Section III
Biological & Cultural Control

NEEM: EFFECTIVE TOOL FOR PUSH-PULL STRATEGY OF PEST MANAGEMENT IN CONJUNCTION WITH TRAP CROP AND BIOCONTROL AGENTS

A. Regupathy[1], P.Duraimurugan[2], V.R. Saminathan and R. Ayyasamy[3]
Department of Agricultural Entomology,Tamil Nadu Agricultural University
Coimbatore-641 003,Tamil Nadu, India.

Present addresss-[1]Plant Protection Consultant

31, Revthy nagar, P.N.Pudur post, Coimbatore- 641 041, India

[2]Indian Institute of Pulses Research, Kanpur- 208 024, Uttar Pradesh, India

[3]Department of Entomology, Faculty of Agriculture, Annamalai University,

Annamali Nagar-608002, Tamil Nadu, India

Email : regupathya@yahoo.com, duraimuruganp@rediffmail.com,
ayyasamyr@yahoo.com

The neem tree (*Azadirachta indica* A.Juss) (Syn.*Melia azadirachta* L., *Melia indica* Brandilis) known for its legendary insect-repellent and medicinal properties. Azadirachtin together with other constituents of neem seeds such as salanin, nimbin, nimbidin, and meliantriol exhibit insect repellant, antifeedant and insect growth regulator properties. Though neem and biocontrol agents, *Bt* ,NPV *Trichogramma* spp and *Chrysopa* are very promising, they are not popular among the farmers as sole method of pest management due to several deficiencies viz. inactivation of HaNPV due to high pH values of dew on cotton foliage, specific activity and less cost benefit ratio of NPV and Bt formulations, NPV and Bt being stomach poisons necessitating thorough coverage and repeated applications, inability of *Trichogramma* to disperse in larger areas and slow action of neem when compared to synthetic insecticides .

The above difficulties could be overcome through a concept called push-pull strategy or stimulo-deterrent diversionary strategy (SDDS). Neem, as host-masking agents, repellents, phago- and oviposition deterrents is deployed to "push" colonizing insects away from the harvestable crop and also to attract predators or parasitoids into the area. At the same time, the pests are aggregated on a sacrificial /ecofeast/ trap crop so that a selective control agents, *eg.* biocontrol agents such as NPV, Bt, *Trichogramma* sp. can be used directly to reduce the pest population .

The concept of this strategy includes:

- The palatability of the trap crop is increased by application of neem confined to main crop leaving trap crop untreated. Repellent, feeding and oviposition deterrence of neem products had been used for diverting pests to trap crop by selective application.

- The efficacy of biocontrol is improved when the pest density is more. Diversification of pest by neem application results in congregation of pest in less area.
- The area of treatment with biocontrol is reduced. This will facilitate more frequent use of biocontrol agents on restricted crop (trap crop).

Push-pull strategy with conjunctive use of neem + trap crop/variety in cotton and rice and three components such as neem +trap crops (bhendi/redgram) + biocontrol agents (NPV / Bt / *T. chilonis*) in cotton was validated in field conditions.

Rice - Neem+ Trap variety : Application of neem on rice cultivar CO47 leaving susceptible TN1(S) as a trap variety enhanced the diversion of leaf folder, *Cnaphalocrocis medinalis* (Gueen) to TN1(S) for egg laying. The preference ratio increased from 1.18 - 1.43 in both untreated to 1.47 - 1.77 in both treated and 1.99 - 2.84 in TN1(S) untreated - CO 47 treated under in house conditions. The neem formulations, neem seed kernel extract (NSKE5%) and TNAU neem 0.03 EC were effective in repelling the leaf folder from treated CO47 to untreated TN1(S); the increase in preference ratio was from 1.48 - 1.55 at pre-count to 2.36 - 2.48, 3.98 - 4.17 and 3.81 - 3.92 after first, second and third applications respectively.

Cotton- Neem+ Trap crop okra : Use of okra as trap crop and neem dust formulations on cotton enhanced the diversion of cotton leafhopper, *Amrasca devastans* Distant(1 : 1.5 to 1: 3.4), cotton aphid *Aphis gossypii* Glover (1 : 1.4 to 1: 3.6), whitefly, *Bemisia tabaci* Gennadius (1 : 1.2 to 1: 1.9) and semiloopers, *Anomis flava* F. (1 : 0.7 to 1 : 1.9) towards bhendi. Cotton- Neem+ Trap crop okra /pigeon pea: The oviposition preference of moths and feeding preference of larvae of *Helicoverpa armigera* Hub. was towards trap crops bhendi and redgram compared to cotton. Application of NSKE on cotton leaving trap crops enhanced the diversion of *H. armigera* to trap crops. The preference of *A. devastans*, *A. gossypii* Glover, *Spodoptera litura* F., *Anomis flava* F. and *Earias vittella* F. was towards bhendi compared to cotton. The *B. tabaci* preferred cotton compared to bhendi. Application of NSKE on cotton increased the preference ratio in favour of untreated bhendi as a trap crop. Restricted application of NPV/Bt/tagging *Tichogramma* (egg cards) on trap crops (from 53 DAS to 81 DAS at weekly interval) significantly reduced the incidence and per cent damage to fruiting bodies, boll, locule and inter locule by *H. armigera* compared to cotton sole crop under untreated check. The recovery of NPV infected larvae on bhendi, redgram and cotton varied from 34.2 - 47.5, 32.8 - 39.2 and 14.2-20.2 per cent in the respective treated plots. The percent parasitisation of cotton bollworm *Helicoverpa armigera* Hub. eggs by *Trichogramma chilonis* Ishii varied from 10.4 to 12.0, 14.5 to 15.5 and 14.8 to 16.4 per cent on bhendi, redgram and cotton respectively. The recovery of Btk infected larvae on bhendi, redgram and cotton varied from 43.3 – 48.8, 40.0 – 48.3 and 32.7 -38.6 per cent in the respective treated plots. Application of NSKE on cotton diverted the population of Coccinellids species such as *Menochilus sexmaculatus* Fabr., *Coccinella transversalis* Fabricius and *Alesia discolor* Muls. and the spider species such as *Oxyopes* sp., *Argiope* sp., *Araneus* sp., *Neoscona* sp., *Plexippus* sp., of coccinellids and spiders to trap crops and increased the occurrence ratio towards trap crops.