

Invasive alien species



Trifolium

Alien species

- Non-native or exotic organisms that occur outside their natural adapted ranges and dispersal potential.
- Some alien species become invasive when introduced outside their natural habitats.
- Express the capability to establish, invade and outcompete native species.

- ❖ Alien Invasive Species as an alien species which becomes established in natural or semi natural ecosystem, an agent of change and threatens native biological diversity.
- ❖ Widely distributed in all kinds of ecosystems through out the world.
- ❖ Include all categories of living organisms.

- ❖ Threat to biodiversity.
- ❖ Species extinctions.
- ❖ Changes in hydrology.
- ❖ Ecosystem functions.
- ❖ Change in soil structure, its profile, decomposition, nutrient content of soil, moisture availability, etc.

Forest invasive species

The FIS are categorized as

- Floral (weeds and plants having national and regional distribution),
- Entomological (insects) and
- Pathogenic (fungi).

Urtica dioca



- **Approximately, 111 FIS have been identified.**
- **No systematic studies have been carried out so far to inventorize the FIS.**
- **Many invasive species have naturalized in India and being used for various purposes furniture, composting etc.**
- **Appropriate strategies need to be devised for their control, eradication and management.**

WEEDS

- **“A plant out of place”**
- **“A plant that grows so luxuriantly or plentifully that it chokes out all other plants that possess more valuable properties”**
- **“Spontaneous growth appearing without being sown or cultivated”.**
- **“Weed is simply a plant, which, in a particular place at a particular time, arouses human dislike and attempts are made at its eradication or control, locally because it competes with more desirable plants, sometimes because it serves as a host to their pests and diseases or is unpalatable or dangerous to domestic beasts”**

Weeds classified into three categories.

Category I:

- ❖ **Comprises of the species, which are thoroughly naturalized and appear to behave as wild plants.**
- ❖ **Members of *Asteraceae*, *Amaranthaceae***

Category II: -

- ❖ Includes the plants of cultivated origin that have become naturalized or run wild.
- ❖ Members of families such as *Solanaceae*, *Cucurbitaceae*, *Asteraceae*, *Apiaceae*, *Brassicaceae*, *Fabaceae*, *Lamiaceae*, *Convolvulaceae*, etc.

Category III: -

- ❖ Species falling under this category are exclusively cultivated, and also met with as escapes.
- ❖ Include members of *Acanthaceae*, *Caryophyllaceae*, *Malvaceae*, *Asteraceae*, *Poaceae*, *Amaryllidaceae*, etc.

Weeds can also be classified as

❖ ***Annuals :***

- ❖ Completes its life cycle from seed in $<$ one year.
- ❖ Abundance of seed and fast growth
- ❖ Annuals are very persistent.
- ❖ Cost more to control than perennial weeds.
- ❖ Most common field weeds are annuals.

❖ ***Biennials :***

- ❖ A biennial plant lives for $>$ one year but not over two years.
- ❖ Only a few troublesome weeds fall in this group.
- ❖ Wild carrot and wild parsnip are examples.

❖ ***Perennials :***

- ❖ Perennials live for more than two years and may live almost indefinitely.
- ❖ Creeping perennials are probably the most difficult group to control.
- ❖ *Lantana camara*

Impacts of FIS:

Lantana camara

- ❖ One of the most obnoxious weeds that has encroached most of the areas under community and reserve forestlands, especially the outer fragile Himalayas.
- ❖ Causes shade as well as allelopathy impacts on the regeneration of important forestry species.
- ❖ Yields of crops and pastures get reduced.
- ❖ Harvesting costs increase manifolds.
- ❖ Heavy expenditure is incurred for afforestation of lands infested with this weed which requires frequent weedings so as to avoid suppression of young seedlings of planted species.
- ❖ Afforestation cost is also increased due to loss of stand and slower growth rate due to weed competition.



Parthenium

- Difficult to control as it seeds prolifically.
- A menace to agriculture because it has allelopathic effect and competes with pastures and reduces their carrying capacity.
- Affects human and animal health by causing respiratory problems, severe dermatitis and tainted milk.

Parthenium in cultivated fields





***Parthenium
hysterophorus***



Eupatorium glandulosum

- Is found in the temperate regions.
- Spreads fast and checks the regeneration of other species particularly in Western Ghats and has replaced the valued flora at places.
- It comes in disturbed soils. In most of the goat-travelled paths, it comes up well; that is why it is locally known as '*goat weed*'.
- Since it has no local or commercial use, it has widely spread in denuded and forestlands.

Ulex europaeus

- Represents a fire hazard to private property in the Western Ghats.
- Invades watersheds, which supply a substantial amount of drinking water.
- Threatening agricultural and grazing lands.
- Forms impenetrable with spiny litter.



Ulex europaeus



Acacia mearnsii

- Introduced in Western Ghats particularly in the Nilgiris to provide fuelwood to the rural people to save the shola forests, which were degraded by human activities.
- Also planted in the tea gardens to provide shade
- But now it has covered most of the shola forests and has become a menace in the Nilgiri Hills.
- Regeneration of shola forests is affected due to profuse regeneration and invasive nature of this species.

Mikania micrantha

- A perennial fast growing weed
- A major menace to the natural forests, plantations and agricultural systems in North-east and South-west India.
- Spreads very fast in areas where canopy is open.

Euphorbia royleana

- In the Himalayan zones comes up profusely and has covered thousands of hectares of land. This plant represents a desert environment.
- Being cactus in habit, it has no use in conserving or making of soil.

Other Weeds

- *Artemisia vulgaris,*
- *Carrisa carandas*
- *Dodonea viscosa*
- *Cannabis sativa*
- *Ageratum conizoides,*
- *Cassia tora,*
- *Clerodendron viscosum* etc.

India report of FIS

Current methods /techniques for prevention /control of weeds

Mechanical:

- ❖ Involves hoes, cultivators, harrows, rotary weeders, discs, ploughs, mowers and manual uprooting.
- ❖ Weeds are physically lifted from the soil, cut off or buried.
- ❖ In most of the forestry operations the FIS such as *Lantana*, *Eupatorium*, *Mikania*, *Mimosa*, etc. are uprooted manually and either burnt or buried.
- ❖ In some places, these are being used for making compost.

Chemical:

- ❖ One of the methods employed for control of FIS.
- ❖ Use is not always desirable due to environmental degradation and pollution and effects on other useful species.
- ❖ Use of herbicides like 0.5% 2,4-D amine, 0.2% trichlorpyr plus 0.05% picloram, 0.05% imazapyr all in water at cut stumps help to control lantana.
- ❖ Spray of chemicals like 2,4-D 1.0- 1.5 kg per ha., Fomasafen 0.25 Kg per ha. And oxadiazon 0.25- 0.38 kg per ha. etc. checks parthenium.

Tillage:

- ❖ Helps in the burial of most small annual weeds.
- ❖ If all growing points are buried, most annual weeds will be killed.
- ❖ Also disturbs the rooting system of most of the perennial weeds.
- ❖ The root system is cut to enough depth so that the plant dies from desiccation before it can re-establish its roots.
- ❖ In moist soils or if it rains soon after tillage, the roots may quickly re-establish themselves.
- ❖ Tall annual weeds are mowed or scythed to reduce competition with crop plants and to prevent seed production.

Crop competition:

- ❖ **One of the cheapest and most useful methods farmers can use.**
- ❖ **Often it means using the best crop production methods so favorable to the crop that weeds are crowded out.**
- ❖ **Weeds compete with crop plants for light, soil moisture, nutrients and carbon dioxide.**
- ❖ **Early weed competition usually reduces crop yields far more than late season weedy growth.**
- ❖ **In planning a control programme, it is important to know the weed's life cycle. If it is possible to interrupt the cycle it becomes very effective control.**

Crop rotation:

- ❖ Certain weeds are more common in some crops than in others. Besides the annual weeds, for the parasitic weeds, such as *Striga* in sorghum and *Orobanche* in tobacco, the hosts are the crop species grown.
- ❖ Rotation of crops is an efficient way to reduce weed growth.
- ❖ A good rotation for weed control usually includes strong competitive crops grown in each part of the rotation.

Biological control:

- ❖ A 'natural enemy' of the plant is used which is harmless to desired plants.
- ❖ Insects or disease organisms are the usual natural enemies.
- ❖ Also parasitic plants, selective grazing by livestock and highly competitive replacement plants are other forms of biological control.
- ❖ Outstanding example of biological weed control is the one on Cactus (*Opuntia spp.*) with a moth borer *Cactoblastic cactorum* and or *Lantana camara* with several kinds of caterpillars and a fly, which damages the berries.
- ❖ Numerous biological agents tested against Parthenium weed, including a gall forming moth, leaf, weevil, beetles and a rust fungus.

Fire:

- ❖ In ditch banks, roadsides and other waste areas, undesirable weed species are burnt during summer.
- ❖ Burning must be repeated at frequent intervals if it to control most perennial weeds.
- ❖ Burning dried vegetation seldom kills the weed seeds; the practice has little value for this purpose.

Actions to prevent introduction of FIS

- ❖ Limit soil disturbances
- ❖ Immediate re-vegetation of disturbed sites
- ❖ Use certified "Weed Free" Seeds for re-vegetation of disturbed sites
- ❖ Clean equipment and materials
- ❖ Early detection and eradication
- ❖ Pre-activity invasive plant survey
- ❖ Limit seed introductions.
- ❖ Incorporate invasive plant management in planning phase
- ❖ Education and awareness

Positive impacts of introduced species on forests and forestry

- sources of products such as **timber, fibre and fuelwood, non-wood forest products**
- livelihoods & **employment**.
- Alien tree species planted in forest plantations and other areas help provide many vital **ecosystem services** such as:
 - combating desertification;
 - protecting soil and water;
 - rehabilitating lands exhausted from other land uses;
 - diversifying the rural landscape;
 - maintaining biodiversity;
 - enhancing carbon sequestration;
 - amenity and shade.

Thank you