29.Management of non-cropped land weeds

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Management of non-cropped land weeds

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Non-cropped land?

- Non-cropped land refers to all the lands that are in various uses other than crops cultivation, like road side, rail track sides, waste lands, Nallah sides and banks of streams and rivers.

Consequences of spread of weeds in non-cropland weeds

- The fast growth and spread of these weeds prevent establishment of native trees, shrubs and grasses thus posing serious threat to the plant biodiversity.
- There is increased danger of wild animals to the inhabitants and their livestock.
- Due to fodder scarcity caused due to invasion by these weeds, farmers are compelled to leave their cattle loose for stray grazing which cause damage to the cultivated crops.

- *Lantana camara* and *Ageratum* plants when taken alongwith other grasses or are grazed accidentally cause death of animals due to presence of poisonous alkaloids.
- The presence of these weeds in pastures and grasslands has reduced the productivity of grasses.
- The vast slopes and arable lands in the close vicinity of our villages have been severely infested with these weeds.
- These thickets of weeds are forcing people to depend on other forest trees to meet their fodder requirements causing thereby deforestation and destruction of useful vegetation.

Important non-cropped land weeds of Himachal Pradesh

Scientific name	Common name	Family	Category
Parthenium hysterophorus L.	Congress grass, Gajar ghas	*Asteraceae*	Perennial broad-leaf
Ageratum conyzoides	Neela phulnu	*Asteraceae*	Annual broadleaf
A houstonianum (Mill)	Bill goat weed, neela phulnu	*Asteraceae*	Perennial broadleaf
Bidens pilosa	*Cobbler's Pegs* or Spanish Needle	*Asteraceae*	Annual
Erigeron Canadensis	Horseweed	Compositae	Annual
Chromolaena adenophorum Spreng.	Crofton weed, kali basuti	Asteraceae or Compositae	Perennial broadleaf
Cirsium arvense	Canada thistle	Asteraceae	Perennial broadleaf
Ipomea	Morning glory	Convolulaceae	Annual

Scientific name	**Common name**	**Family**	**Category**
Cynodon dactylon	Bermudagrass	Poaceae	Perennial grass
Achyranthus	Prickly chaff flower, devil's horsewhip	Amaranthaceae	Annual broadleaf
Lantana camara L.	Wildsage, bunch berry, *lal phulanoo* and *punch phul buti*	Verbenaceae	Perennial broad-leaf
Hackelia uncinata	Jhangeer	Boraginaceae	Annual broadleaf
Imperata cylindrica (l) Beauv.	Thatch grass, chhiz, alang-alang, Congograss	Poaceae	Perennial grass
Polygonum alatum	Nepalese Knotweed	Polygonaceae	Annual broadleaf
Oxalis latifolia H.B.&K.	Khat-mithi	Oxalidaceae	Broadleaf
Echinochloa colona	Jungle rice	Gramineae	Annual grass

Scientific name	Common name	Family	Category
Polygonum barbatum	Knotgrass	Polygonaceae	Broadleaf
Urtica dioca L.	Stinging nettle, ain, bitchu booti	Urticaceae	Perennial broad-leaf
Rumex obtusifolius	Broad-leaved dock, Sorrel, wild palak	Polygonaceae	Broadleaved perennial
Solanum xanthocarpum	Yellow Berried Nightshade, Kantakari, Nidigadhika, Kateli	Solanaceae	Annual broadleaf
Datura stramonianum	Jimson weed, Thornapple	Solanaceae	Annual broadleaf
Xanthium strumarium L.	Cocklebur	Compositae	Annual broadleaf
Alternethera philoxeroides	Alligator weed	Amaranthaceae	Perennial plant
Galium aparine	Bedstraw, catch weed	Rubiaceae	Broadleaf

Integrate Weed Management

- **One method of weed control may be effective and economical in a situation and it may not be so in other situation.**
- **Continuous use of only one practice may result in some undesirable effects**
- **Only one method of weed control may lead to increase in population of particular weed.**
- **No single herbicide is effective in controlling wide range of weed flora**
- **Continuous use of same herbicide creates resistance in escaped weed flora or causes shift in the flora.**
- **Indiscriminate herbicide use and its effects on the environment and human health**

Concept

- **Uses a variety of technologies in a single weed management with the objective to produce optimum results at a minimum cost taking in to consideration ecological and socio-economic constraints under a given ecosystem.**
- **A system in which two or more methods are used to control a weed. These methods may include cultural practices, natural enemies and selective herbicides.**

Advantages of IWM

- Prevents resistance in weeds to herbicides
- No danger of herbicide residue in soil or plant
- No environmental pollution

Methods of weed management

For designing any weed control programme in a given area, one must know the nature & habitat of the weeds in that area, how they react to environmental changes & how they respond to herbicides.

Principles of weed management are;

- Prevention
- Eradication
- Control

COMPONENTS OF IWM

Mechanical Weed Control

Digging:

Digging is very useful in the case of perennial weeds to remove the underground propagating parts of weeds from the deeper layer of the soil.

Sickling and mowing:

Sickling is also done by hand with the help of sickle to remove the top growth of weeds to prevent seed production and to starve the underground parts. **Mowing** is a machine-operated practice mostly done on roadsides and in lawns.

Burning:

Burning or fire is often an economical and practical means of controlling weeds.

Mechanical weeders

- Dry Land Weeder

- Power rotary weeder

- Tractor operated multi row rotary weeder

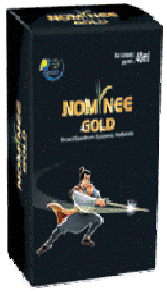
Cultural

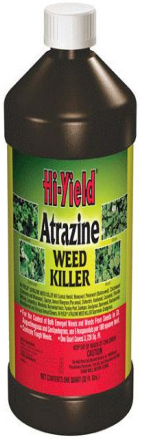
Growing of useful plants

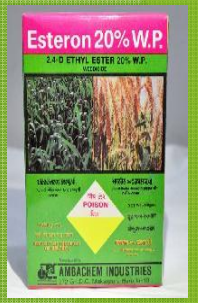
Chemical Control

Chemicals that are used to kill plants or weeds are called herbicides. Their use has been increasing rapidly since 1944 when 2,4-D was first use as herbicide. In many instance, they offer most practical, effective and economic means for controlling weeds.

example :-







Biological control

Use of insects, disease organisms, or competitive plants for the control of weeds

In biological control method, it is not possible to eradicate weeds but weed population can be reduced. This method is not useful to control all types of weeds.

Introduced weeds are best targets for biological control. The bioagent must feed or effect only one host. It should not feed other useful plants. It must be free of predators or parasites. It must adopt to the environmental condition. The bioagent must be capable of seeking out the host. It must be able to kill the weed or at least prevents its reproduction in some direct or indirect way.

Example:

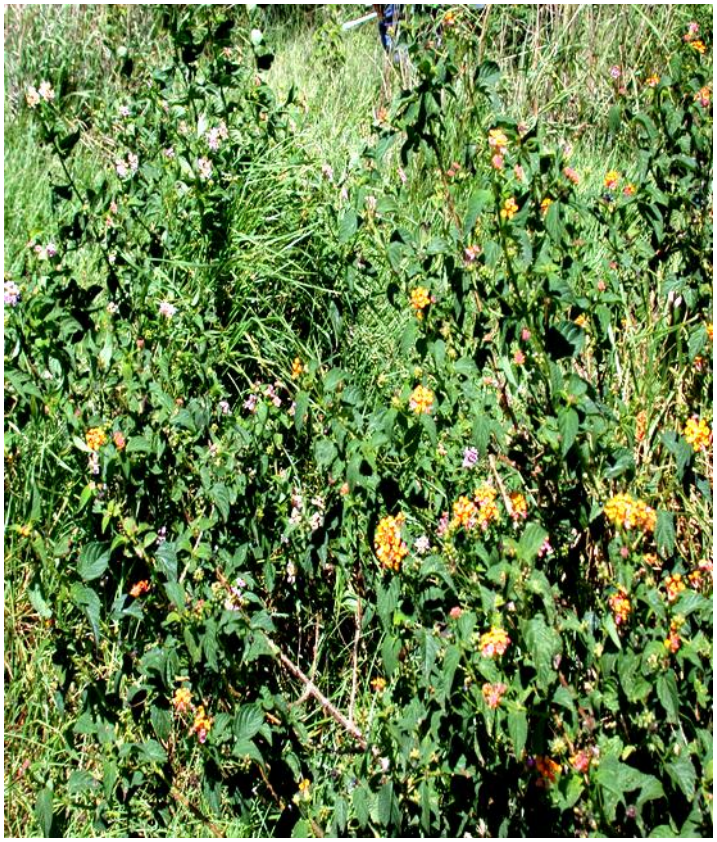
Insects : *Uroplata giraldi* - *Lantana camara,*

mites – prickly pear

Plants: Planting of fodder trees and grasses

Lantana camara can be controlled by *Crocidosema lantana* Busk (moth).

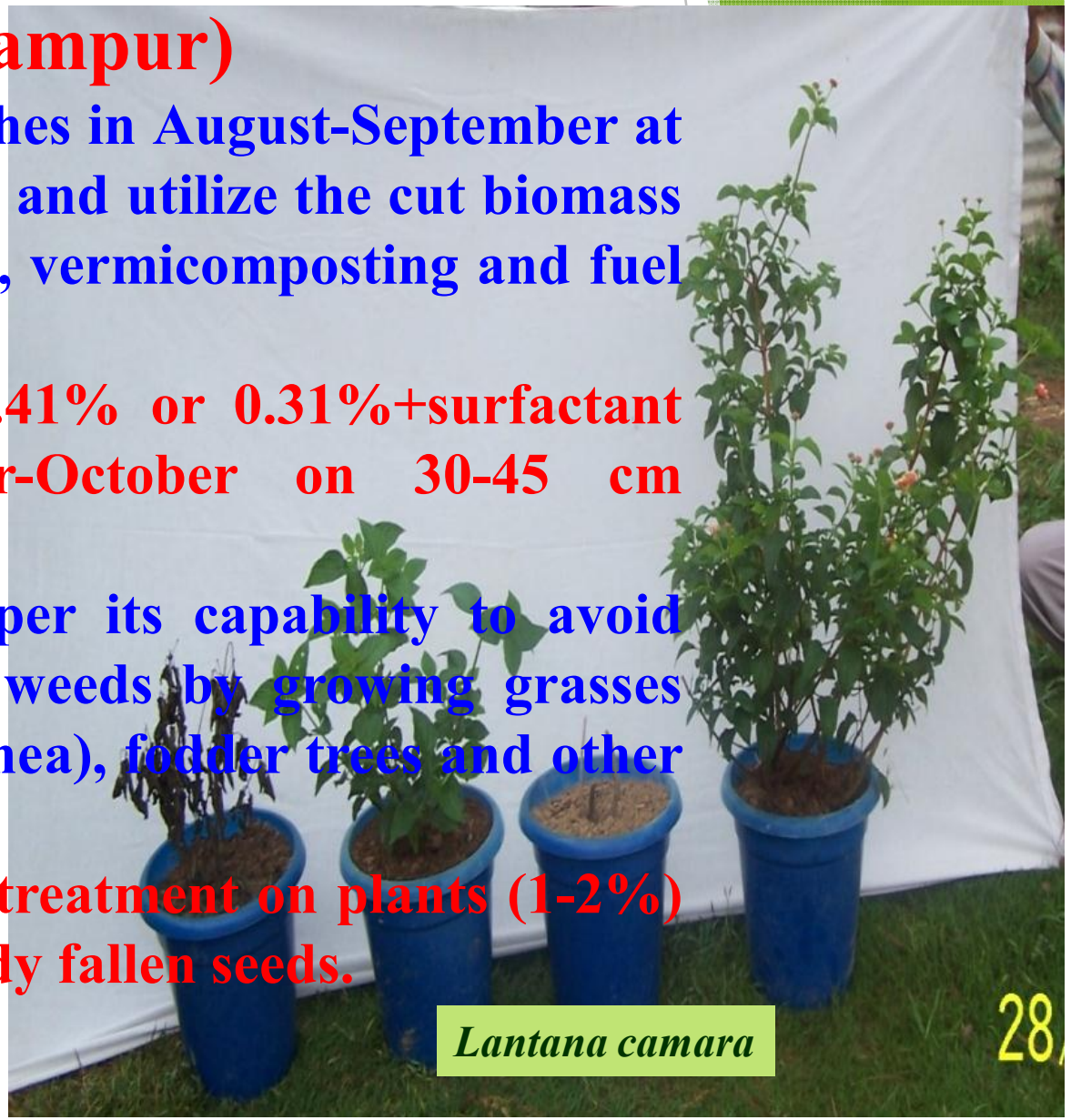
Lantana camara



- *Lantana camara* is regarded as one of the worst weeds because of its invasiveness, potential for spread, and economic and environmental impacts. *Lantana* forms dense, impenetrable thickets that take over native bushland and pastures. It competes for resources with, and reduces the productivity of pastures and forestry plantations.
- It adds fuel to fires, and is toxic to stock. *Lantana* is a serious threat to biodiversity in several World Heritage-listed areas. Numerous plant and animal species of conservation significance are threatened. It is listed as the most significant environmental weed by the South-East Queensland Environmental Weeds Management Group. It is a problem in gardens because it can cross-pollinate with weedy varieties to create new, more resilient forms.

Three phased integrated technology (Palampur)

- Cut the Lantana bushes in August-September at 5-7 cm above ground and utilize the cut biomass for making furniture, vermicomposting and fuel wood.
- Apply glyphosate 0.41% or 0.31%+surfactant 0.1% in Sepember-October on 30-45 cm regenerated foliage.
- Utilize the land as per its capability to avoid emergence of other weeds by growing grasses (Setaria, NB-37, Guinea), fodder trees and other useful vegetation.
- Uproot or give spot treatment on plants (1-2%) emerging from already fallen seeds.



Lantana camara

Phase-I

Cutting of bushes

Phase-II

Proper stage of herbicide application

After the kill of
Lantana bushes

Phase-III

Tree plantation

- Ferrell et al (2012) obtained effective control of largeleaf lantana by two applications of fluroxypyr, two applications of fluroxypyr + aminopyralid, or a single application of aminocyclopyrachlor as basal or cut surface applications. At 1 YAT, only triclopyr + aminopyralid provided >;90% control as a basal application. Cut surface applications were similar with triclopyr + aminopyralid and triclopyr + fluroxypyr providing effective control. Neither triclopyr alone nor imazapyr provided effective control for 1 YAT with basal or cut surface applications.

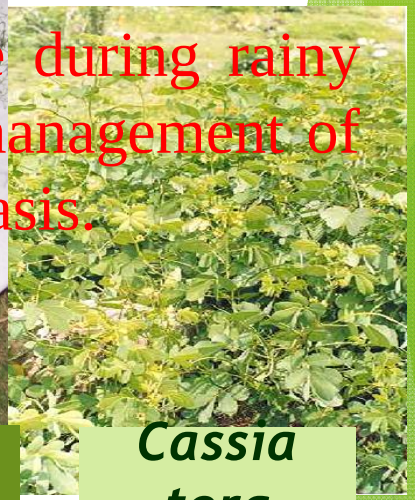
Parthenium hysterophorus

Type of infestation	Chemical	Biological	Physical	Pasture management	Mechanical
Light – few plants, over a small area	Spot spray before seeds set	Not suitable	Hand pulling is not recommended because of the health risks. Use strategic fencing to separate different land types and improve grazing management	Maintain good pasture cover by not overgrazing	Some landholders have achieved success by ploughing in parthenium weed in the rosette stage before it seeds, but this must be followed up by sowing a crop or direct seeding perennial pasture
Medium – plants over a medium area	Spray before seeds set.	Release biological control agents			
Heavy – large number of plants	Spray before seeds set	Establish a nursery site for biological control agents if possible			

- Spread seed of *Cassia tora* or *Cassia sericea*.
- Do not allow the plants to flower or set seeds by frequent cutting/uprooting before flowering or by applying
- Atrazine 1.5 kg/ha or 2,4-D (Na) 0.5-1.0 kg/ha or 2,4-DEE 1.0 kg/ha or metsulfuron-methyl 4 g/ha or or metrubuzin 0.5 kg/ha or paraquat 0.6 kg/ha at its 2-3 leaf stage.
- Glyphosate 1.0 kg/ha before onset of monsoon on campaign basis.
- Introduce *Zygogramma bicolorata* beetle during rainy season. Follow integrated approach for management of *Ageratum* and *Parthenium* on campaign basis.

Zygogramma bicolorata

Parthenium hysterophorus



Cassia tora

AGERATUM

- Atrazine 1.5 kg/ha or 2,4-D(Na) 1.5 kg/ha or paraquat 0.6 kg/ha in May-June and or September-October on emerging plants at their 2-3 leaf stage
- Glyphosate 1.5 kg/ha in May-June and Sept.-Oct. on old *Ageratum* plants before flowering
- Plant improved grasses as per agro-climatic conditions
- Spread/sow seeds of *Cassia tora*

Ageratum houstonianum

Grasslands

Productivity of grassland without control of *Ageratum*

Restoration of grassland ecosystem after control with Atrazine.

Restoration of grassland ecosystem after control with glyphosate

Improvement in productivity by


Infestation in waste land


Regeneration of
natural grass

After spray


Grass in full bloom

C *Chromolaena adenophorum*

C h r o m o l a e n a

Chromolaena

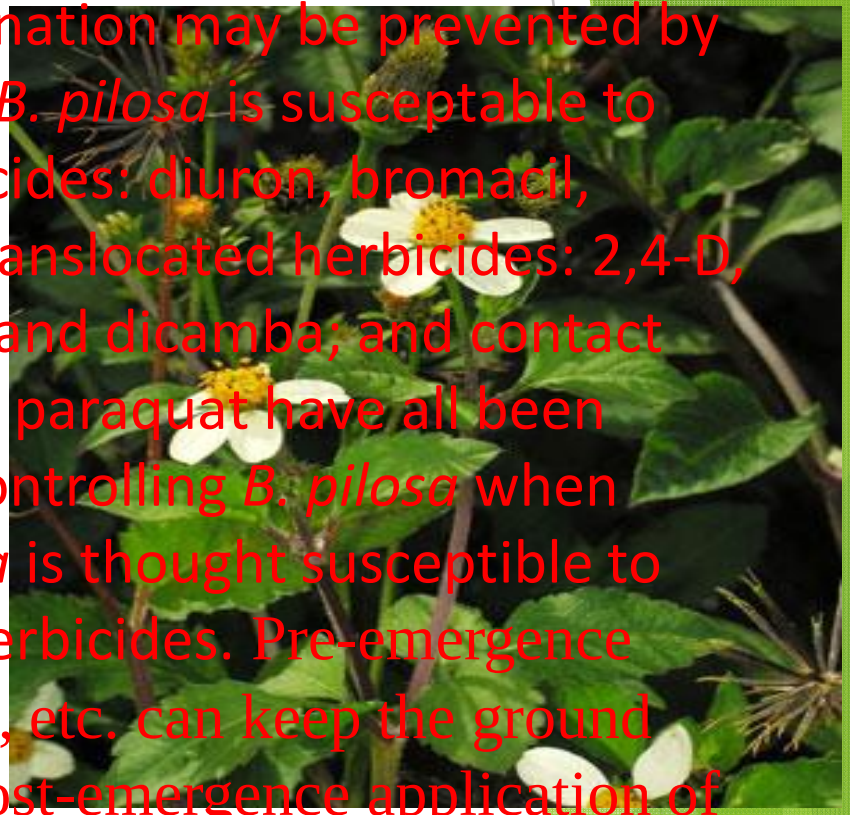
- Uproot plants after rains but before flowering
- Cut bushes at ground level in April-May and August-September
- Glyphosate 1.5 kg/ ha or 2,4-D(Na) or 2,4-D-EE 1.5 kg ha^{-1} on regenerated foliage in May-June or September-October
- Utilize the land as per its capability

Chromolaena adenophorum

Erigeron canadensis is a species which is particularly difficult to eradicate. Under mid hill conditions of Himachal Pradesh glyphosate (1.0 kg/ha and 0.5 kg/ha), 2, 4-D (Na) (1.50 kg/ha and 1.0 kg/ha) and 2, 4-D (EE) 1.0 kg/ha controlled this weed effectively. Gluphosinate ammonium when spray at 10-15 cm height of weeds has been found selective in peach orchards. Four litre Basta (gluphosinate), 5 litre Basagram (bentazone), 4 litre Blazer, 2 litre aciflurfen and 2 litre goal (oxyflourfen)/ha provide 100% control of *E. canadensis* within 4 weeks of treatment.

Erigeron canadensis

Bidens pilosa can be easily removed with hands before flowering but after seed setting it does not allow even to pass through the invaded areas. Germination may be prevented by mulches if they are thick enough. *B. pilosa* is susceptable to several herbicides. Residual herbicides: diuron, bromacil, atrazine, oryzalin, and ametryn; translocated herbicides: 2,4-D, glyphosate, amitrole, metribuzin, and dicamba; and contact herbicides bentazone, diquat, and paraquat have all been evaluated as effective means of controlling *B. pilosa* when applied at standard rates. *B. pilosa* is thought susceptible to the majority of broad-leaf plant herbicides. Pre-emergence application of atrazine, metribuzin, etc. can keep the ground weed free for the whole season. Post-emergence application of 2, 4-D at 2 to 4 leaf stage can effectively control this weed in grasslands without any effect on grasses.



For *Rumex obtusifolius*, 2, 4-D and atrazine are quite effective herbicides and their combination has been found more promising (Rana et al 2016).

Imperata

Imperata cylindrica can be managed by following hot weather cultivation in May – June by deep ploughing, spray of glyphsate 1.0 kg/ha or glyphosate 0.75 kg/ha + surfactant 0.5% in June or dalapon 4.5 kg/ha in February or paraquat 0.6 kg/ha or cheeling (scraping of existing weeds with spade) followed by spray of oxyfluorfen 0.25 kg/ha (Angiras et al 1990).

Alligator

Alligator weed grows in different situations, each requiring particular herbicide controls. In non-cropped lands, it can be controlled with glyphosate 1.50 kg/ha or 2,4-D 1.0 kg/ha or metsulfuron-methyl 4 g/ha.

Urtica dioca

2,4-D, MSM or glyphosate

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