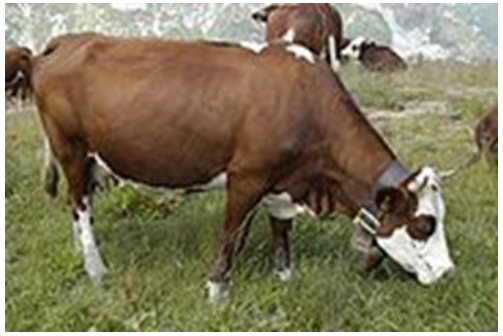
BIOLOGICAL CONTROL OF WEEDS

- **Biological weed management:** **refers to the use of biological agents i.e. pests, predators, pathogens and parasites to control weeds**



Major Components

1. Macrobial control

(i) Invertebrate animals

- Involves use of insects
- Has been successfully demonstrated with introduced weeds that dominate large tracts of uncultivated lands
- The introduced weeds have been fed upon by equally introduced insects with carefully determined narrow ranges of feeding habits.
- In most cases, such insects feed exclusively on that weed

Characteristics

1. The effect is permanent
2. Used where other methods fail to provide lasting control and in locations not easily accessible
3. Initial monetary investment is high but its cheaper in the long run than other methods
4. Does not pose any risk of polluting the environment

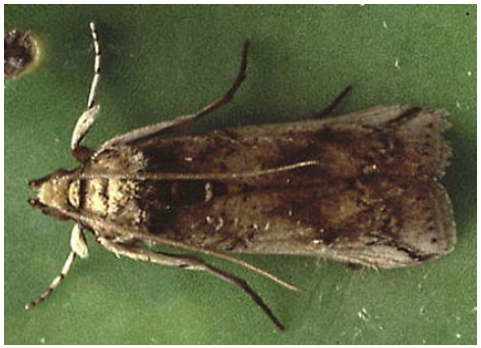
SUCCESS STORIES

India around 1863

- Use of the cochineal insect *Dactylopius ceylonicus* for the control of *Opuntia vulgaris.*

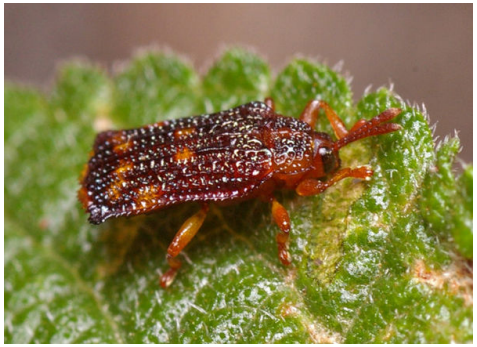
Australia, following the success in India.

- Combined *D. Ceylonicus* with the moth *Cactoblastis cactorum*.



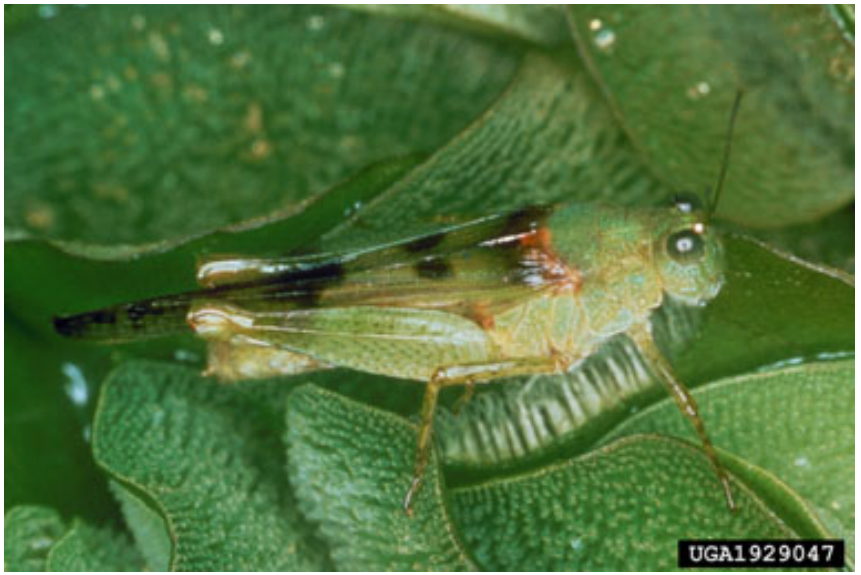
Hawaii

- Control of *Lantana camara* using several insects that include *Uroplata girardi* and *Salbia hoemorrhoidalis*



Zambia, Lake Kariba 1974

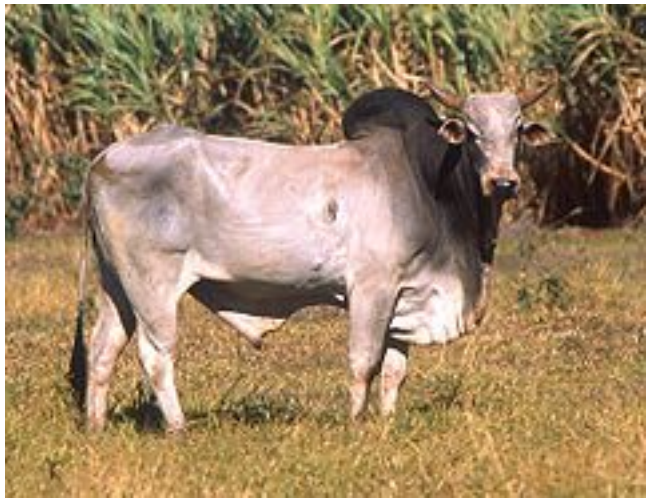
- *Salvinia molesta* using the grasshopper *Paulina acuminata*

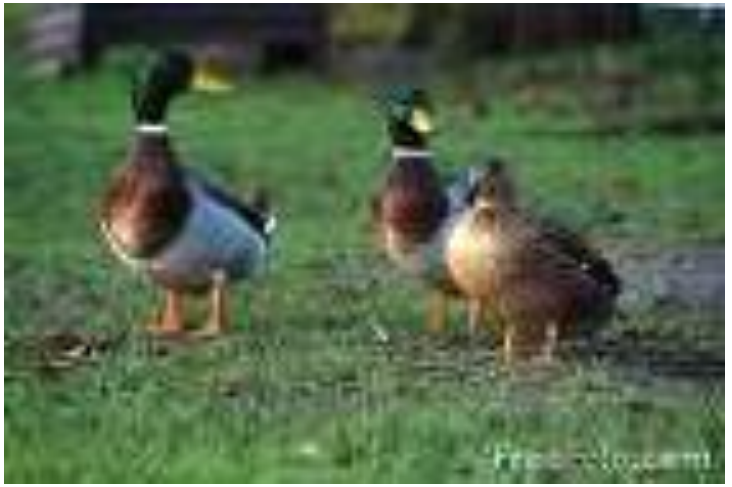


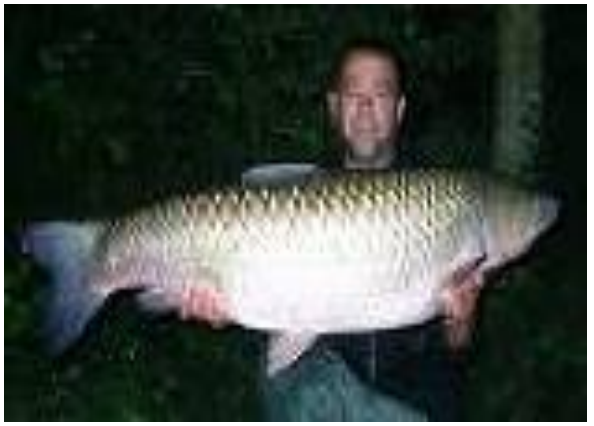
- **Was later used in Papua New Guinea following that success.**

(ii) Vertebrate animals

- Used for suppressing vegetation for centuries
- An indirect benefit of allowing animals to graze freely in fallow vegetation or pasture
- E.g. use of cattle, sheep and goats
- Sheep are more effective grazers than goats
- Other examples:
  - Ducks and fish successfully used to control aquatic weeds







Fish

- Use of grass carp (*Ctenopharyngodon idella* Val.) for aquatic weeds is common in the Netherlands and has also been successfully used in Egypt.

2. Microbial Control

- Involves use of microorganisms like fungi, bacteria, nematodes and viruses
- Two (2) approaches are mainly used;

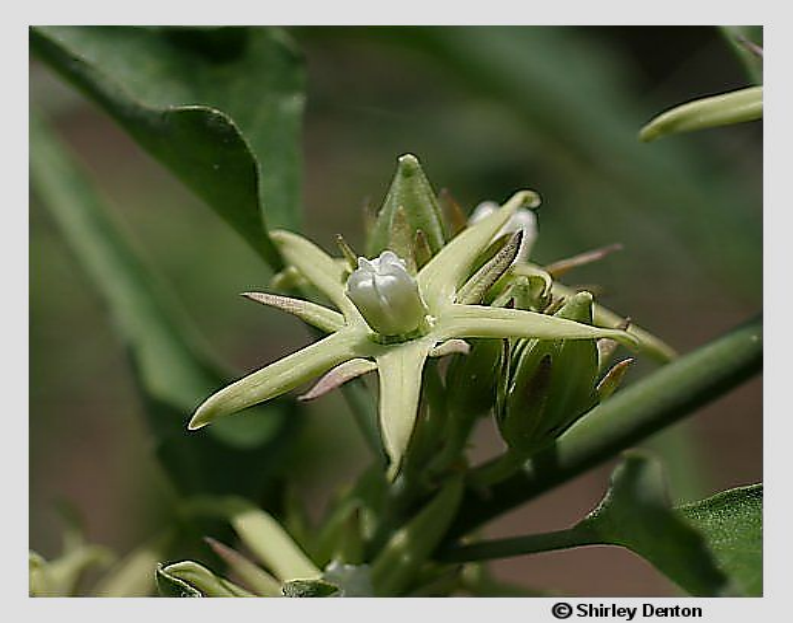
  (i) Inoculative approach: An organism is released, reproduces, and disperses on its own in habitats with the target weed
- **Success story – Australia**
  - **Control of rush skeleton weed *Chondrilla juncea* L. In wheat with chondrilla rust (*Puccinia chondrilla)***

(ii) Inundative

- In this approach, the weed is controlled in the area with an abundant supply of the microbial agent (usually a fungal pathogen) is applied
- **Organisms used for the inundative approach must be:**
  1. Easily cultured in the laboratory
  2. Produce high amounts of inoculum
  3. Be highly virulent yet specific
  4. Nontoxic to non-target plants and animals

- **Under inundative approach, the pathogens could also be mass produced and formulated into commercial products**
- **These products can then sprayed on target weeds as BIOHERBICIDES**
- **Progress has been reported in pastures, rangeland, citrus, soybean and rice fields, and in forestry in the western counties**

- **Control of strangler vine *(Morrenia odorata)* with a soil-borne fungi (*Phytophthora palmivora*) now marketed as the mycoherbicide DEVINE**



3. Live mulch

- A crop production system in which a crop is planted in the living cover of an established cover crop without destruction of the cover crop vegetation
- Practiced for decades in tree crop plantations
- Use in food crops very recent, Partly because of associated interference commonly observed between living covers and crops

- It prevents the establishment of those weeds that colonise fallow lands and produce seeds
- In cases where the live mulch starts to compete with the crop, slashing, mowing or chemical control becomes necessary
- Water supply must be sufficient for a good growth of crop/cover crops

4. Plant canopy

- Main effect is to shade the under storey plants and limit their ability to synthesize carbohydrates
- Hence makes the crop more competitive.
- Simply plays a complimentary role in reducing weed pressure
- Crop needs initial weed-free environment for proper establishment, therefore other methods will need to be used before crop canopy is fully developed

5. Allelopathic effects

- Utilization of allelochemicals for weed management in crops
- Use of allelopathic crops can definitely reduce cost of weed control since this technology will be **SEED BASED** and is hence more easily transferable to low input management systems prevailing amongst the small scale farmers

Induction of allelochemicals