High fecundity – reason for tick control failure

CHEMICAL CONTROL

- Chlorinated hydrocarbons
- Organophosphorous compounds
- Carbamates
- Pyrethrins
- Pyrethroids

Managing ticks- towards an eco friendly scenario?

- Integrated tick management over a specific time scale, using a variety of tick control technologies, will have the greatest effect on reducing tick abundance

- No one solution for the tick problem

Fluazuron

- This **chitin synthesis inhibitor** is efficacious against *Rhipicephalus (Boophilus)* ticks
- The pour-on formulation does not prevent the tick feeding but during a period of almost 12 weeks **reduces the fecundity and fertility** of engorged females to close to zero
- Causes significant mortality among immature ticks because they are unable to moult to the next instar.
- Because of its binding to fat, fluazuron is excreted in milk and it is thus unnecessary to treat calves suckling on treated cows
- Long withholding time: six weeks after treatment

Spynosins

Spinosad

- **Spinosad is a fermentation metabolite of an actinomycete and disrupts the binding of acetylcholine in postsynaptic nicotinic acetylcholine receptors**
- **It has persistent efficacy against larval reinfestations with *R. microplus* for two weeks after treatment**
- **Efficacy is greater against nymphal and larval ticks than against adults**

Why the search for unconventional control measures?

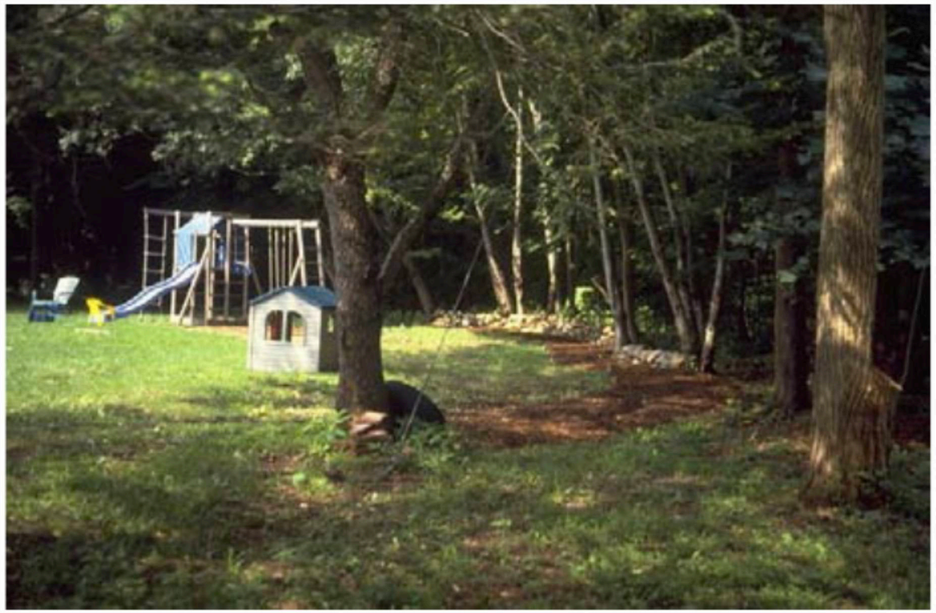
- Complete reliance on chemicals for control
- Environmental issues
- Residues in milk, meat
- Consumer concerns
- Regulatory restrictions

Integrated Pest Management

- Integrated pest management (IPM) basically involves the selection and use of several methods to reduce, rather than eliminate, a pest population with expected ecological, economic, and sociological costs and benefits.
- For ticks and mites, this may involve-
- The use of landscape practices to reduce ticks
- Management or treatment of host animals
- Targeted applications of least-toxic pesticides

Landscape intervention

Yard before landscape intervention



Yard after landscape intervention

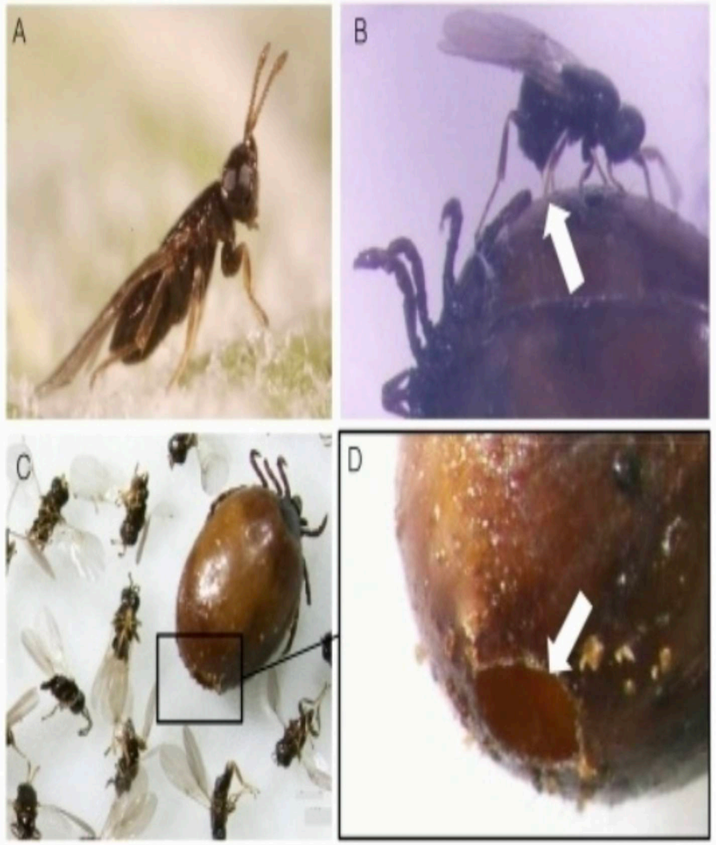
Altering the landscape to increase sunlight and lower humidity may render an area less hospitable to ticks.

PREDATORS

BIRDS	ANTS	MITES
cattle egrets (*Bubulcus* ibis) **oxpeckers** (*Buphagus* spp. in Africa) **cattle tyrants** (*Machetornis rixosa,* in America).	***Pheidole megacephala*** ***Solenopsis* spp** (fireants) ***Camponotus* spp** (carpenter ants). There are also studies that show that formic acid released by the ants has a repellent effect on ticks	***Anystis baccarum*** is a mite species that predates on other mites and is used as a biological control weapon in crop protection. It also predates on tick larvae.

Parasitoids of ticks

- All parasitoid species of ticks are small hymenopteran wasps of the genus Ixodiphagus, particularly Ixodiphagus hookeri.
- A Female habitus.
- B Female ovipositing in an engorged nymphs of Ixodes ricinus (ovipositor indicated by the arrow).
- C Adults of I. hookeri around the dead body of an engorged nymph of I. ricinus.
- D Emergence hole from which parasitoids exit the dead body of the engorged nymph.



PATHOGENS

BACTERIA	FUNGI	NEMATODE
• ***Bacillus thuringiensis*** **(Bt)** • produces **thuringiensin**, a toxin that destroys the gut cells of ticks that ingest it • If the arthropods or their larvae eat the spores or come otherwise in contact with them the bacteria will multiply in the organism and kill them within a few days	• When the spores of fungi come in contact with the ticks or insects they stick to their cuticle, where they germinate and produce ***hyphae,*** they proliferate in the body cavity irreversibly damaging the body organs and ultimately killing the host within a few days. • ***Beauveria***, • ***Metarhizium***, • ***Paecilomyces*** ÇÇ • ***Verticillium***	• **Entomopathogenic** nematodes • ***Steinermena*** • ***Heterorhabditis***. • These roundworms penetrate into the insect body where they release symbiotic bacteria that they carry inside. These bacteria multiply inside the insect, and kill it in a few days. The decaying tissues serve as nutrients for both worms and bacteria.

Phytotherapeutic agents used against ticks

- *Vitex negundo* (Nochi)
- *Acorus calamus* (Vasambu)
- *Azadirachta indica* (Neem)
- *Pongamia pinnata* (Pungu)
- *Allium sativum* (Garlic)
- *Ocimum sanctum* (Thulasi)
- *Stylosanthus* plants produce vicious fluid that poison and kills ticks

Revolution in Development of Vaccines Against ectoparasites

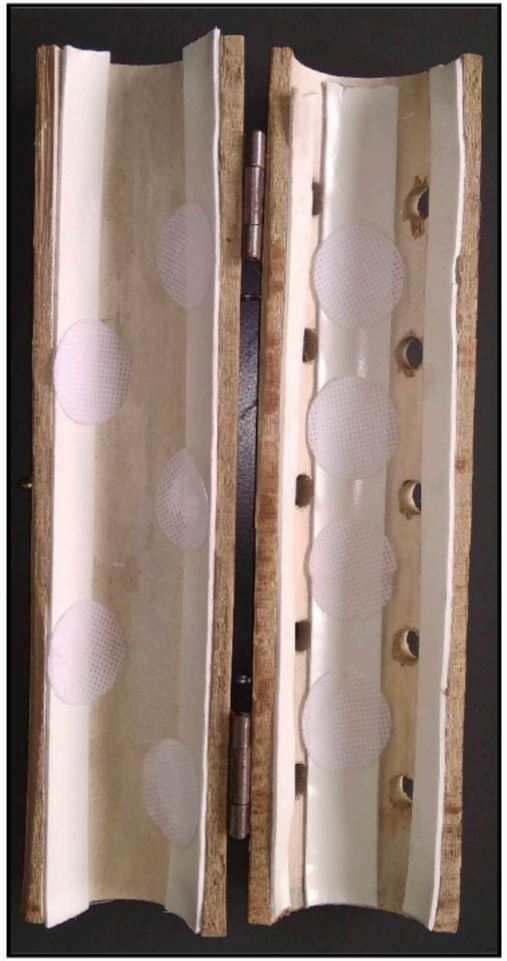
- Genetically engineered
- *E. coli* expressed
- Bm 86 vaccine
- TickGARD and an yeast expressed GAVAC
- Induces antibodies to bind to Bm86 molecule on intestinal cell causing them to lyse thereby interfering with blood feeding activity of ticks
- Impairs reproductive capacity

Use of sex pheromones for the control of cattle tick

BAMBOO STICKY TICK TRAP

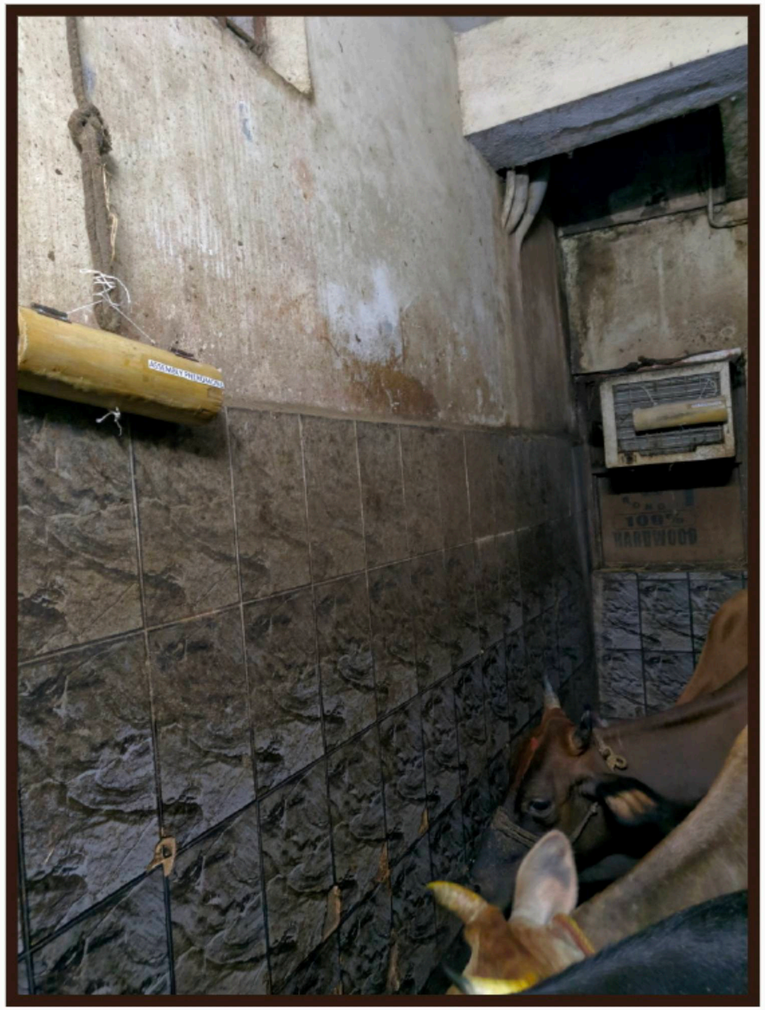
Bamboo trap

Bamaboo trap with vapour patches impregnated with pheromones



FIELD TRIALS USING THE BAMBOO TRAP AND COCONUT HULL TRAP

Cattle shed



Tackling flies and ticks in ruminants

Thank you