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POSSIBILITY OF BIOLOGICAL MANAGEMENT OF *Parthenium hysterophorous* LINN.

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During last few years, a dangerous weed, *Parthenium hysterophorus* L., has been found overgrowing most of the cities, road, river sides, parks, pasture, waste and vacant land and croplands are being occupied by this noxius exotic weed. The weed is popularly known as carrot weed, congress weed, worm weed, white head, mutter kraut absinthe maroon yerbquamrga Gazarghaso or sometimes partherium. It is a native of West Indies, central and Northern America. This is possibly an exotic weed, introduced in India along with food grains imported under PL.480 scheme and was first described by Rao (1956).

During the last thirty years the infestation of Parthenium has spread in many states of India. It now appears to be a serious agricultural problem and has become well known as a medical hazard in several parts of the country (Tower's *et al.,*1977). Contact dermatitis from this weed has been recognised in the southern United States, for almost half a century (French, 1930). Allergenic contact dermatitis is caused by contact of the skin with low molecular weight chemicals and sensitization of blood to lymphocytes. Similarly Allergenic rhinitis (hay fever) is produced by contact of nasal mucous membranes with high molecular weight chemicals of plant pollen and is associated with the presence of circulating antibody (Tower *et al.* 1977). Nagesh and Kumar (1987) have proved the etiological role of pollen of this weed in producing nasal as well as branchial allergy. The Indian epidemic of dermitis were reported by Rande (1971) and Lonkar and Jog (1972). The dermatitis affected primarily the exposed skin surface of Agricultural labourers but an increasing number of city dwellers have become affected, as the plant has spread into urban region (Lonkar *et al.* 1974). *Sesquiterpene lactones*, notably the parthenin are the major allergence of the plant (Rodriquez et al, 1971; Lonkar *et al.,* 1974; Subba Rao *et a.l,* 1977). Dried plant materials including dried trichomes, disseminated as an air borne dust, may play a role in the production or perpetuation of dermatitis in sensitized individuals who are apparently not directly exposed to living plants. It seems that direct, perhaps unnoticed, contact with living plants is the major source of dermatitis (Tower *et al*., 1977).

Recent studies on the toxicity of Parthenium to domestic animals have shown that the weed is potentially hazard to the animal, causing live stock poisoning and correct contact dermatitis (Narasimhan *et al*., 1977, Sperry *et al.,* 1964). It has also been proved experimentally that the weed consists of water soluble inhibitors, causing strong allopathic impact on various crops (Kanchan and Jayachandra, 1976 ; Kanchan,1975).Therefore, the eradication of plants from urban as well as agricultural crop areas is urgently needed. Sankaran (1990) in his presidential address clearly mentioned the threat caused by the weed to agriculture and emphasised the need to control the weed.

IMPACT

Medical Hazard

Many species of the family Compositeae including parthenium are known to be able of causing allergic contact dermatitis (Mitchell 1975, Lonkar *et al.,* 1980). The First report of Allergic contact dermatitis by *Parthenium hysterophorus* was given by French (1930) in U.S.A. Subsequently many workers reported similar clinical findings which were seasonal in nature (Khan & Grothaus 1936, Subbarao *et al.,* 1974. Jog 1972 Das and Krishna Murthy 1981).The pioneering work of Mitchell and his associates established that sesquiterpene lactone derived from Compositeae plant cause allergic contact dermatitis (Mitohelle *et al.,* 1971; A,B Mitchell and Dupwis 1971, Dupuis *et al.,* 1974). Parthenin the major susquiterperie lactone in Parthenium was first isolated by Herz *et al.,* 1962). It has been shown that Indian Patients suffering from parthernium dermatitis are sensitive to parthenin (Lonkar *et al.*, 1974).

Another allergenic compound in this weed was also reported as Ambrocin (Rodriquex *et al.,* 1976). Higher the dermatitis affected primarily the exposed skin surface (not usually covered by clothing) of Agricultural labourers. There are

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evidences that the degree of toxicity differs with sex. Lonkar and Jog (1972) and Lonker *et al.,* 1974 observed that the dermatitis of the exposed skin surface in male adults employed in agricultural work was ten times more than the females. Tower et al, (1977) Stated that the contact allergy to partheminum can developed by repeated contact with the weed. Dried plant materials including Trichomes disseminated as an air borne dust may also play a role in the production and perpetuation of dermatitis in sensitized individuals. Beside contact allergy, it was also known to cause allergic rhinitis in many part of the world (Castex *et al.*, 1940 and Fernandez ,1942).

The weed is also potentially dangerous to animals causing contact allergy, diarrhoea, to animals causing contact allergy, diarrhoea, livestock, poisoning etc (Narasimhan ., 1964, Jric *et al.,* 1975a,b,). Tower *et al*., 1977 reported ulceration of mussels, dental pods, dossnm of tongue in all the test animals fed Parthenium.

In September 1988 a report appeared in Madhya Pradesh Chronical , Bhopal, 5th September 1988. That several cows had died after consuming poisonous grass partherium.

Agricultural Hazards

Various parts of the weed including pollens are known to contain water soluble growth inhibitors (Vartak 1968, Kanchan 1975, Le Tourn eau *et al.,* 1956 Krishna Murty *et al.,* 1955, Hosamani and Prabhakar Setty 1973, 1976. Laxmi Rajan 1973 and Kanchan and Jayachandra 1976). According to Garciduenas *et a.,l* (1973) Crude extracts, methanol fractious or parthenin found in the weed inhibited the development of Spacolus Vulgaria Kanchan and Jayohendra (1976) recorded a marked reduction in growth or Rhizobia due to partenium, Degar (1979) reported that the aqueous extract of different parts of weed exhibits significant inhibition on germination of seeds and growth of seedling of maize Jower, and arhar,.

Besides the above, weed also complete with crop plants for water, nutrients, light, carbon dioxide and space. It harrow insets, diseases and other pests; consequently control of these pests will be required resulting in higher cost of plant protection.

CONTROL

The detrimental effects of the weed as mentioned above necessitate its eradication in crop land forests and other location of public use. The control of weed is one of the most important and a challenging problem in India. Many scientists suggested different control measures for this weed.

Hand Weeding

The Indians agricultural research Institute (IARI)New Delhi has advocated the hand weeding to eradicate this weed without a doubt it is effective means of control but has certain serious disadvantages . It is tedious, laborious, slow and costly. The most undesirable aspect of this method to control parthenium is that it may cause dermatitis in sensitization of workers especially in made adults. Therefore, hand weeding is not advisable to.

Chemical Control

Chemical herbicides are a relatively new tools in man's light against weeds. Several pre and post emergence herbicides have been tried to control parthenium in India (Jaychandra 1971, Krishna Murthy *et al*., 1976; Hosamanis and Jayandra,1976). Chemicals like atrizine, samazine, prometryne, chlorobormuron, 2-4-D amine, disodium methane areenic acid, bromacil, weedone concentrate 48, brush killer 62, glycophosphate have been found to be effective against parthenium.

Although chemicals have proved effective up to certain extent, sometimes has created formidable problems and do not found wide acceptance due to various reasons. Even with proper use, chemicals may be hazardous. Toxic residues can be accumulated in food, soil and surface water. It can cause injury to no target crops, endangered species may occur, toxic metabolites may also occur in food chains. Resistance may also develop in target peals. Beneficial organisms are often eliminated natural enemies of the post may also be dissected. (Wilson & Huffaker 1976).

Significant environmental and human health hazards have arisen at specific non-agricultural sites as a result of requirement for synthetic chemical pesticides. Thus alternative pests control strategy is clearly needed.

Biological Control

The discovery and development of biological alternatives to chemical pesticides is an essential agent for agricultural scientists. Biological

control concepts are not new. The first successful use of a host specific biological control agent was that of an Antralian lady bird Rodobid cardinalis muls against cottony cushion scale. (Icerya Purchari Mark) in California in 1886. Since interest in biological control has increased greatly and worldwide successful methods of control have been developed for many weeds. Fortunately development and implementation of an integrated pest control strategy have an a adequate understanding of the natural enemies of the weed as well as available crop management alternatives.

Natural enemies: Insects

The weed in India is attacked by a number of native insects such a mealy bugs and aphides (Char *et al.,* 1975) Rajendran (1976) reported two species of aphides viz. *Aphis jussypil* and *A. Piraecola* on Parthenium in which they caused considerable damage however, the former species is specially dangerous to cotton cultivates. Since it is major pest of cotton in many places of India. It is also major post of chillies, transmitting chillies mosaic virus and a minor pest of banana, citrus, lady's fingers and melons. The aphides are potential reotors of plant viruses and of the weed are not checked effectively by other means it will serve only to increase the population of these pests. Which will then migrate to cultivated plants (Sarearan 1976, Towers *et al.,*1977).

Pathogens

Biological control with plant pathogens in general is comparatively recent development in pest management. And the subject is extensively reviewed by several workers (Wilson 1969, Zettler & Charudattan & Walker 1982, Freman 1972, Templeton *et al*., 1979 Templeton & Smith 1977, Templeton and Trujillo, 1981; Templeton 1982; Quimby and Walker,1982;Templeton and Greavest,1984; Cook, 1984; Cook and Evans, 1984; Patak *et al*., 1987; Evans, 1987; Mortensen and Molley 1989. Among the plant pathogens, fungi have received the greatest attention in research and development projects to control weeds but have also bacteria, viruses and nematodes have also been considered. The erratically all classes of plant pathogens including mycoplasma, vision, viroids etc. Have potential, but fungi appear most promising from biological and technological perspective which is evident by commercialization of many of them as mycoherbicides.

Although biological control of parthenium has been attempted to some extent not much has been emerged out except finding that a virus cause server phyllody (Phatak *et al*, 1975, Mani et al 1977, Annappa & Homani, 1977). Keshwal (1982) conducted preliminary studies of on the efficacy of this disease and suggested that the disease is incited by an mycoplasma organization and can be use to control the parthenium . Particularly in places like road sides river banks pastures or vacant land. However, transmitted through *Aphis gossypil* which is a potential danger to cotton crops. Thus it is not safe to use atleast in cotton growing areas.

Sincere efforts made by plant pethologists to utilize plant pathogens to control weeds have been reported that the notorious weed parthenium is attacked by several pathogenic fungi. A potential rust *Puccini abruta* var: parthenicola, an introduced pathogen in U.K. is now under final field testing (Erans 1983,84,86). In India inspite of many published reports (Table I) no serious efforts have been made to assess the biological potential of these fungi for the management of partherium.

Realising the need and potential danger caused by the weed parthenium and also importance of biological control, microbial control. Programme with indigenous pathogens has been started at Jabalpur. Since 1987. Several fungi were isolated from various parts the weed (Farkya. S, 1988; Rajak *et al*. 1990; Pandey *et al.*, 1991a.). Screening tests conducted in green house conditions showed that some of these fungi viz., *Colletotrichum dermatium C gloeosporiodies Alternarid alternate A. Macrospores, A. Dianthi Myrothecinum roridum; sclesotium rolfsil; Fusarium oxysporus, F. Solani, F. Monoliformae* are quite effective and caused severe damage to the weed. (Luka 1989, Pandey *et al.,* 1991b.) studies conducted by Luka (1989) and Pandey *et al.,* 1991 b reveals that the pathogen *Myrothecium roridum* caused significant repletion in growth, vigour, seed formation viability and germination in parthenium. Similarly, *S rolfoli*, Sacc incited.

Similarly severe collar rol in parthenium seedings and responsible for the decline in the populations of the weed seedings to the extent of 90-95% and 34 to 40% in green house and field conditions respectively (Pandey *et al*., 1992). Host specificity test conducted showed that the pathogen has very limited hurt. Range as only mustard seedlings were attacked severely in laboratory

conditions. However, the pathogen was also severely attacked to *Menthium strurmarium* another problematic weed. It has considerable potential as bio control agent but the main hindrance about its success are the isolation of inoculums by a soil fungus *Trichoderma viride*.

CONCLUSION

Although these pathogens have considerable potential as bio control agent but required extensive stepwise investigations to understand their biology, interactions with host path and environment prior to use as mycoherobicides. Each pathogen must be considered unique and must be thoroughly studied in laboratory green house or growth chamber priors to recommit as bio control agent. (Templetion *et al*., 1986a) That Pathogen can employed to manage weed thus appears to be sound both biologically and economically their use is based on basic principles of plant pathology. The challenge is to develop them for use in weed management system integrated with other control practices demonstrations showing that this environmentally advantageous approach is also economical could add a new dimensions to the already by diverse arsenal for controlling this weed.

Table 1: Some examples of attempts made to control *Parthenium hysterophorus* L. through Phytopathogeric fungi

S.No.	Name of Fungi	Status	Country	Reference
1	*Alternarid tennis*	A	India	Rao 1964 a
2	*A. Zinniae pape*	A	India	Rao 1964b.
3	*A. Atternata* (Fr) Kuster	B	India	Rao 1964b.
4	*Farkya 1988*	B	India	Rajak et al 1990,
5	*A. Dianthi Steyens & Ha Hall*	B	India	Pandey *et al*,, 1990a
6	*A. Macrosposa* Zimm	B	India	Pandey *et al*,, 1990a
7	*A. Macros*	B	India	Pandey *et al*,, 1990a
8	*Curvularis Lunata*	B	India	Pandey *et al*,, 1990a
9	*C. senegalersis*(Speg) sub	B	India	Pandey *et al*,, 1990a
10	*Colletotriduon capsici*	B	India	Rao & Rao 1979 (Syd)
11	*C dematium*	B	India	Pandey et al 1992
12	*C.Gloeosporioides* (Penz) Sacc	B	India	Rao & Rao 1979
13	*Cercospora Partheni* Syd.	B	India	Chup 1954
14	*Fusarium Equiseti* (cordi) sacc	B	India	Pandey *et al.* 1991c
15	*Fusarium Oxisporum* Schl. Ex. Fr.	B	India	Pandey *et al.,* 1991c
16	*Myrothecium roridum* Tode ex. Fr.	B	India	Luca, 1990
17	*Phoma herbarum* west	B	India	Pandey *et al*1990,91ab
18	*Sclerotium rolfail* Sacc	D	India	Pandey *et al*1990,91ab
19	*Puccinia abrupt* Var Parthenicola	C	U.K.	Evans 1983,84,86,87
20	*F melampodii* Diet as Holway	A	America	Parmelee, 1967
21	*Bremia lactacae* Regel	A	Dominian Rep.	Erans, 1987
22	*Sphaerotheca fuligena* (schl)	A	India	Patwardhan 1966
23	*Erysiphae Cichoracearum* De ex Merat	A	India	Satya Prasad & Usha Rani 1981

A= Discovered C= Green House evaluated

B= Pathagenicity tested D= Commercialized

REFERENCES

Adkison P L, 1983. A perspective on pest management presented as the Prof. D.A. Willbur honorary address at the 3rd international working conference on stored product Entomology, Kansas state University, Mannattam, K.S. October 23-37, pp 1-6.

Adkisson P L, 1986. Integrated Fest management. Bulletin of the F.C.S.A. , 136-141.

Agarwal G P and Hasija S K, 1986. Micro organisms in the laboratory . A labora

guide for mycology, Print house (India) Lucknow, PP 155.

Boyette C D and Walker H L, 1986. Evaluation of *Fusarium lateritium* as a biological herbicide for controlling velvet leaf (*Abutilon theophrastil*) and Prickly sida (Sida spinosa) weed Sci. 34.34: 106-109.

Deshpande K S, Deshpande U K and Rathore O S, 1982. Biocontrol of *Parthenium hysterophorus* L. Indian bot. Reptr 1. (1) : 40-42.

Dodd A P, 1927. The biological control of prickly pear in Australian common wealth, Council of Scientific Industrial Research Bulletin, 34: 1-44.

Hasija S K, Rajak R C, Luka Rita S and Pandey A K, 1989. Pathogenic potentiality of some fungi to *Parthenium hysterophorus* L. Indian phytopath. (Communicated)

Hosamani M.M. and Setty P, 1973. Curr. Res. Univ. Agric. Sci., Banglore, 2:93.

Huffaker C B and P S Messenger, 1976. Theory and practice of biological control. Academic press, New York, pp.788.

Kanchan S D and Jayachandra, 1976. Procedings of the seminar on Parthenium-A positive danger (Bicro and the University of Agriculture sciences, Banglore);11.

Lonker A and Jog M K, 1972. Contact dermatitis Newlett. . Lond., 11:291.

Luka R S, 1989. Evaluation of some micro organisms for biological control of *Parthenium hysterophorus* L.M. Phil. Thesis.

Nagesh K N and Kumar L, 1987. The role of *Parthenium hysterophorus* pollan in nosobranchial Allergy in children. Indian J. Allergy Appl. Immunol., 1(2) :33-37.

Pandey A K, Rajak R C and Masija S K, 1989. Biological control of weeds and over view. In Prof. P Rama Rao Felicitation volume, Hyderabad.

Pandey A K, Hasija S K and Rajak R C, 1990 *Myrothecium roridum* Tode ex Fr. A new pathogen of *Parthenium hysterophorus* L. With biocontrol potential :J. Eco. Taxo. Bot.

Phatak S C, Callaway M B, and Vavrina C S, 1987. Biological control and its integration in weed management systems for purple and yellow Nutsedge (*Cyperus rotundus* and *C. esculentus*) Weed Tech. 1: 54-91.

Rajak R C, Farckya S, Hasija S K and Pandey A K, 1990. Fungi associated with congress weed (*Parthenium hysterophorus* 1.) Proc. Nat. Acad. Sci. India 60(BII)

Rande S, 1971. Maharashtra Med. J., 17: 495.

Rao R S,1958. *Parthenium hysterophorus* Linn. A new record for India. J. Bombay Nat Hist. Soc. 54:218-220.

Subha Rao, Mangala P V, Subbarao B S, Prakash K N, 1977. Clinical and Immunological studies on persons exposed to *Parthenium hysterpphorus* L. Experientia, 33: 1387.

Vijiya kumar C S K and Rao A S, 1977. Two new leaf spot desiase. Indian phytipathol,, 30:118-120.

Walker H L, 1982. Seeding blight of sicklepod caused by *Alternaria cassia* plant dis., 66:428-28.

Wilson C L, 1969. Use of Plant pathogens is weed control Annu Rev. Phytopathol., 7:411-434.

Zettler FW, 1972. Plant pathogens as biocontrols of aquatic weeds. Annu Rev. Phytopathol., 10: 455-470.