ASSOCIATION FOR ADVANCEMENT IN PLANT PROTECTION

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Together we will protect our crops

Inside This Issue

From the Editor's Desk

Are there any Ecosafe, Sustainable Management Options ?

Given the concept that ecological perceptions are primary in resolving the complex, yet integrated functioning of the living system in this planet that includes plants and their parasites, the management of the later can best be achieved, not by their elimination as is being attempted today through pesticides or GMOs, but by learning to co-exist with them. The key question is how to make use of modern technologies like IT and biotechnology towards synergistic coexistence where the survival of all biotic components in an agroecosystem are balanced as in natural ecosystems and yet a desired yield is obtained.

IT provides the software to develop increasingly precise mathematical models for predicting weather, movement of vectors and parasites, ecology of pathogens and epidemiology of diseases, thus helping in forecasting more precisely when to apply what kind of management strategy. Currently available options generally do not provide viable options for coexistence.

Unfortunately, we are still dependent on developing biocidal or static chemical moieties that will kill or deter the parasites. Using the biotechnological tools, mass screening of such moieties using high through-put approaches like HTS, biochemical screens, in vivo cellular assays (TCAs), exploiting the reporter genes through differential output testing is enabling the Industry to introduce a large array of apparently lucrative pesticides into the market, required usually to be applied in very low dosage (thanks to nanotechnology). The other extensive use of biotechnological tools is also directed towards effects disruptive to the ecosystem approach proposed, i.e., producing pest resistant or pest-killing GMOs using genetic engineering tools. GMOs preferentially being produced are geared towards herbicide tolerance, metal-ion toxicity tolerance, introducing pest-killing characteristics in plants (endotoxins) etc.

Actually, our past plant protection practices have acted as a hub that permitted disease/pest intensification both horizontally and vertically. Additionally the pesticide treadmill kept on rolling leading to an unprecedented environmental chaos. The prime question is, do we have any ecological options where the same tools can be used for the benefit of the crops, the microbial milieu around them (and ultimately man, the key chaos generator) through gentle nudging of agroecosystems, instead of adopting aggressive tectomic (surgical removal) practices often used conveniently by surgeons as they mostly handle individuals and not populations. Realisation of this chaos led to the evolution of IPM and other ostensibly sustainable systems like low input sustainable agriculture (LISA), low external input sustainable agriculture (LEISA), and ecological systems agriculture (ESA), and holistic agriculture, I-3 programmes for farm management that included IPM, ISWM and IFM.

Biological basis of sustainable crop production will require build up and maintenance of soil organic matter, formation of water soluble soil aggregates, increased microbial transformation of nutrients in the rhizosphere, selection of locally adapted crops and microbial ecotypes, increased resistance of crops to pests and diseases and improved genotype matching with crops through use of native genetic resources and cautious application of biotechnology for introducing the desired traits into the environment. Thus, in marginal lands, fertility needs to be improved and maintained by rhizosphere management (PGPRs, siderophores). Genetic modification of plants that will (i) produce root exudates in microorganism-mediated plant nutrient uptake, (ii) support unfavourable microorganism communities (to root pests) around roots, (iii) mycorrhizal microbes in the restoration of degraded agricultural soils etc. needs to be explored and put in place. Unfortunately, instead of such fruitful use, biotechnological tools are being used largely for production of eco-disruptive plant types, being enriched with undesirable characteristics like herbicide tolerance (sulfonylurea, glyphosates etc), highly toxic metal ion tolerance or insect resistance through killer endotoxins (Bt-t coleopterans or Bt-k lepidopterans). The disadvantages of such practices being aggressively pursued by the corporate are (i) overuse of herbicide may lead to cross tolerance, (ii) insects are likely to develop resistance to GMOs (as

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Emergence of Contract Farming and its Likely Impact on Pest Scenario

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As the agribusiness becomes more competitive, the economics of produce procurement implores corporates to move towards contract farming, rather than getting hold of and managing plantations or large farms. Small holders may enter the contracts to reduce transaction costs of accessing new markets, borrowing, managing risk, acquiring information or increasing employment opportunities. Success of such farming depends both on contracting environment and management practices. The contracted environment include the strength of markets for contracted output, Government's macro policies, technical sophistication in production and attenuation of land ownership while important management elements are farm groups, selection of participants for contracts, managing contract default and conflict resolution. Direct benefits to small holders include easy access to market, availability of improved technology, better risk management and opportunities for employment of family members. Indirect benefits accrue from employment of women and increased commercial acumen. The contract farming has the potential to improve the welfare of small holders but this is not a necessary corollary. Marginal farmers with small holdings of less than 2 acres may be excluded through a selection bias and narrowing of markets outside contracts unless institutional barriers are placed in the form of antitrust legislation, policies to directly improve the contracting environment, policies to address the specific problems the small holders face in entering contracts and participation of NGOs in contract facilitation (Source : IDEAS, University of Connecticut).

In India, a combination of agricultural reforms and a billion dollar business opportunity have generated a huge buzz in contract farming. The amendment of the APMC Act in 14 states has turned the indian corporate to agriculture sector. According to sources in the agriculture ministry, the total area under contract farming is at present 7m acres (out of available 400m acres) of which corporate contracts amount to barely 0.2m acre. Companies like Field Fresh, Pepsi Co. India are pioneers in this type of farming and grow corn, basmati rice and potatoes. Others involved are HLL, Tata, DCM Shriram, McDonald's, Reliance, ITC to name a few. Joining the bandwagon are retail stores like Big Bazaar, Metro etc.

Fourteen states including Maharashtra, Andhra and Rajasthan have amended their APMC this year along the lines of model APMC Act which allows the farmers to directly sell their produce to buyers offering them the best price. West Bengal is on decision-making mode.

Another significant boost to contract farming is integration of food laws, presently tabled in the Parliament. This will repeal 9 laws and introduce uniformity in food laws.

The path for contract farming in India is not at all clear as yet. There is need for reform in credit delivery mechanisms. Cooperative Bank's lending system often ends up in huge losses in the form of bad loans due to improper risk management systems. There is no legal framework that prevents either party from reneging in certain contracts. Pepsi is acquiring chillies through intensive farming on farm size of 3-4 acres whereas the average land holding of farmers is only 0.5 acres.
(**Source:** IBEF, Economic Times, May 8, 2006).

The scenario that is not being looked into as it lies in the future is that large scale contract farming will bring about a significant shift in cropping systems leading to a possible shift in susceptibility to environment-microbial-predator-parasite milieu that may alter dramatically the disease-pest-pathogen scenario.

The plant protection mechanism in place may not be able to combat such paradigm shifts in pest scenario requiring long term researches in ecological and epidemiological understanding before proper management strategies could be devised and placed. In the interim period, the contracts may get repealed in search of greener pastures!

The editors solicit comments, opinions for or against the concept muted by the author. They will be published in the next issue.

(Editorial: Continued from page 1)

only single gene resistance have been conveniently manipulated (Diamond-back moth syndrome), (ii) GMOs may become pests by invading natural communities, (iv) cross compatible crops growing nearby may lead to development of more serious weeds, (v) impact on non-target microorganisms may affect recycling, (vi) horizontal transmission of undesirable traits through accidents, (vii) lack of our ability to track or regulate GMOs once they are released may lead to inconceivable genetic disasters.

On the other hand, some areas where biotechnology can provide sustainable traits include (i) altering root architecture for improved uptake efficiency, (ii) increasing and altering root exudates production to support beneficial microorganisms in the rhizosphere and (iii) desirable mutualistic associations between roots and microorganisms. Obviously, these are areas that will not be nurtured or promoted by the corporate sector and require focal thrust from the public sector agencies.

The aspect of biological control most meaningful towards sustainable agriculture and reducing pest induced reduction in yield is through exploitation of the phenomenon of tolerance where the crop coexists with the pests while giving near normal yield. To make tolerance ecologically and economically meaningful for plant protection (i) it should occur in many host-parasite relationships, (ii) the external and internal conditions under which it occurs must be known, (iii) it must be possible to increase the intensity and duration in order to bridge the critical phase for yield formation, (iv) an effective test system must be available with whose help such reaction can be recognised, and (v) it must be detectable so as to permit more precisely targeted application of pesticide. Understanding tolerance mechanisms, development of tolerance friendly pesticides, a shift in test parameters from destroying pests to reducing loss level and a shift in current yield-loss models to ones that take into account tolerance are imperative for introducing tolerance as a major sustainable strategy.

Nothing is achieved without inherent risks and managing pests through exploiting tolerance is no exception. It is a challenge. Are we ready to accept it?

Chitreshwar Sen
On behalf of the Editorial Board

Higher Education in Agriculture

I am drawn by the polemics about the losing standard of higher education in agriculture, plant pathology in particular, in the country [The Big Debate, AAPP Newsletter 1(2), April 2006; Views, AAPP Newsletter 1(1)]. Perhaps, what the two learned students of plant pathology have talked about can be explained by invoking the golden rule of plant resistance against pathogens. It is known that genes for resistance against pathogens are spread in plant populations vertically (VR) or horizontally (HR). VR is conferred by oligo-genes (few) and are distinct, discrete, direct and differential while HR by poly-genes (many) and are indiscrete, indistinct, indirect and non-differential. The syndrome that the learned fellows of plant pathology have talked about, by analogy, is a clear case of few vs. many; in other words, vertical vs. horizontal spread of education in the country. This may be the aetiology of the social malady that they have talked about. Or is that really a malady?

There was a time when we used to refer the oligo- and polygenes for resistance as major and minor genes. Later, we learnt that the epithets major and minor are perceptions more of the viewer than the plant. We learnt the hard way that effects of HR in plant populations are more durable than that of frank oligogenic VR (recall the history of breeding for resistance against late blight of potato). We learnt that the ecological fitness of a plant population against plant pests (biotic stresses) depends on the horizontal spread of polygenes conferring resistance, albeit indirectly. Perhaps, in case of the damaging plant diseases caused by pathogens such as 'the fungi behaving badly' [sensu A. Pain, Genome Watch, 3, Nov. 2005], a combination of oligo- and polygenic resistance - moderate vertical rise on a strong horizontal base, can provide us durable resistance. Durability is the basis of survival or 'sustainability' in present day parlance.

Since the 1970s we are seeing a steady developmental push forward in agricultural education (academic) colleges, universities, KVKs, project directorates, national centers, institutes, NAEPs, NARPs, NATPs, NAIPs etc in the country. This is more a horizontal push than a vertical thrust. Our efforts to rebuild our society, howsoever corrupt and inefficient it may be, shall not succeed without 'building local capacity-skills and knowledge' (a phrase on loan from development strategists). To build local skills and knowledge, in short time over a large space, in a poor and lowly developed country as ours (a case of badly behaving fungi?) horizontal spread of education rather than a steep vertical rise may be the answer, at least for the time being. That is what is happening in the country in agricultural education in a general way. The indiscrete, indistinct and non-differential human resource that the learned fellows have talked about is adding up to a slow build up of durability in societal development. That is making us fitter as a nation. Without having a strong horizontal human resource base our vertical rise, here and there, may collapse some day. Our history of 200-years of subjugation and the initial years of self-rule bears testimony that a few 1000-watts lamps, here and there, could not light up the few 1000-years of accumulated darkness.

Let the light of education spread horizontally to the darkest corners of the society. Do not quibble even if that is only of 20-watts intensity.

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A new syrphid predator of mango shoot gall psyllid

Mango shoot gall is a stubborn problem of mango in north India, Bangladesh, Nepal and parts of Pakistan. Till 1970, the only control measure against this was to prune the gall bearing branches. A chemical control schedule was worked out at Pantnagar later. However, there was no report on any effective bioagent against the psyllid, *Apsylla cistellata.*

Larvae of a syrphid species was found to feed voraciously on the psyllid nymphs inside the galls during Feb-March, 2006. Such galls were free from any nymphs. One hungry larva on an average consumed one nymph / min upto 10 nymphs, when offered to feed upon. After that the larva seems to be satiated and took rest. Nymphal period under laboratory was 10 days in March followed by pupal period of 7 days. Further work is on progress.

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New Biopesticides in the Offing

At NBRI, Lucknow, under the leadership of Dr. H.B. Singh, a team of Scientists have devoted themselves to biopesticide product development in the areas of bioinoculant application package for industrially important ornamental and food crops. Development of mass culture/production technology of fungal antagonists (*Trichoderma* & *Gliocladium* spp.) for their dissemination at large scale for management of soil-borne fungal diseases of various ornamental and industrial crops, quality control of biofungicides, popularization of biopesticides at rural level by organizing training- cum-field demonstrations.

Achievements:
The technology comprising synergistic composition of *T. harzianum* isolates useful as bioinoculant showing high temperature tolerance, having phytopathogenic fungi controlling activity, abiotic stress tolerance, ability to stimulate plant growth, and/or to induce systemic resistance in plants. The technology relates to rapid composting of bovine dung and other organic wastes using temperature tolerant strains.

The technology also relates to synergistic fermented plant growth promoting biocontrol composition having plant growth promotion activity and ability to control economically important phytopathogenic fungi-induced diseases like integrated disease management practices for corm rot and yellow disease of gladiolus, control of collar rot disease of betelvine using consortia of *T. harzianum* and *Ps. fluorescens*, Sclerotinia rot and blight of opium poppy caused by *Sclerotinia sclerotiorum* (a new disease in India) by using chemical and biological means and management of foot and leaf rot and anthracnose disease of betelvine

(**Source:** www.nbri_lko.org)

A new eriophid mite pest of garlic

The occurrence of a new Eriophid mite damaging experimental garlic crop at the University Crop Research Centre at Pantnagar is reported. Damage was upto 80%. The reason for such extreme damage this year was attributed to lack of winter rains from December to March, 2005-06.

Leaves get curled upward and several hundreds of mites were seen feeding on ventral surface adjoining midribs of leaves. Yellowing and drying of affected leaves was very clearly visible. The mite seemed to be another of the important pests of garlic crop in addition to the thrips.

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Resumption of rice blast in the plains of W. Bengal

Devastation of some rice cultivars by blast was observed in irrigated rice of South 24-Paraganas, West Bengal in March of 2006. Since the fungus, *Magnaporthe grisea* causes blast disease in rice, a scourge that destroys enough rice crops, our recent survey is witness to the ravage of entire rice fields of some marginal farmers in Kakdwip Namkhana areas. The moderate incidence was also noticed in some places of Midnapur and Burdwan districts. Once thought to be a threat only to South Bengal, rice blast now appears to have emerged as a growing concern throughout the rice producing states in India. We are currently investigating the nature of the pathogen including the variations in the genetic makeup and mating types and its response to new fungicidal molecules.

The hope is that some molecules could check the disease spread. The genetic makeup may determine the nature of the chemical moieties that will be best suited for effective disease control. Though the sexual reproduction and production of perithecia in nature is very rare, detection of natural production of perithecia in infected rice leaves of this area may serve as resource pool for further understanding of the host-pathogen interaction in blast disease development. *M. grisea* is the first fungal plant pathogen whose genome has been made public. It is expected that the genome will reveal the mechanisms of fungal pathogen-plant interaction in both aerial and root infection.

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(**Editorial note:** See *AAPP Newsletter*, Vol. 1, No.2)

Restructuring agri-education in India

I concur with the thoughts projected in this Newsletter that agricultural universities in India should confer degrees on (integrated) Plant Protection both at undergraduate and graduate levels and agricultural training should be designed keeping in mind the necessities both at regional and national levels. In addition, restructuring the system of agricultural education is a requirement where a bottom up approach from farmer's need at the ground-level to solutions formulated at the university should be a continuum.

In order to facilitate those processes, undergraduate degrees in plant sciences could be consolidated into functional but overlapping categories (i.e., B.Sc.(Ag) Hons in **Plant Protection** covering plant pathology, weed science, entomology and plant physiology etc., **Agronomy** mix matching crop physiology & management, soil sciences, hydrology, engineering, genetics and breeding etc., **Horticulture**, encompassing pomology, floriculture, vegetable production, physiology, genetics and breeding etc., **Agriinformatics** consisting of crop production, soil sciences, engineering and information systems, **Molecular Biology & Bioinformatics** integrating genetics, breeding, molecular biology, physiology, molecular data processing and Informatics etc., **Agricultural Extension** based on sociology, knowledge management, agro-economics and bits of every other areas mentioned above…the list being not exhaustive. However, degrees in narrow subject areas (i.e., plant pathology, entomology, nematology etc.) should be reserved for M.Sc. and Ph.D. levels only. In the U.S. major agricultural universities offer B.S. and M.S. degrees in Integrated Pest Management (IPM). Students not considering going for a research career in plant protection are encouraged to enroll in such programmes. Plant Protection Clinics and Extension services are part of most state and university plant protection departments and many such clinics are interlinked. For example, National Plant Diagnostic Network (www.npdn.org/DesktopDefault.aspx) is a set of interconnected regional networks created to link plant and animal disease diagnostic facilities across the country. There are also crop-specific advisories and networks. In the same token, I believe that state departments in India could link with agricultural universities to update employees with, among other things, on advancement in IPM and Agriinformatics. Such initiatives should be backed with incentives and reinforced with accountability and counterchecking in the best interest of India's agricultural development. Also, Agriinformatics could be taught as part of the agricultural engineering, agronomy, horticulture and extension curricula, both at undergraduate and graduate levels.

Agricultural universities should take leading roles in informatics research and development. On a positive note, I recently came across several agriculturally related informatics initiatives in India. The "Digital Dividend" from the World Resources Institute. (www.digitaldividend.org/pubs/pubs_01_overview.htm) has some useful links. There are also portals that are relevant to farmers globally. The ICRISAT Online Database contains 50,000 records on crops and resources of interest to farmers in semi-arid tropical areas. The Rice Knowledge Bank provides wide range of information to farmers from pest control to irrigation. From this site, farmers can access Rice Doctor to

Diagnose field problems and Trop Rice to make crop management decisions.

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People's participation in plant protection - an alternative approach

According to World Bank (1994) participation is a process through which stakeholder's influence and share control over development initiatives, decisions and resources which affect them. The conventional approaches of technology generation and technology transfer in agriculture has so far been 'supply driven', narrowly converged to the need of 'resource rich' and gone ruthlessly silent for marginal or fringe farmers. Robert Chambers in the last part of seventies branded this 'elite development approach' as rural development tourism. As an alternative, Participatory Plant Protection Approaches (PPPA) keep relentlessly deriving elements from indigenous technical knowledge and praxis. Use of biological agents in plant protection, social surveillance in crop protection and community mobilization therein altogether epitomize the application of people's knowledge and wisdom as well. It can be said that 'knowledges are socially created, maintained and transmitted' (Geady, 1978). Some of the PLA (participatory learning action) techniques and studies as suitable in modelling PPPA could be: ITK and ITW, Praxis, Agro-ecosystem analysis (Conway), Matrix Ranking and vector scoring, social fencing and social capital, CBPM (community-based planning and monitoring), LFA (logical framework analysis), BME (benefit monitoring and evaluation) and AHP (analytic hierarchy process). However, socializing any technology needs three basic processes: Accommodation, Assimilation and Aculturation. All these need a qualitative change and commitment in the philosophy and approaches of plant protection researches.

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Point-Counter-Point

Pesticides vs Biopesticides

Modern agriculture is facing challenges with high cost of production and more or less static or dwindling yield of major food crops over the last few years. In the competitive open economy and post GATT scenario, reduction of production cost is only possible through alternative approaches of managing most critical inputs like fertilizer, seed, pesticides and irrigation. From the consumer's points of view, supply of quality food produce and products and safer environment are the primary concerns. To meet these requirements, biopesticides will play a pivotal role for growing foods. Currently available pesticides molecules are very costly and their residual effect on environment cannot be assured with guarantee that they are all ecofriendly.

Use of biopesticides in modern production system has many advantages:

- Less costly and provide long-term protection of crops
- High level of specificity in action (?)
- Less harmful to man, environment and crop
- Suppress/check pest population rather than control
- Effective, often rapidly biodegradable and leaves no residue problem (?)
- Often, self perpetuating in nature.

Current use of biopesticides in Indian agriculture is very low because of various reasons :

'WHEN LIES BECOME FACTS'

Bhola Singh is dead.....A farmer from Balloh, Dt. Bhatinda, Punjab, committed suicide. Suicides in the green fields of Punjab are increasing almost alarmingly.

- **550 farmers in Vidarbha** committed suicide in last season and it is likely to increase the next year.
- Farmer's leader in Wardha, Vijay Jawandhia once remarked: "If I were given a choice, I would like to be born as a European cow, but certainly not as an Indian farmer, in my next birth." There, a cow gets a US $ 2 subsidy per day and enjoys all the comforts. "And here, in India, a farmer is a debtor all his life. Post his death, his son / family inherits his debts and has to borrow money for his funeral."
- Study links cancer to pesticides
  - Children's development undermined (Greenpeace, India)
  - Quality of semen deteriorates
  - Increased cervix cancer among women
  - Cotton belt most affected i.e., Andhra, Karnataka, Maharashtra, Punjab, Madhya Pradesh, Gujarat, Rajasthan.
- For last 3 years or so, suicide rate is increasing in the cotton belts of India particularly among those who took to Bt cotton.

Did we hear about such suicides on our farming belts pre-1991? Farmers were poor but not in a 'debt trap'. The green fields are now transforming into killing fields in a region rich in cotton, paddy, soybean, fruits, etc. The malady is getting worse.
The rot runs deeper than just drought or extensive use of pesticides although half the pesticide bill of India goes to cotton belt and over a quarter to fruit crops, ridiculing India's biosafety regime mandated by the Cartagena protocol... Such heavy use of pesticides poisoned water, fauna and people.

'It is ironic that the food producers are starving while the purchasers have stocks beyond their consumption limits', says Jawandhia. The answer to why such lemming-like suicide spurts spreading over the farming community of our country - is 'blowing in the wind' in our market driven economy. One has to remember, this is neither the beginning, nor the end of the malaise and unless our policies are set right, crisis of enormous proportions await both our farming community and our polity.

Source: AAPP, adapted from Jaideep Hardikar, India Together , June 3, 2006.

- Market potential still in nascent stage but slowly increasing
- Concept promotion is highly risky, increase is not assured and field performance as of now erratic
- Government attitude is plausible alternative in the ambit of evolution of IPM
- Farmers' point of view is still curious but biased towards pesticide mentality
- Public opinion - a great panacea!

Points of concern in use of biopesticides are .....
Biosafety markers are not clear as they have been used very sparingly for short duration only in small pockets. Thus,

- The four R's (resistance, resurgence, residues, replacement) may still occur with biopesticides if used unilaterally and over the decades
- May parasitize on natural enemies and beneficial insect [e.g.*Trichoderma,* aspergilli, penicilli, *Bacillus thuringiensis* on mulberry silkworm]
- Ecological balance may be disturbed by aggressiveness
- Health hazards :*Trichoderma,* aspergilli, penicilli, *Paecilomyces*
- Biomagnifications unforseen
- Unlikely to cause major macro changes in marine planktons, coral reef and climate.

Undoubtedly, **chemical pesticide** is one of the most critical agricultural input used by the farmers to protect their crops from ravages of pests, as well as, from agrochemical business point of view. If all pesticides are withdrawn from the world market at a time, the consequences could be chaotic.

However, it is not true that agricultural productivity is directly proportional to increased chemical pesticides usage. Keeping aside the agriculture sector, a huge amount of toxic chemicals from manufacturing and processing industries (leather, dyeing, medical wastes, pharmaceuticals, hygiene etc.) are being loaded daily to agricultural land as well as to aquatic environment. India as yet uses only reasonably low level of pesticide (288g/ha vis-à-vis 2.5kg/ha in USA, 3.0 kg in Europe and 12.0kg in Japan). A lion's share (55%) of chemical pesticide is consumed in non-food cotton crop in India and rest is allocated to food crops mainly vegetables, fruits, plantations, cereals, sugarcane and pulses.

The use of chemical pesticides has many advantages:

- Immediate response is magical, visible and curative
- Mostly broad spectrum of action
- Easily available to the growers and relatively long-shelf life of the finished product
- Relatively low usage rate(particularly for new Molecules).

Indiscriminate use of pesticides lead to the 4R's, elimination of natural enemies and pests, upsetting the ecological balance, environmental degradation/pollution, health hazards like COPD, cancer, genetic disorder, entering into the food chain leading to bioaccumulation, damage to coral reefs and its consequent impact on the macroclimate and long term impact of declining productivity.

It is true that national average use of pesticide in the country is still relatively low (288g/ha) and consumption is showing declining trend during 1995 to 2000. This does not imply that we are still below a tolerable level of pesticide use. Certain states like Punjab, Haryana, Delhi and Pondicherry use pesticides at high rates (800 g/ha) and if we look at the district or taluk level, the usage rate may be abysmally high in some. Physical data indicate that there is a definite trend of decline in consumption of total pesticides which is primarily due to the replacement of older chemicals with newer novel molecules, innovatively formulated, that have a very low dosage requirement (even 6g a.i./ha) and partially due to wide campaign of Government agencies for implementation of IPM.

Some facts on chemical pesticides .....

- Market potential is high and a king in the market of plant protection
- Concept promotion is at low risk as it is already familiar
- Government attitude is favourable
- Farmers' point of view - a known devil is more acceptable
- Public opinion is unfavourable

Lesson : We can not do away with chemical pesticides in spite of the hue and cry created by the activists. What can be done is to make a conscious effort at reducing pesticide use, striving for more eco-safe, biodegradable pesticides while increasing the natural, recyclable biologicals through more fine-tuned IPM, IPP or GPP. It is better to be practical than to regret later.

Source: AAPP, BCKV, Mohanpur, e-mail:aapp_bckv@yahoo.co.in

J. Tarafdar, BCKV, Mohanpur informs:

Department of Biotechnology, Govt. of India-sponsored Multi-Institutional Project on "Generation of virus-resistant rice for India: Diversifying transgenic resistance to popular varieties of rice" has been started at BCKV in collaboration with Department of Plant Molecular Biology, Delhi University (South Campus), Department of Plant Pathology, Bidhan Chandra Krishi Viswavidyalaya, Kalyani and Centre for Plant Breeding & Genetics, Tamil Nadu Agricultural University, Coimbatore.

Phytophthora parasitica a serious menace to betelvine cultivation

Of the various pathogenic attack on betelvine (*Piper betle*) like wilt, foot rot and leaf rot by *Phytophthora parasitica*, leaf spot and stem anthracnose by *Colletotrichum capsici* and bacterial leaf spot and stem rot caused by *Xanthomonas campestris* pv. *betlicola*, the former perhaps ranks first in its destructiveness under both field and storage conditions in West Bengal. The extent of losses may vary from 30-100% in case of foot rot and 20-40% in case of leaf rots, leading often to almost total crop failure. The disease generally appears at the onset of monsoon and continues through the rainy months. It wanes during winter months and reappears again during hot summer months when sudden rainfall occurs. In foot rot affected vines, leaves and shoots turn yellow, wither and finally dry out to a pale brown colour. In the diseased plants fine young roots are infected first. Gradually the rotting spreads through older roots and ultimately reaches to the foot or collar region of the plant. In a diseased plant, the whole underground portion gets more or less completely rotten. The soft tissues of old roots and the internodal portion of the cuttings are completely decomposed by the pathogen, leaving only the fibrous portion. The pathogen also causes leaf rot whose initial symptoms appear in the form of water soaked spots, enlarging rapidly in size, on mature leaves near the soil. The spots are of two types, one type is circular, necrotic, deep brown in colour with distinct grey-brown zonation and the other of expanding, circular, dark-brown necrotic spot without any zonation. The central rotten portion of the spot drops out, leaving a gaping hole with irregular edges. In both these types, the symptoms develop on any part of the leaves, including tips and margins. The two types of spots are an expression of fluctuating and continuous high humidity, respectively.

A package of practices has been developed that protects the crop largely from this and some other fungal diseases :

1. Clean cultivation with proper drainage facility.
2. Collection of planting material from disease-free plantation for planting.
3. Cutting treatment with 0.5% Bordeaux mixture(BM) + 0.25% Streptomycin sulphate/Streptocycline for 25-30 min before planting.
4. Drenching of soil with 1% BM before planting of cuttings
5. Application of 1% BM as soil drenching four times at interval of 30 days and spraying of 0.5% BM 7-8 times at interval of 15 days starting at the onset of monsoon .
6. Integrated disease management with sanitation+one application of 1% BM at pre-monsoon + after one month, biocontrol agent (*Trichoderma* @ 10^7 cfu) + one application of 1% BM 2 months after its first application reduced the diseases considerably and increased yield.

(**Source: B. Dasgupta**, Head, Deptt. of Plant Pathology BCKV, e-mail : b_dasgupta25@yahoo.co.in

Leaf spots of groundnut and their management

Groundnut is second major oilseed crop after mustard and grown through out the year in West Bengal. Early leaf spot (*Cercospora arachidicola*) and late leaf spot (*Phacoisariopsis personata*) cause serious damage and yield declined 5.50-6.08 g/4m^2 for every 1% unit increase in disease severity. Both the leaf spots appear together but the symptoms are different. In early leaf spot reddish brown to black circular to irregular spots 1-10 mm in diameter appear on lower leaves of the plant whereas in late leaf spots smaller, circular, 16 mm in diameter, carbon black spots appear on the lower surface of the leaves. Diseases generally appear 35 wk after sowing. Important source of primary inoculum is infected crop residues and volunteer groundnut plants around the field.

Conidia produced on infected plants and are disseminated by wind/rain splash, causing secondary infection. Conidia are mostly produced in the early hour in the morning and disseminated through out the day. Disease severity increased during the period of abundant rainfall and the maximum-minimum temperature ranges between 35°C to 22°C. Disease can be managed by avoiding monocropping, deep ploughing and correction of magnesium deficiencies. Application of NPK fertilizers at 15:35:15 kg ha^{-1} in combination with 6.56 t ha^{-1} FYM and 4 sprayings of mancozeb 2 g L^{-1} control the leaf spots and give maximum pod yield. Carbendazim @ 0.1% and mancozeb @ 0.25% or carbendazim + mancozeb (12 x 63%) (Saaf) @ 0.025% gave good protection.

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Biotechnological Approach to Insect Pest Management

Among the novel approaches for pest management, biotechnology provides potent and innovative tools for designing and development of insect resistant transgenic crops and ecofriendly products. To address this issue, a national symposium on '**Biotechnology and Insect-Pest Management**' was organized at Entomological Research Institute during Feb 2-3, 2006 at Chennai. Eminent agricultural scientists like Drs. M. S. Swaminathan, S. Jayaraj, P. Vidyasekaran, S. Ignacimuthu, N. Raychoudhury and K. Narayanan graced the occasion and had made critical observations on various aspects like utility of molecular biology in developing insect resistance, producing biopesticides and their applications. Some important information that emerged from the various deliberations included recent development of resistance in cotton bollworm to Bt-toxin gene and their possible management through designing or delaying/preventing breakdown of resistance, pyramiding genes, gene rotation, using different gene promoters and manipulation of gene expression. Considering biosafety aspects, proteinase gene inhibitors (PR-6) can be exploited to develop resistant plants. Survival of bruchid, *Callosobruchus maculatus* can be reduced through incorporation of alpha-amylase inhibitor gene from *Phaseolus vulgaris* into chickpea. Biotechnological approach could be effectively utilized for insect viruses in

pest management and new generation of microbial biopesticides with speedy mode of action can be developed by transfer of neurotoxin genes from spider, scorpion etc. through recombinant r-DNA technology. In addition to the discussion on different aspects of mass production technologies of biopesticides, their compatibilities with IPM, safety to non-target organisms, the achievement of Bt-gene cloning and transfer into a bacterium, *Pseudomonas* and its expression with larger survival capabilities on leaf surfaces and in soil was reported. Several key successes on DNA marker assisted selection of genes to improve insect resistance in cereals, chitinase as a novel tool for selection of effective entomopathogenic fungal pathogens like *Beauveria*, *Metarrhizium* against leaf folders and BPH, glycerol-based formulation of SlNPV, comparative virulence of UV-selected HaNPV were presented. Certain non-volatile oil formulations with synergistic effects in controlling *Spodoptera litura*, adverse effect of botanicals on the growth of *Bacillus thuringiensis* var. *kurstaki* and morphogenetic effects of neem formulations on red palm weevil were also reported. The symposium concluded with the greater emphasis for avoiding monocropping of transgenics, management of resistance, biosafety, evolving IPM for Bt crops, effects of Bt crops on natural enemy diversity, interaction with biocontrol agents, ETL and economic analysis for cost effectiveness.

(**Source: AAPP**, adapted from *Curr. Sci.* 90(7), 10th April, 2006)

On 19 April 2006 The Hindu reported: Agriculture experts in India are calling on farmers to speak out against multinational companies who are pushing genetically modified seeds to the extent that Indian farmers cannot sell their own traditional seed brands. Global Good News service views this news as the failure of modern environment systems. Such 'flops' highlight the need for more intelligent, evolutionary, Natural Law based, life-supporting systems.

During a seminar called 'Seeds and Genetic Engineering', the experts asked farmers to resort to 'seed Satyagraha' (non-violent resistance) to do away with the intervention of the multinationals in the Indian agricultural sector. The seminar was organized by Amrita Bhoomi, an international centre for sustainable development. Speaking on the occasion Subhash Palekar, termed the acts and intentions of the multinationals 'a threat to Indian culture and agriculture'. He urged farmers to stay with the traditional methods of farming in order to meet this challenge.

Other experts at the seminar encouraged the propagation of organic farming to stave off health hazards associated with chemical agriculture. According to the article, the experts said that as a result of chemical farming 'there was a