

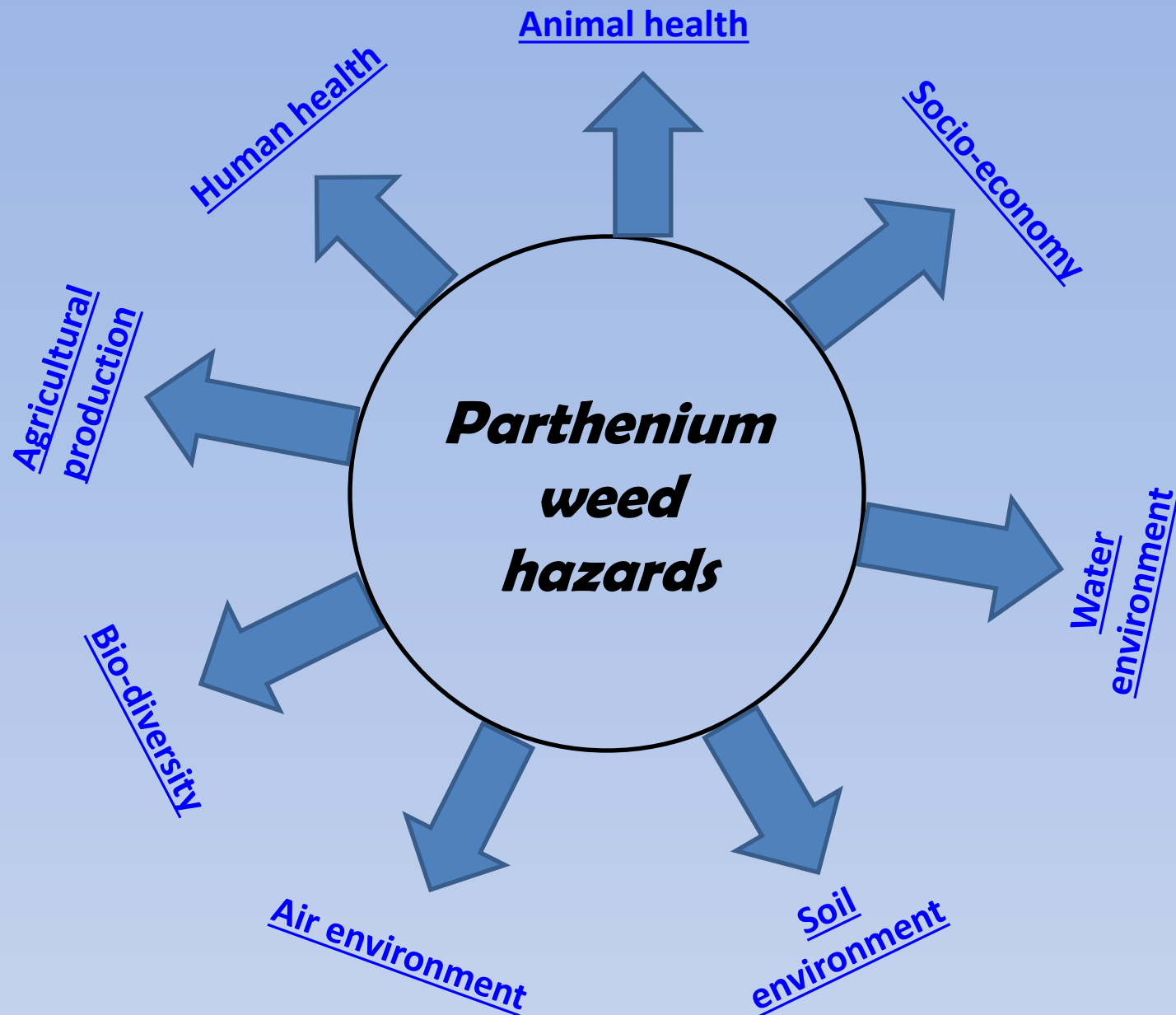
Parthenium hazards in Malaysia and Its Sustainable Management

Prof. Dr. S. M. Rezaul Karim
Faculty of Agro Based Industry
Universiti Malaysia Kelantan
Jeli Campus, Kelantan



Concept of parthenium hazards

- Parthenium weed (*Parthenium hysterophorus* L., Asteraceae; Rumpai Miang Mexico) is a recalcitrant, invasive alien species which has recently been discovered in Malaysia.
- It has harmful effects on human and animal health (**severe allergic diseases**), crop production (40% loss) and pasture production (80% loss), biodiversity and soil ecosystem.
- It spreads very fast and is very difficult to control if naturalized and established in a country.
- It produces a large number of seeds and can complete its life cycle within 4 weeks under stressed condition.



Parthenium weed hazards

- **Affect human health**
 - Dermatitis, Eczema, Rhinitis, Hay fever etc.
- **Affect animal health**
 - Allergic swollen of mouth, Mouth ulcer, Stomach toxicity etc.
- **Loss in agricultural production**
 - Yield loss, Quality deterioration, Value loss of products
- **Loss in bio-diversity**
 - Inhibit growth of useful microbes, Changes the food web chain in soil, replace native flora etc.
- **Impair soil environment**
 - Release allelochemicals in soil, Nitrogen exploitation etc.
- **Impair water environment**
 - Leaving allelochemicals in water, Affect aquaculture industry
- **Impair air environment**
 - Air pollution with pollens and trichomes
- **Socio-economic losses**
 - Loss in work efficiency, Cost for allergy treatment etc.

How the plant looks like and its different forms

Single young plant



Morphological views

Parthenium seedling



Matured plant



Flowers of Parthenium



Growing in roadside

Rosette form of Parthenium weed



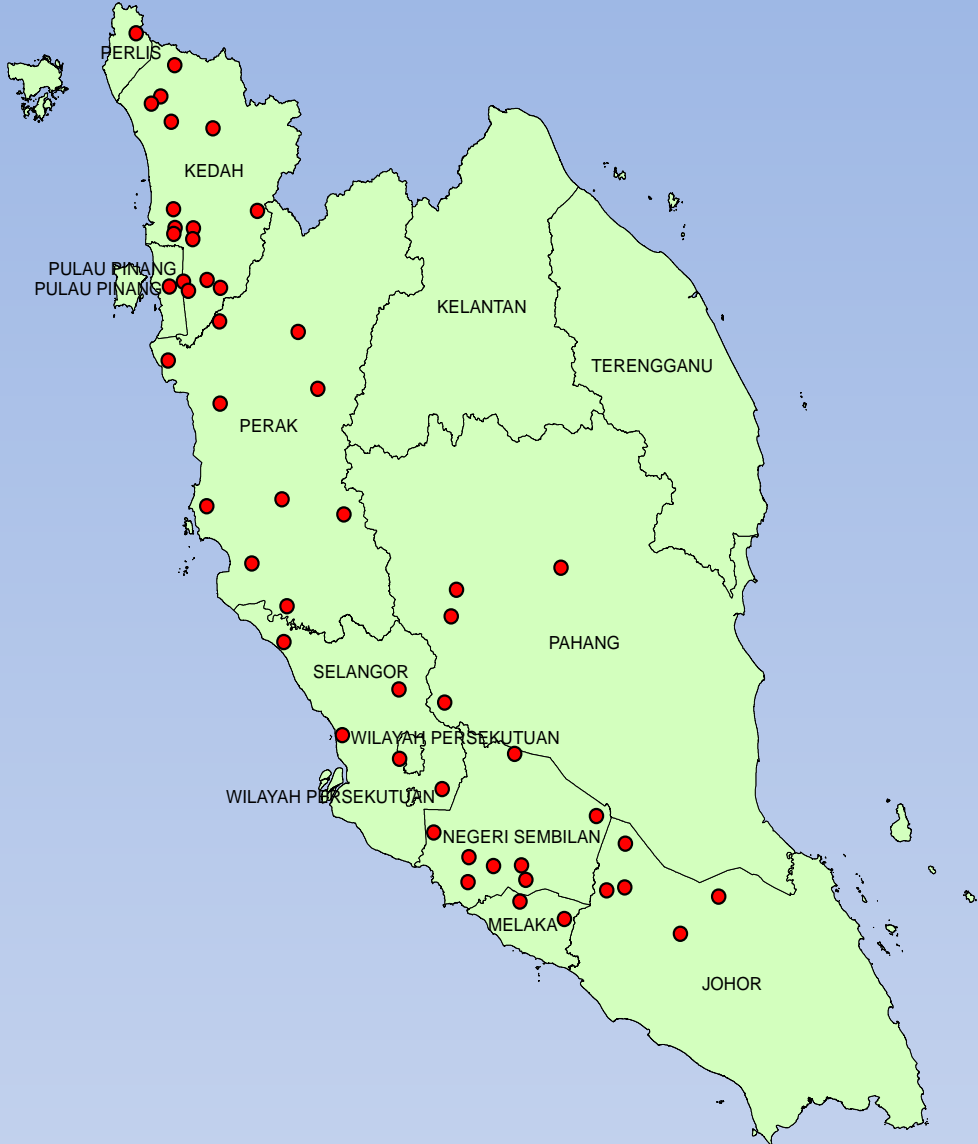
Parthenium above man height



Parthenium distribution in Malaysia



Parthenium infested areas in Peninsular Malaysia



Parthenium infestation in Batang Kali (Roadsides)



Roadside infestation in Kulim, Kedah



Parthenium within house premise in Pokok Sena, Alor Setar



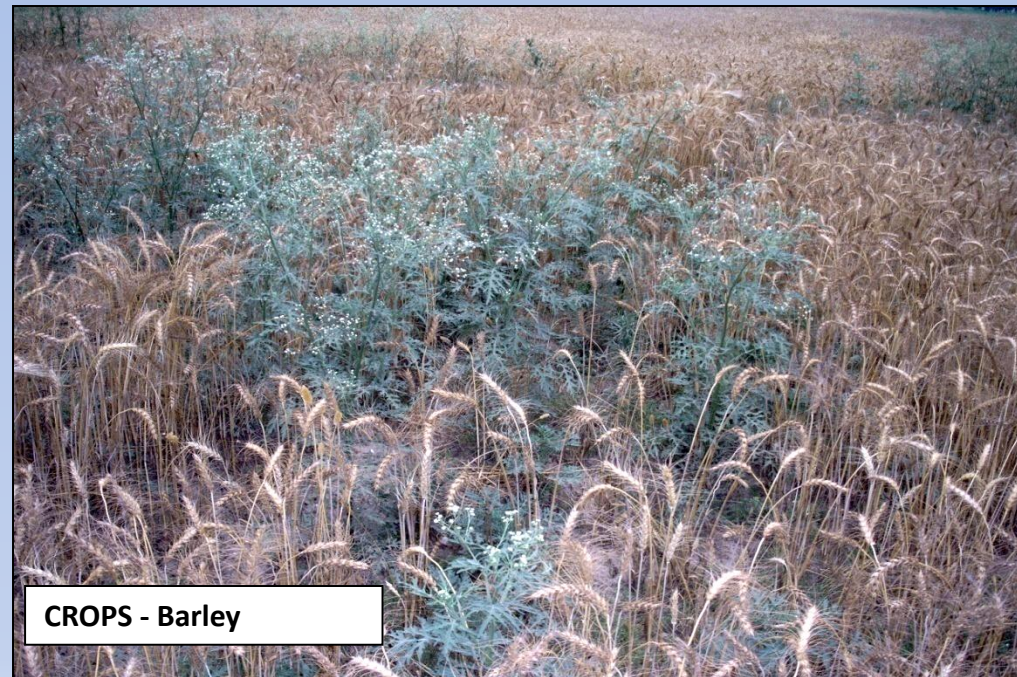
Impacts of parthenium weed

Table 1. Impacts of parthenium weed on crop production

Impact on	Ill impacts	References
Crop production	<p>i. Inhibit the germination and subsequent growth of crops and pasture grasses</p> <p>ii. Failure in seed setting and yield loss in maize in India</p> <p>iii. Grain loss (30%) in irrigated sorghum in India</p> <p>iv. Inhibitory effect on nitrogen fixing and nitrifying bacteria</p> <p>v. Poor fruiting of leguminous crops and reduction in chlorophyll content of crop plants</p> <p>vi. Reducing pasture productivity by 90%.</p> <p>vii. Serves as an alternative host for crop pests, such as scarab beetle: a pest of sunflower, functioning as an inoculums source.</p> <p>viii. Increase in cultivation costs since land preparation need re-working to eliminate the emergent parthenium weed seedlings.</p> <p>ix. Hosting the major parasitic weeds, <i>Orobanche</i> spp. and <i>Cuscuta</i> spp. in Ethiopia.</p>	<p>i. Navie et al., 1996; Evans, 1997</p> <p>ii. Towers et al., 1977</p> <p>iii. Channappagoudar et al., 1990</p> <p>iv. Kanchan and Jayachandra, 1981, Dayama, 1986</p> <p>v. Lakshmi and Srinivas, 2007</p> <p>vi. Evans, 1997, Ashraf, 2014;</p> <p>vii. Navie et al., 1996, Singh, 1997, Ashraf, 2014</p> <p>viii. Chippendale and Panetta, 1994</p> <p>ix. Shabir, 2014.</p>



Parthenium in Maize



CROPS - Barley

Parthenium in Barley

Crops infested with parthenium

In Turnip field



In Brassica field



Crops infested with parthenium

In Maize field



In Sorghum field



Parthenium in sugarcane in Kedah



Parthenium infestation in Oilpalm farm at Sidam Kiri, Kulim



Table 4. Impacts of parthenium weed on human health

Impact on	Ill impacts	Reference
Human health	<p>i. It is lethal to agricultural labourers and city-dwellers, who are sensitive to it. There is no effective treatment for the allergies, other than avoiding contact or leaving the area.</p> <p>ii. Parthenium-contaminated animal feed leads to tainted milk and the hepatotoxic parthenin in tainted milk reacts synergistically with copper, causing Childhood Cirrhosis.</p> <p>iii. This weed elicits allergic contact dermatitis (a disease manifests as itchy erythematous papules and papulo-vesicular lesions on exposed areas of the body) in humans.</p> <p>iv. Inhalation of parthenium pollens cause allergic rhinitis that develops into bronchitis or asthma if the pollens enter the respiratory tract during breathing.</p> <p>v. It causes diarrhoea, severe papular erythematous eruptions, breathlessness and choking.</p>	<p>i. Mukhopadhyay, 1987</p> <p>ii. Tanner and Mattocks, 1987</p> <p>iii. Gunaseelan 1987; Morin et al. 2009; Akhtar et al. 2010</p> <p>iv. Towers and Subba Rao, 1992</p> <p>v. Maishi et al. 1998.</p>



← Health problems due to parthenium







Skin rash on arm

Health problem due to Parthenium

Hand of a severely affected man



Man died due to parthenium



Parthenium dermatitis

Is parthenium really harmful?

- Gupta et al (1998) confirmed by a skin prick and bronchial provocation test (BPT) with parthenium plant extract that the weed is an allergenic plant evoking bronchial hyper-responsiveness and asthma. They noticed a significant fall in the mean values of pulmonary functions such as forced expiratory volume in 1 second (FEV1) and peak expiratory flow rate (PEFR) after the BPT in patients with astmatic symptoms than in those not showing such symptoms. **They concluded that a significant proportion of bronchial asthma patients had been sensitized to parthenium weed and that exposure to parthenium weed may be a cofactor in seasonal exacerbation of their allergy symptoms** (J. Assoc. Physicians. India. Jun, 46(6):518).

- A clinical survey showed that 34% of the patients suffering from rhinitis and 12% suffering from bronchial asthma gave a positive skin-prick test reaction to parthenium weed pollen antigen extracts. **Parthenium weed-specific IgE (Immunoglobulin E is a type of antibody that is present in minute amounts in the body but plays a major role in allergic diseases) was detected in 66% patients suffering from seasonal rhinitis”** (Rao et al. 1985; Clin. Allergy, Sept. 15(5):449).
- In a large scale study of allergies in India conducted by Shaikh and Shaikh in 2008, it was found that **18.2% cases of children and 38.7% cases of adult patients were suffering from allergic contact dermatitis due to parthenium weed** (J. Indian Med. Assoc. 106: 220).

Experts' opinion about parthenium

Don't touch carrot weed, public advised

December 10, 2014

Pollen from the plant contains toxic chemicals which can be harmful to health, says Health Ministry.



KUALA LUMPUR: The public has been advised to not touch or be exposed to carrot weed, scientifically known as 'parthenium hysterophorus', because it can cause allergy, especially to children and elderly people.

Health director-general Dr Noor Hisham Abdullah said pollen from the weed contained chemicals known as parthenin, hymenin and ambrosin which could be harmful to health.

Rumpai Miang Mexico boleh menjejaskan kesihatan

RIMBA, Sabtu, 28 Februari. - Salah satu inisiatif kerajaan bagi menangani isu-isu yang mungkin berbangkit mengenai Rumpai Miang Mexico (*Parthenium Hysterophorus*), Jabatan Pertanian dan Agrimakanan serta bahagian-bahagian yang berkaitan di bawah Kementerian Perindustrian dan Sumber-Sumber Utama (KPSSU), telah mengadakan Taklimat Kesedaran Awam mengenai Rumpai Miang Mexico (*Parthenium Weed*), di Dewan Simpurn, Pusat Urusniaga Hortikultur Rimba, Gadong.

Taklimat disampaikan oleh dua orang pakar daripada Bahagian Biosekuriti Tumbuhan, Jabatan Pertanian Malaysia, Kementerian Pertanian dan Industri Asas Tani, Malaysia iaitu Encik Palasuberniam Kaliannan dan Encik Mokhtaruddin bin Husain.



SALAH orang pakar daripada Bahagian Biosekuriti Tumbuhan, Jabatan Pertanian Malaysia, Kementerian Pertanian dan Industri Asas Tani, Malaysia menyampaikan taklimatnya mengenai Rumpai Miang Mexico.

Try to avoid contact with killer weed at all costs, says doc



Wednesday, Dec 10, 2014

The Star/Asia News Network

By Tashny Sukumaran

PETALING JAYA - Individuals should exercise care with the Parthenium hysterophorus as the weed has asthma and eczema-causing properties.

"If they come into contact with the weed and begin feeling itchy or short of breath, they should immediately take an antihistamine to counter any allergic reaction," advised Malaysian Medical Association president Dr H. Krishnakumar.

Many in Malaysia falling sick due to killer weed



Wednesday, Dec 10, 2014

The Star/ANN

KULIM - Kulim is just one of the areas in Malaysia where *P. hysterophorus* grows freely by the roadside, posing a problem for residents who frequently have no idea why they're suddenly itching and sneezing.

At a palm oil estate in Sidam, workers have developed itches and asthma, possibly due to the *P. hysterophorus* which grows outside and around their quarters.

R. Poobarasi, 24, said she has had asthma for the last two years but has no idea what triggers it.

"I think it may be cold drinks, but the asthma appeared out of nowhere," she told The Star.

Outside her house, dozens of *P. hysterophorus* plants thrive.

Experts' opinion (Video)

1.

<https://www.youtube.com/watch?v=YxaBBuL8koA> (Dr. Wan Noraini Binti Wan Mohamad Noor), Ministry of Health

2.

https://www.youtube.com/watch?v=wVE_CmALVv4 (Prof. Dr. Abdul Shukor Juraimi, Dean, Faculty of Agriculture, UPM, Serdang, Selangor)

3. <https://www.youtube.com/watch?v=V8n-NKiAh-c> (Faridah Aini Mohamed, Director, Plant Biosecurity Division, Department of Agriculture, Malaysia)

Table 5. Impacts of parthenium weed on animal health

Animal health	<p>i. As the sesquiterpene lactone, parthenin, causes severe dermatitis, anorexia and intestinal damage and this leads to death of buffalo, cattle and sheep.</p> <p>ii. It taints the meat in sheep given a diet of 30% parthenium weed; and tainting of milk and honey.</p> <p>iii. Degenerative changes in the liver and kidneys in buffalo and sheep.</p> <p>iv. Alopecia (loss of skin pigmentation), dermatitis and diarrhoea in animals feeding on this weed.</p> <p>v. Reduction in rat WBC count after oral treatment of Parthenium extract indicating weakening of its immune system.</p> <p>vi. Exposure to the weed also causes systemic toxicity in livestock</p>	<p>i. Towers and Subba Rao, 1992, Naarasimhan et al., 1980; More et al., 1982</p> <p>ii. Towers and Subba Rao, 1992; Taye, 2002; Lakshmi and Srinivas 2007</p> <p>iii. Rajkumar et al.1988.</p> <p>iv. Rajkumar et al. 1988</p> <p>v. Yadav et al. 2010</p> <p>vi. Gunaseelan, 1987</p>
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Goat is eating parthenium weed





Allergic effects on goat mouth

Cow is eating parthenium weed





Allergic effects on Cow's mouth

Table 6. Impacts of parthenium weed on biodiversity

Biodiversity	<p>i. Changing in native grasslands, woodlands, river banks, floodplains etc. by invading new surroundings and disturbing the entire grassland ecosystem.</p> <p>ii. Adverse effect on a variety of natural herbs which are used as traditional medicines for the treatment of several diseases.</p> <p>iii. Due to its invasive capacity and allelopathic effects, it has detrimental environmental effects by displacing native plant species and transforming the invaded habitats into monoculture shrub lands.</p>	<p>i. Kumar and Rohatgi, 1999, Batish <i>et al.</i> 2005, Lakshmi and Srinivas, 2007; Timsina <i>et al.</i>, 2010</p> <p>ii. Mahadevappa <i>et al.</i>, 2001; Shabbir, 2006</p> <p>iii. McConnachie <i>et al.</i> 2010</p>
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Highly aggressive weed replacing native flora



Parthenium threats in Malaysia

The people's paper
Star

NATION
Yet another
foreigner slain

Passer-by stumbles upon man's body with slash and stab wounds in front of shrine in Relau, Penang. >6



Parthenium flowers are hanging over the irrigation channel at Sg. Petani



Parthenium within house premise in Pokok Sena, Alor Setar



Parthenium in a park and in front of a residence at Pokok Sena





Difference between Ulam raja and Rumpai Miang Mexico

Ulam raja



Parthenium weed

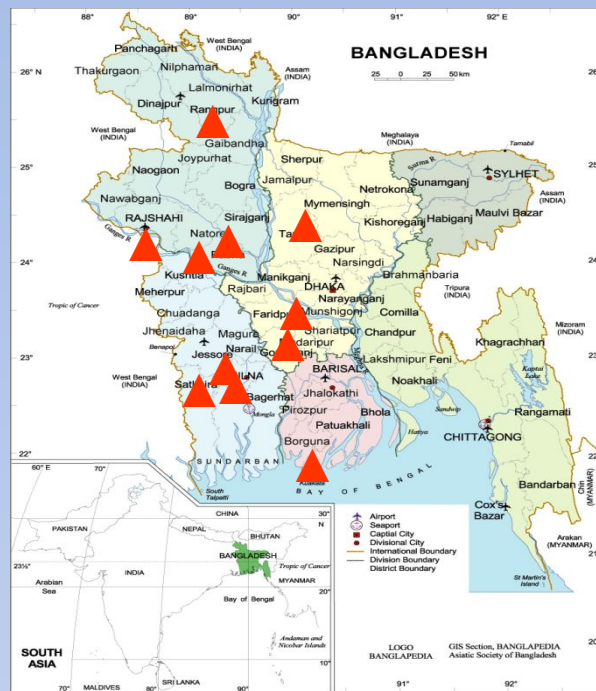


How fast it spreads

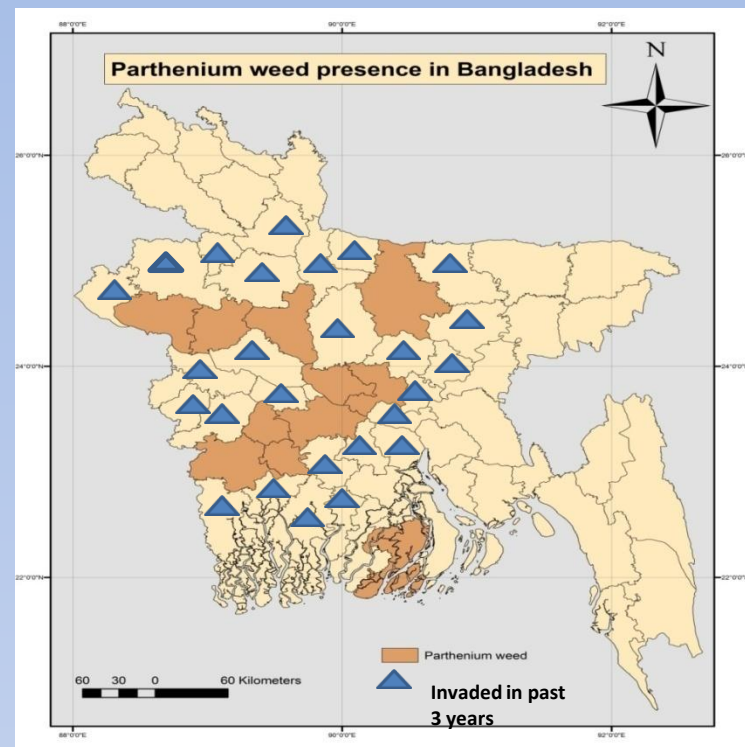


Parthenium infestation in Bangladesh

In 2009



In 2012

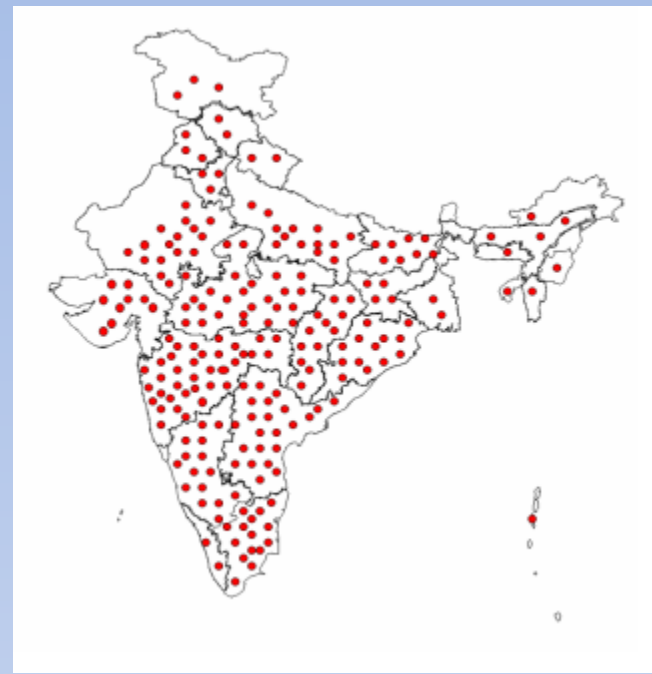


Parthenium infestation in India

1980



2011



Soil seed bank of parthenium



Parthenium weed seed bank in soil at Batang Kali

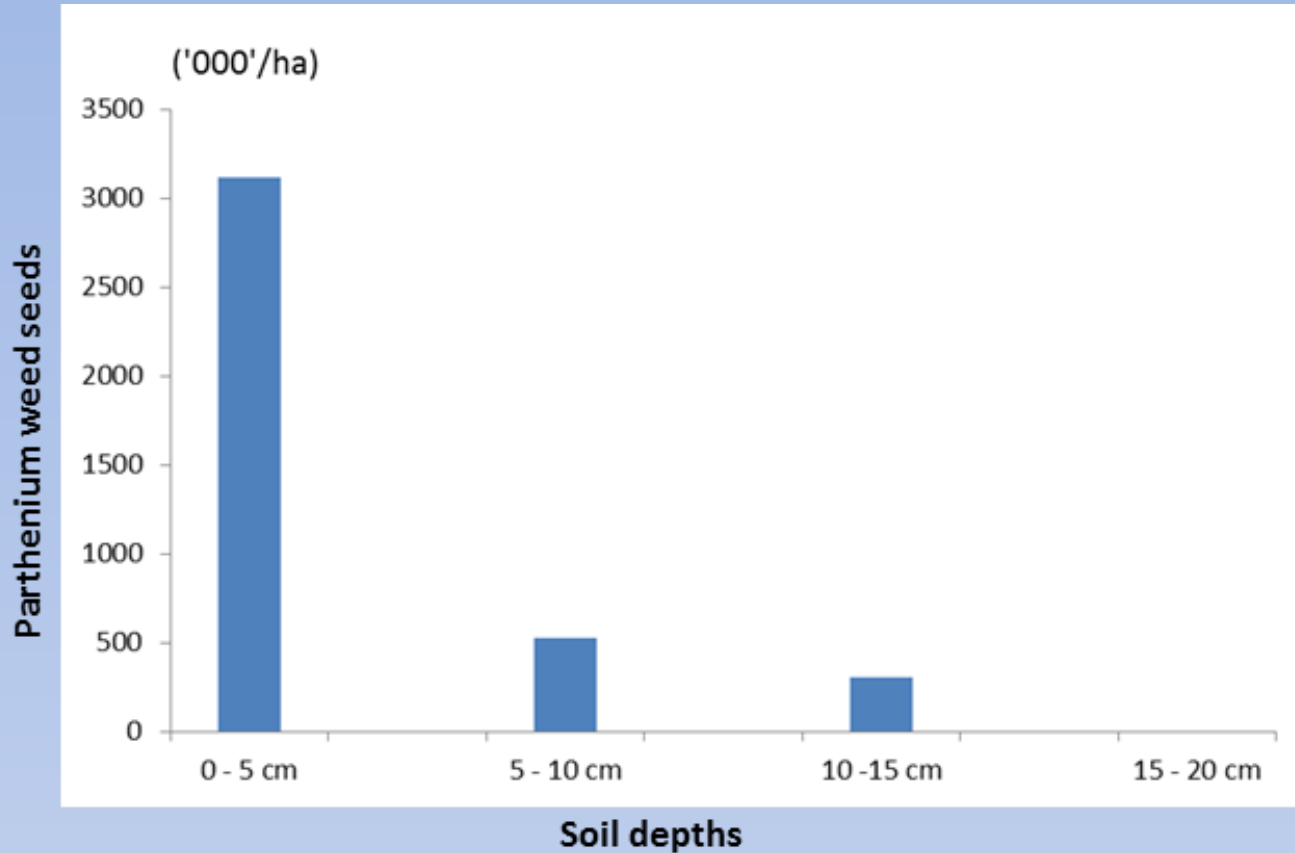


Table 1. Number of parthenium weed seeds in different soil depths at Batang Kali

Table 7. Number weed seeds (million/ha) at different depths of five location of Batang Kali

Soil depth	Locations (Number of seeds/7.5 cm soil cores)				
	<i>Location 1</i>	<i>Location 2</i>	<i>Location 3</i>	<i>Location 4</i>	<i>Location 5</i>
0 – 5 cm	3.13 (7088989)	1.50 (3393665)	0.48 (1093514)	0.40 (904977)	0.32 (716440)
5 – 10 cm	0.47 (1055806)	0.18 (414781)	0.12 (263951)	0.17 (377073)	0.03 (75415)
10 – 15 cm	0.32 (716440)	0.13 (301659)	0.02 (37707)	0.07 (150829)	0.00
15 – 20 cm	0.00	0.00	0.00	0.00	0.00
Average	1.31 (2953745)	0.61 (1370035)	0.21 (465058)	0.21 (477627)	0.12 (263951)

This site will now need to be revisited and managed for at least another 7 to 10 years as the seed bank becomes depleted.

Farmers' perception about parthenium



Perception of a cattle traders at Batang Kali



Saya tak tahu! I don't know about this plant

Farmers' perception at Batang Kali



Saya tak tahu! I don't know about this plant

Perception of local peoples of Kulim



“We saw this weed two years ago. We try to kill by *racun* but we cannot kill it.”

Tool to remove parthenium weed



Tool to remove parthenium



What might happen in future?

- Ezemvelo KZN Wildlife Ecologist Ian Rushworth (2014) stated that **Parthenium weed could become the biggest natural disaster ever to befall communities and their lands in KwaZulu-Natal (South Africa)**. More people's lives and livelihoods are threatened as a result of this weed than from any natural disaster ever experienced. He said "Our rural communities are frighteningly vulnerable to this weed, especially those disturbed areas that are sparsely covered and over-grazed. It is already threatening people's food resources – crops and livestock – as well as their health. **Unless we act very soon I'm afraid we are staring a health catastrophe in the face**" (Compton, 2014)
(<http://www.iol.co.za/dailynews/news/invasive-plant-threatens-health-livelihoods-1.1661199#.VBj-RPmSyCk>)

How to manage parthenium weed?



Integrated parthenium management

Chemical control

- Non-selective herbicides
- Bio-herbicides

Mechanical control

- Ploughing down in soil
- Using weeder in crop fields

Biological control

- By insects and pathogen
- Competitive legumes

Manual control

- Uprooting & damping under soil
- Slashing & burning



Prevention

- Washdown facility
- Border check certificate
- Weed hygiene practices

Legislation & Act

- Imposing fine who carry or allow the plant

Community awareness

- Group discussion
- TV & radio broadcasting

Utilization

- Compost making
- Biogas production
- Medicine development

Benefits

Human & animal safety
Secured animal production
Increased agricultural production
Quality produce obtained
Sustainability of bio-diversity

SUSTAINABLE MANAGEMENT OF KILLER WEED, RUMPAI MIANG MEXICO



S.M. Rezaul Karim

Faculty of Agro Based Industry, Universiti Malaysia Kelantan, Jeli Campus, 17600 Jeli,
Kelantan



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Integrated Management Approach

- For chemical control knockdown herbicides (e.g. glyphosate) should be applied to kill the plants and residual herbicides (e.g. Lasso) should be applied afterward for stop seed germination.
- There should be some washdown and cleandown facilities near the exits from parthenium infested regions to prevent spread of parthenium seeds.
- Alarming signboards and banners should be displayed in the public places and along roadsides.
- **Hand weeding of matured plants is not recommended due to possibility of allergic effect and seed falling to soil.**

Pre-emergence herbicides to control parthenium

Alachlor (Muniyappa and Krishnamurthy 1976),
Atrazine (Adkins et al. 1997; Muniyappa, Prasad, and Krishnamurthy 1980; Tadesse, Das, and Yaduraju 2010),
Chlorimuron (Reddy, Bryson, and Burke 2007),
Flumioxazin (Grichar 2006),
Fluometuron, imazaquin, norflurazon, quinclorac (Reddy, Bryson, and Burke 2007),
Simazine (Muniyappa and Krishnamurthy 1976)

Post-emergence herbicides to control parthenium

2,4-D amine salt (Muniyappa, et al. 1980; Reddy, et al. 2007)

Bentazon (Muniyappa and Krishnamurthy 1976),

Dicamba, diquat (Muniyappa, Prasad, and Krishnamurthy 1980),

Glufosinate (Crane, Stubblefield, and Meister 2006; Reddy, Bryson, and Burke 2007),

Glyphosate (Reddy, Bryson, and Burke 2007; Singh et al. 2004),

Metribuzin (Sharma 2003),

Metsulfuron methyl, Picloram (Goodall et al. 2010),

Sulfosulfuron (Tiwari et al. 2009),

Biocontrol of Parthenium by *Zygogramma bicolorata*



Complete defoliation of *Parthenium* by *Zygodotoma bicolorata* at a field site in India.

(Increase in the population of grasses and other local vegetation can be seen)



Before introduction



After introduction

Parthenium replacement by legumes *Cassia tora*

Before introduction



After introduction



Beware of Parthenium hazard



Awareness creation among the community



Awareness creation workshops



In Bangladesh



In India

Student rally shouting anti-parthenium slogan (in India)



Parthenium eradication through public participation in India



Uses of Parthenium for compost preparation



Safety guidelines for preventing parthenium spread

- Parthenium weed spreads very fast through seeds via vehicles, machineries, human beings, crop seeds, livestock, hay, grains, flood water etc. Therefore care must be taken to prevent the seed spreading through all these avenues.
- The researcher/visitors coming from the parthenium infested area should be checked properly before he/she leaves the area if any seeds carrying through his boots, clothes, his vehicles, any tools or equipment he/she had used in the parthenium infested area.
- The vehicles must be cleaned properly especially the radiator, underneath of driver feet and passenger floor mats, chasis, under parts e.g. Axles, Driver shafts, tires, mud guards etc. A high power vacuum cleaner should be used to clean those parts and area of the vehicles.
- The vehicles must be washed properly in a Carwash before leaving the place of the infestation.
- Carrying of parthenium seed for doing any research must be done in sealed zipped plastic bags, so that no seed can be dropped out during transportation.
- If plant or seedling need to carry for research those should be done without any flower or seeds. No seed bearing plant should be carried from place of infestation to the place of research.

- If plant or seedling need to carry for research those should be done without any flower or seeds. No seed bearing plant should be carried from place of infestation to the place of research.
- On the research station, the research with parthenium seeds or plants must be done in well-protected netted house, so that no seed can be spread to new place within the research station.
- For studying biology of parthenium including seed production capacity, all seeds must be collected by providing quality polythene at the surface of soil under the plants.
- For herbicide trial, parthenium seedlings should be raised using specified number of seeds from the seed stock so that all the used seeds remain under control of the researchers.
- For studying weed seed bank, the soil samples must be carried in sealed polybags so that no soil can be dropped in the vehicles or on the road during transportation.
- In the laboratory, soil samples must be analyzed carefully so that no soil samples are dropped on the floor. After extracting the parthenium seeds from the soil, the soil must be placed in a 1 meter deep soil pit outside the research station.



Conclusion

- Parthenium weed causes significant socio-economic damages and may cause natural disaster and poverty in Parthenium-invaded countries including Malaysia.
- We must take immediate coordinated control approach where federal and local governments, community peoples and land owners must be involved.
- The government of Malaysia must declare parthenium as **class 2 species** i.e. species of severe adverse economic and social impacts and establish “Parthenium Weed Act” to restrict spread of weed seeds from infested areas to other places.
- Through strict quarantine regulation the government must stop entry of parthenium seeds in Malaysia.
- Community awareness should be created through different media

Acknowledgement

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THANK YOU



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