism(s) to exert their anticonvulsant effect (Muhammed et al., 2013) . The levels of biogenic amines such as dopamine, serotonin and nor-adrenaline in the fore brain region were also estimated and a significant level of restoration was observed in the extract treated animals. Significant results were observed in the estimated parameters thereby justifying the use of these medicinal plants in the treatment of epilepsy (Karim et al., 2019) .

v. Spermicidal activity

The sperms of normal HF cattle in a frozen state were recovered from a straw after thowing and made

available from Animal Husbandry Department, Kota. Only semen with normal sperm morphology and

motility was used. Reduction in sperms motility was observed after adding the plant extract to semen and too it was dose and time

dependent. It is recorded that with extract 1 (800 ppm) sperm motility has been reduced to 45% in 10 minutes. At 600 ppm, it was reduced to 55%. At 400 and 200 ppm concentration it was reduced to 63 and 75% in 10 minutes which is shown by Figure 1. Extract 2 at 800 ppm concentration, depressed sperm motility to 50% in 10 minutes. At 600 ppm concentration it reduces sperm motility to 60% in 10 minutes. At 400 ppm concentration sperm motility was decreased to 72% and at 200 ppm concentration; it was reduced to 78%. Both the extracts of *P. hysterophorus* after 60 min showed a further 5-10% decrease in sperm motility. At 600, 400, 200 ppm concentration of above extract, sperm motility was reduced to 40, 45 and 60%, respectively in 10 minutes Extract 4, at highest concentration (800 ppm) reduced sperm motility significantly to 20% in 10 minute. At 600, 400, 200 ppm concentration of above extract, sperm motility was reduced to 30, 40, 55%. (Madan et al, 2011)

The plant is also used as a tonic, analgesic, antipyretic, antiperiodic, febrifuge and emmenagogue in Mauritius, Rodrigues, Mexico, Belize and Indiare. It is used for venereal diseases in Cuba as well as for menstrual pain and unspecified female complaints (Surib- Fakim et al, 1996).

vi. Anti - inflammation

Oral administration 10, 20, 40 mg/kg of body weight of *P. hysterophorus* extract led to significant anti-nociceptive and anti-inflammatory effects against acetic acid induced writhing in mice and carrageenan induced paw edema in rats, respectively. 200mg/kg of body weight of fresh leaves ethanolic extract exhibited high degree anti-inflammatory in carrageenan induced paw edema rats. 1, 2 mg/kg of body weight (Karim et al, 2019; Arora et al ., 2022). Parthenolide administration also produced anti-nociceptive and anti-inflammatory effects. The anti-inflammatory property may be due to an inhibitor of cellular phospholipases, which prevents release of arachidonic acid in response to appropriate physiological stimuli (Mohammed and Geelani, 2013).

iv. Anti Diabetic Activity

Arya et al, 2012 observed that the administration of aqueous extract of *P. hysterophorus* L. flower (100 mg/kg of body weight) significantly decreased the serum glucose level in normal and alloxan induced diabetic rats . Slightly decreased blood glucose level was found in rats after oral administration of fresh leaves extract .

v. Thrombolytic Activity

Crude methanolic extract of *P. hysterophorus* has shown to have significant thrombolytic effect comparable to standard thrombolytic agent, Streptokinase (Al-mamun et al., 2010).Parthenolide and some other metabolites were determined as the inhibitor of human blood platelet function (Hewlett et al, 1996). The Thrombolytic activity is a possible relevant effect to migraine prophylaxis through the inhibition of serotonin released from platelet by platelet aggregating agents: adenosine diphosphate, adrenaline, sodium arachidonate, collagen, and U46619 (Hewlett et al, 1996) (Hepteinstall et al,1985).

vii. Anti HIV Properties

About 40% inhibition of reverse transcriptase (RT) activity was observed in hexane fraction in anti-HIV assay at 6.0 µg/ml concentration. The study showed that phytochemicals present in *P. hysterophorus* leaf have

considerable potential as cytotoxic and antioxidant agents with low to moderate anti-HIV activity(Kumar et. al, 2013).

The *P. hysterophorus* extracts were evaluated for antiretroviral activity by targeting HIV reverse transcriptase (RT) enzyme using HIV-RT kit (Roche). Anti-RT activity was measured at two different concentrations (0.6 and 6.0 μg/mL). The extracts showed low inhibition potential (<50%) against RT in vitro (Figure 10). Some of the extracts (HX, ET, and AQ) produced modest anti-RT activity (about 23–40%). Nevirapine, the standard anti-HIV drug, showed 99.67% inhibitory activity (Kumar et al., 2013).

Lower anti-HIV-RT activity produced by P. hysterophorus leaf extracts indicates that phytoconstituents present in the crude extracts do have antiviral potential at lower test concentration. Since numerous chemical moieties (with or without activity) are present in crude extract, it might be possible that isolation and purification of the active ingredients from potential fractions (HX, ET, AQ) and their bioactivity testing in the future may provide further enhancement in anti-HIV activity(Cos et al.,2004).

Other Beneficial Aspects

Role of *Parthenium hysterophorus* in improving Crop Productivity

Parthenium hysterophorus's natural allelopathic tendencies can be customized to increase crop production at lowest expenses and to diminish the present dependence on industrially manufactured agrochemicals that harm the soil quality. The allelochemicals might as well be utilised as herbicides, pesticides, nematicides, fungicides and phytohormone. Its Pest control ability has been recorded in terms of ovicidal and anti-fleedant effects (Datta and Saxena 2001). The allelochemicals additionally offer defence against phytophagic predators.

Upon studying the worth of a compost of *P. hysterophorus* in 14 weeks it was found that it increased its wetness level over gas, phosphorus and potassium than NPK alone (Kishor et al., 2010) .. This may also be applied as organic manure (Gunaseelan 1998). Upon using *P. hysterophorus* weed as manure for maize and legume production, it was found that the very best root and shoot biomass in maize was obtained in 3% manure treatment, that was considerably bigger than that obtained within the management and admire that obtained within the NPK chemical treatments (Javaid ,2008).

The impact of *P. hysterophorus* manure and EM (effective microorganisms), a biofertilizer, on wheat (*Triticum aestivum* L.) cultivation was studied. Highest root biomass was recorded in 3% Fresh manure-amended treatment. Spike length, variety of grains per spike and grain yield step by step raised by increasing the amount of manure. There was 43–253% increase in grain yield over management because of varied manure treatments as compared with NPK fertilizers (Javaid , 2010)) So, if approached properly, this weed will certainly contribute to agricultural progress.

Bioremediation of polluting Heavy Metals and dyes using *P. hysterophorus* Linn.

Environmental pollution by heavy metals has become a global nuisance. Nickel (II) has been reported in the effluents of silver refineries, electroplating, metal base casting and galvanic battery industries. At high

levels, it can cause cancer of lungs, nose and bone. Cost-efficient novel technologies or absorbents are required for the treatment of metal-contaminted wastewaters particularly in developing countries like most Asian nations . Lata et al. (2008) studied the sorption capability of *P. hysterophorus* for the removal of nickel from solution by variable parameters like agitation time, Ni(II) concentration, adsorbent dose and pH scale (Lata et al., 2008 ; Lata et al., 2007 ; Roy, 2022 a). The dried biomass of *P. hysterophorus* is employed for carbon preparation by mixing it with H_2SO_4 (1:1.5 w/v ratio) and keeping it at 120°C for 24 h, followed by rinsing and drying. This treated *Parthenium* (SWC) may be a good, simply accessible and low-priced adsorbent for the removal of Ni(II) from dilute solution(Rao et al., 2006).

Cadmium (Cd) is widely employed in electroplating, plastic producing, scientific laboratory based processes and industries of pigments and Cd/Ni batteries. However, it's extraordinarily cyanogenic even in low dosages and answerable for inflicting nephrosis, high pressure level, bone deformity and destruction of RBCs (Roy, 2022 b) . Owing to its bioaccumulation, Cd (II) is taken into account as a priority waste matter by the U.S. Environmental Protection Agency. Ajmal et al. (2006) studied the potency of dried powder of *P. hysterophorus* as associate adsorbent for removing Cd(II) from waste water. Batch method was utilized for sorption of Cd(II) ions by dried and crushed mass of *P. hysterophorus*. Atomic absorption spectrophotometry (AAS) of the filtrate showed that *P. hysterophorus* is a good adsorbent over a good vary of initial Cd (II) concentration. The utmost sorption of Cd(II) ions within the pH scale vary 3–4 was 99.7%. The natural process studies showed eighty two recovery of Cd(II) from the adsorbent, when 0.1 M HCl resolution was used as effluent.

Cresol, a phenol by-product, is found in effluents of organic compound, oil and metal refineries, chemical and optical fibre producing, ceramic and steel plants, phenoplast producing industries, etc. This cyanogenic effluent is thought to cause abdomen tumours, corrode the eyes, skin and metabolism tracts and have an effect on the central systema nervosum, circulatory system, lungs, excretory organ and liver, even resulting in state of mind and death. Activated charcoal obtained from *P. hysterophorous* by chemical activation employing conc. H2SO4 is a good sorbent. So as to check the adsorbent effectuality of Parthenium-based activated charcoal (PAC), it's compared with industrial grade activated charcoal (AC).It is found to be nearly as good as AC for removal of p-cresol up to a level of 500 mg/l in solution (Singh et al., 2008) . AC is a costly activated charcoal thus its regeneration is crucial. In distinction to the present, PAC is cheap, simply accessible and doesn't need regeneration and therefore guarantees proper utilization in p-cresol removal from industrial sewer water (Singh et al. 2008).

The discharge of colored waste into streams affects their aesthetic nature, reduces chemical change and renders aquatic bodies cyanogenic because of the metals and chlorides in it. Adsorbents readied from *P. hysterophorus* were tested to get rid of Methylthioninium Chloride from a solution during a batch reactor process. Dye sorption capability of sulphuric acid-treated

Parthenium (SWC) and Phosphoric acid-treated Parthenium (PWC) is compared therewith commercially accessible activated charcoal (AC). Most dye is sequestered by AC; but, PWC and SWC additionally showed important results and might be thought of as potential adsorbents for Methylthioninium chloride removal from dilute liquid solutions (Lata et al. 2007). Going by these promising findings, this weed may be exploited for industrial pollution management.

Weed Management using *P. hysterophorus* Linn.

Salvinia (*Salvinia molesta* Mitchell), *Pistia stratiotes* also called Water Lettuce and water hyacinth (*Eichhornia crassipes*) proliferate fast in water bodies and deprive aquatic creatures of Oxygen. Pandey (1994) studied the impact of dried *P. hysterophorus* L. leaf powder on these baleful weeds. The treatment caused wilt and desiccation of above-water components of those floating plants. With the increasing concentration of *P. hysterophorus* extracts, the seed germination and growth of lovegrass (*Eragrosti*s) minimized considerably (Tefera, 2002).

Enzyme production using *P. hysterophorus* Linn.

Xylanases are a group of enzymes involved in the cleavage of Xylans. They have industrial applications for biofuel, artificial sweetener, animal feed production, baking and textile business, clarification of fruit juices and coffee production. (Saini et al, 2014) Besides, there has been an increasing interest in xylanases for ecofriendly bleaching of pulp in paper industries. *P. hysterophorus* has been investigated for its potential as a useful source of cheap xylanase (Dwivedi et al., 2009). They investigated xylanase production from a mutant of genus *Penicillium oxalicum* in submerged fermentation. A significantly higher level of the Enzyme synthesis in medium containing *P. hysterophorus* confirms the practicableness of employing this low cost resource as another carbon supply to save lots of price of the enzyme production method (Dwivedi et al. 2009).

Addition of *P. hysterophorus* L. in Manure for Biogas Production

Given the global oil crisis, energy production from biowastes by anaerobic digestion has attracted huge interest. Upon mixing *Parthenium hysterophorus* with cattle manure at a tenth level and allowing digestion anaerobically at ambient temperature in 3-l batch digesters an important increase in alkane series content was achieved. The alkane series content of the gas varied between sixty and seventieth (Gunaseelan 1987). *Parthenium hysterophorus* ought to be seriously thought of as a substrate for the assembly of biogas in India via anaerobic digestion, considering the abundance of this weed and huge numbers of livestock.

Animal wellbeing products from *P. hysterophorus* L.

Parthenium hysterophorus L. may be employed as a flea-repellent agent for dogs (Maishi et al. 1998). This weed could be a economical supply of potash, oxalic acids and high-quality proteins (HQP) which might be utilized in animal feed (Mane et al. 1986).

Discussion

Nearly all broad categories of management ways have proved futile one by one to curb the spread of *P. hysterophorus*. So, integrated

approaches area unit secure to limit the invasion of this weed and there is a need for developing economically feasible protocols for the utilization of its plant parts in human welfare.

There is a requirement to encourage the analysis on the employment potential of this weed and to judge its effectuality on field trials. The target of "control through utilization" may be achieved through joint efforts of researchers, farmers, governmental and non-governmental agencies. the invention of the uses of this weed additionally might pave the means for indirect wipeout of the weed. At present, although *P. hysterophorus* is taken into account a weed, its novel uses are being highlighted. Nanomedicine, biopecticide, manure potential, agent for bioremediation of cyanogenic metals and dyes, herbicide, low cost substrate for accelerator production and supply of biogas area unit a number of the recently discovered implications of *P. hysterophorus* L.

This weed is out there in four continents in abundance. Its industrial process price is low and nearly free from any environmental hazards. The commercial utilization of *P. hysterophorus* biomass as energy supply and raw materials is important in the long run, as fossil fuels are limited. Likewise, its use as manure and chemical may be appreciated since there is substantial evidence of the issues posed by chemicals. A detailed investigation and assessment of the compounds in *P. hysterophorus* is needed to decode its properties and put it into use.

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