



PUSH & PULL STRATEGY: Farmer's budget friendly approach

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Introduction

The 'push-pull' strategy an evolving tool for pest management to manipulate the distribution and abundance of insect pests. Basically it helps in repelling the pest away from the main crop(push)by using a stimuli that helps in masking the host. While some pests are attracted (pull)by the stimuli attractive than the main crop (smell, colour, nectre,etc) to some other areas it basically works as trap crops where they are concentrated, facilitates their control. Push pull strategy is one such method that focuses on behavioural manipulation of pest in favour of mankind.

The term 'push-pull' was first conceived as a strategy for insect pest management by Pyke, Rice, Sabine and Zaluki in Australia in1987. They investigated the use of repellants and attraction stimuli as their experiment, deployed in tandem, to manipulate the distribution of *Heliocoverpa* spp. in cotton to reduce reliance on insecticides, to which the moths were becoming resistant. The concept was later changed and refined by Miller and Cowles in the US in 1990, who termed the strategy 'stimulo deterrent diversion' while developing alternatives to insecticides for control of the onion fly, *Delia antiqua*.

For the development of a successful strategy a good knowledge and scientific study about the behavioral/chemical ecology, study about the pest body their interaction with host and natural enemies the specific combination of components differs in each strategy according to the pest to be controlled (its specificity, sensory abilities, and mobility) and the resource targeted for protection.

COMPONENTS-

- Push components: Push components are there to make protected resources difficult to find, or undesirable for the pest.
- Pull components: In pull components, attractive stimuli are used to divert pests from the protected resource to a trap or trap crop.

PRINCIPLES OF PUSH PULL STRATEGY-

Push-pull tactics are used to manipulate the behaviour of insect pests and their natural enemies by combining cues that work to make protected resources undesirable to pests (push) while drawing them towards an appealing source (pull). As a result, the tactics include a two-pronged system of direct insect migration and influence their distribution and abundance (push-pull). The principles of the push-pull strategy are to



maximize control efficacy, efficiency, sustainability, and output, while minimizing negative environmental effects. It involves the use of natural and/or artificial signals like pheromones, kairomones and planting of trap crops etc. Visual stimuli are rarely employed alone to lure pests to traps or trap crops, but they can help olfactory stimuli work better. The push-pull strategy undertakes a holistic approach in exploiting chemical ecology and agrobiodiversity.

ADVANTAGES OF PUSH PULL STRATEGY FOR FARMERS-

- This push-pull strategy does not use any chemical deterrents or toxins, but uses repellent plants to deter the pest from the main crop, as a result of which the harmful chemicals does not affect the farmers or does not cause and harm to them. The trap plants used in this push-pull strategy have the inherent ability of not allowing development of trapped stemborers, thus reducing the number of trapped insects, and as repellent and attractive stimuli plants are used results in low investment and higher return to farmers.
- It is basically a nontoxic strategy.
- As it does not require and chemicals or hormone which results in zero crop failure due to phytotoxic effect of chemicals.
- By planting those repellent plants, it also provides oxygen to the environment.
- Attracts both immature and adult stages of insects.
- Increased efficiency of population reducing components.
- Improved potential for use of anti-feedant and oviposition deterrents.

- It has increased efficiency of individual push and pull components.
- It's use is very simple and easily available commercially.
- By employing push-pull strategies, pest management becomes more environmentally friendly and sustainable. This reduces reliance on synthetic pesticides and promotion of natural alternative control methods to contribute overall pest control efficacy while minimizing harm to beneficial organisms and the environment.

DISADVANTAGES OF PUSH PULL STRATEGY-

Everything has its own advantages as well as some disadvantages which includes

- Less effective to compete with abundant surrounding odour sources for attraction.
- It is difficult to understand behavioural and chemical ecology of host pest
- It has a lengthy process of registration which is very difficult for some farmers to complete the process of registration which reduces the adaptability towards it.
- It requires monitoring and decision system which may not be satisfactory to all the farmers.
- More insecticides and low knowledge of biological control agent.

SOME CASE STUDIES OF PUSH PULL STRATEGY:

- The volatiles from molasses enhanced parasitism by *Cotesia sesamiae* (Cameron, 1906) whereas those from *desmodium* suppressed the African witchweed.



- The trap crops of Sudan grass also increased the efficiency of stem borer natural enemies, Gummy exudates of Napier produced upon feeding by the first and second instar larvae restricts larval development allowing only few to survive.
- It is now used to control the polyphagous lepidopteran pest *Helicoverpa armigera* (David F. Hardwick, 1965) and *Helicoverpa punctigera* (Wallengren, 1860) attacking cotton in Australia.
- It has been used for the management of the stem borer pests of cereals in Africa.
- Synthetic aggregation pheromone 4-methyl-3,5-heptanedione acted as pull and commercially available neem antifeedant formed the push component of the strategy.
- The best way to control pea leaf weevil (Linnaeus,1758) in beans neem leaves are used.
- The attack of pollen beetle in oilseed rape is managed by planting Turnip rape (*Brassica rapa*) along the periphery as a pull strategy but as a push strategy nonhost plant volatiles of lavender (*Lavandula angustifolia*) repels *M.aeneus* (Fabricus,1775) from the target crop.

CONCLUSION-

Push pull strategy is proved to be one of the best integrated pest management methods for the farmers of Africa for controlling stem borers on cereal crops, among several push-pull strategies in development or in application for insect pest control. It can be a helpful to increase the potential of small farmers livelihood as well as agricultural productivity and environmental

sustainability. Each technique has a different combination of components depending on the pests to be managed (specificity, sensory abilities, and movement) and the resource to be protected. It doesn't hinder neither the plants life nor have any toxic effect to humans. This was made keeping in eye about the utilisation of these technologies by the farmers which would result in the spontaneous technology transfer among farmers, resulting in a major impact on food security in the region through enhanced agricultural productivity. We should work on developing tools for quality control of the performance of new push and pull components, improving understanding of soil nutrient dynamics in long-term push-pull fields, and studying and solving emerging problems for the long-term sustainability of the push-pull system and its placement on a strong scientific foundation. As a result of which a happy farmer will produce a large and good variety of crops which will lead to sustainable agricultural practices.

REFERENCE-

Khan, Z.R., K. Ampong-Nyarko, P. Chiliswa, A. Hassanali, S. Kimani, W. Lwande, W.A. Overholt, J.A. Pickett, L.E. Smart, L.J. Wadhams, and C.M. Woodcock. 1997. Intercropping increases parasitism of pests. *Nature* (London) 388: 631-632.

Chatterjee, D., Kundu, A. 2022. Push Pull Strategy of Integrated Pest Management, Just agriculture multidisciplinary e-newspaper. Vol.2, 1.

Chamberlain, K., Z.R. Khan, J.A. Pickett, T. Toshova, and L.J. Wadhams. 2006. Diel periodicity in the production of green leaf volatiles by wild and cultivated host plants of stemborer moths, *Chilo partellus* and



Busseola fusca. *Journal of Chemical Ecology* 32: 565-577.

Aldrich JR, Bartelt RJ, Dickens JC, Knight AL, Light DM, Tumlinson JH. 2003. Insect chemical ecology research in the United States Department of Agriculture - Agricultural Research Service. *Pest Manag. Sci.* 59:777-8.

