

Suggested Future Pest Management Strategies for Cotton Revival in Pakistan

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If Agriculture is the backbone, then cotton is the white gold of Pakistan. Being an important cash crop, cotton contributes substantially to the national economy of Pakistan. Due to the historic decline reported in cotton production, all cotton stakeholders are at single point to bring its revival through farmer's trust. For this, after locust plague and COVID19, Prime Minister of Pakistan, announced Agriculture Emergency Program at the start of 2020. Punjab Agriculture Policy, two committees to investigate the reasons for cotton decline, webinars on cotton pink bollworm, breeding property rights approval, and subsidy on recommended seeds, insecticides and fertilizers are key initiatives by public and private sectors of Pakistan towards combined efforts to revive cotton in Pakistan. Cotton yield losses might occur due to several other factor, however, insect pests e.g., Pink bollworm, whitefly, armyworm and mealy bugs are the most abundant to pose threat for cotton production. National cotton breeding institute and intercropping research center are being established in Bahawalpur (Punjab province) with the help of Chinese Government under China Pakistan Economic Corridor (CPEC). Many other future strategies are enlisted here which can help out the farmers to grow cotton over wide area: (1) Precision agriculture- new pest management technologies to get as much production as possible while using less input and less labor use, (2) Biological control- mass rearing of natural enemies (e.g., green lacewing and Trichogramma species) to control major sucking and chewing insect pests in cotton fields by Punjab Agriculture Department. Eleven established biocontrol labs in different cotton growing districts of Punjab province which could bring a significant change in the future cotton revival plan. (3) Multiple Gene BT technology- more varieties with multiple gene technology to cope the resistance of bollworms must be developed with multiple gene technology. It could provide way forward to combat the resistance development in bollworms. (4) PB rope (Gossyplure)- availability of gossyplure, a sex attractant that disrupts mating when distributed throughout the field shall be ensured for sustainable PBW management, (5) Green Pest Control or Smart Plant Protection- Bio-control measures such as bio-pesticides, botanicals, etc., should be evaluated for crop protection in addition to yellow sticky traps and botanicals for sucking insect pests, e.g., whitefly control, (6) SIT (sterile insect technique)- it has been used to control major pest insects including the pink bollworm, fruit fly and mosquitoes, (7) Phenological stages- research should be conducted on the most susceptible phenological stages of cotton crop for different insect pests that cause damage and yield losses, (8) Pesticides sale- registered pesticides license shall be issued only to fresh agriculture graduates for better usage, (9) Application of pesticides- instead of being stick to the traditional methods of pesticides application, novel equipment and methods must be explored that guarantee accurate application to nontarget pests, infested parts of plants and ensure the safety of farmers (e.g., drones), (10) Cotton shredder use to reduce the chances of PBW survival in cotton fields and off season PBW management strategy at cotton ginning factories, (11) Shifting of business to villages (Union Councils) in order to support the famers by minimizing the traveling cost, etc., (12) To promote the universities- shall be the hub of research and commercialization of innovative ideas.

Overall, integrated pest management approach is the only way forward to revive cotton in Pakistan in addition above mentioned strategies. However, it will take time, but current initiative being taken by Government of Pakistan for the revival of cotton are yielding positive results to gain the farmers trust mainly responsible for the revival.

Probiotic-Health Claim

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Foodborne illness can be highlighted as one of the most substantial health alarms among the recent decades. Conferring to WHO, foodborne diseases are rising up at an alarming frequency, and are a major obstruction to socio-economic expansion of a country. Food based outbreak causes mortality of 2.2 million that contributes about 4% of all deaths each year worldwide. In the modern era where resistance has been attributed to almost every antibiotic drug, probiotic is a promising approach towards a hale and hearty gastrointestinal tract.

Elie Metchnikoff initially presented the concept of probiotic in 1908, when he observed the extensive life span of Bulgarian peasants, who used to consume fermented milk foods. He proposed that lactobacilli existing in these products might counteract the putrefactive effects of gastrointestinal metabolism. Yogurt and other fermented foods were considered as the first functional probiotic foods. Today probiotics are available in a diversity of food products as well as supplements. Most frequently used bacteria in these products include the *Lactobacillus* and *Bifidobacterium* species. These organisms are non-pathogenic and non-toxicogenic and retain viability in the course of storage. They survive the acidic environment of the stomach; furthermore, these bacteria also improve intestinal health. It is investigated that nutritional effects of food (e.g. yogurt, milk, cheese) has been enhanced in terms of folic acid, niacin, riboflavin, vitamin B12, and vitamin B6 levels when fermented with probiotic bacteria. Along with nutrient production, probiotics may increase the digestibility of certain dietary nutrients such as protein and fat. As far as therapeutic potential is related, probiotics have most vital and documented helpful impacts that include the prevention from various diseases including diarrhea, increasing the efficacy of antibacterial activity, reduction in the symptoms of constipation, balancing the bile and salts. A few probiotics are thought to have antioxidant action as entire cells or lysates. Probiotics have additionally displayed their intrinsic influences in reducing manifestations of allergy, cancer, AIDS, numerous infections of the respiratory system and urinary tract. There are diverse arbitrary reports on their beneficial influences on autism, fatigue, type 2 diabetes, aging, fatigue, obesity and osteoporosis. Probiotics employ their effect on hosts in numerous ways. These bacteria adhere to epithelium (inner lining) of the human GI tract. The adhesion ability is the most efficient function of probiotic strains since this way they compete for binding and receptor sites that pathogens occupy hence preventing the pathogen invasion. They may antagonize pathogens directly via production of antimicrobial and antibacterial substances such as cytokines, butyric acid, lactic acid and bacteriocin. Probiotics improve the immune system and stimulate immunomodulatory cells like cytokine, also produce lactase which aids in lactose digestion. According to European Food Safety Authority (EFSA) probiotics are not considered a nutrition claim but it is a health claim. The health claim of any probiotics are governed by an approval process involving technical review of safety, scientific substantiation of the health effect (based on animal and/or human studies), quality control, quantitative assessment and assessment of the product formulation. Generally consumed probiotic microorganisms are *Lactobacillus rhamnosus*, *Lactobacillus reuteri*, *Bifidobacteria* spp. and some strains of *Lactobacillus casei*, *Lactobacillus acidophilus*-groups, *Bacillus coagulans*, *Escherichia coli* strain Nissle 1917, few Enterococci, particularly *Enterococcus faecium* (SF68), and the yeast *Saccharomyces boulardii*. These specified probiotics are being used in a range of foodstuffs such as fermented milks either independently or in mixes. FAO and WHO have jointly presented advanced guidelines with a specific end goal to establish the systematic outlook for a successful probiotic assessment probiotics in nourishments to support the health cases and other advantages. These are identification of strain, functional interpretation of the strains and safety assets, establishment of the medical advantages in human examinations, appropriate labeling of the competence claims along with the shelf life of the substance. Probiotics should be administered vigilantly and cautiously, and only on the basis of resilient scientific confirmation. Such evidence should direct the cautious, deliberate addition of clinically verified probiotics to generally consumed food products to allow consumers to suitably benefit from these organisms.