USA in academic quality and the eminence of its President and Prime Minister. We need to only slightly change our mindset and reorganize what we have to start our journey to be at par with US universities. It is a pity that our Education Ministry and academic leaders have not been able to rid our schools and colleges of the CET/PMT tuition mania, which is nothing short of a social and academic scourge leading to massive social exploitation of students and parents, putting undue emphasis on all chasing an engineering or a medical college admission at any cost, including buying leaked question papers at whopping prices! A simpler option to restore the credibility or accept the system of CBSE/ICSE as such, does not seem to occur to anyone. Modernization of our exams can rid us of our UMC (Unfair Means Case) forever. It is not just a student who copies but an obsolete examination system which allows it. Make science examination more scientific. Above all, why not make science learning lucrative? Which technology can grow without science and where can science be taught without practicals but through mere tuitions? Indian science is being killed in intermediate schools and colleges by this rat race for technology at the cost of science. Seeds of science indeed can be sown only in the young minds through a balanced and psychologically wise solution to our highly polarized or distorted science teaching as well as learning.

Most of the elite universities in India have the same type of assets or liabilities of resources, and manpower as well as solutions are indeed common. A slight change of mindsets and management strategies can improve our educational institutions. A study/sabbatical leave and academic stay outside our own, in India or abroad, does a lot to kindle newer ideas and fresh perspectives. Such journeys can do a lot to homogenize the educational intellect and open up new vistas of a trendy education system capable of becoming an industry in itself. We need to focus much more on our alumni across the world that are ever willing to give ideas as well as support. The alumni page on the website of a university can kindle the minds of our young students as well as faculty. We are indeed rich in such unharnessed assets to augment our academic system. Indian science can have a much brighter future with small grassroots modifications, which are indeed the need of the hour across the country.

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Bioherbicides: An eco-friendly approach to weed management

In irrigated agriculture, weed control through chemical herbicides, creates spray drift hazards and adversely affects the environment. Besides, pesticide residues (herbicides) in food commodities, directly or indirectly affect human health. These lead to the search for an alternate method of weed management, which is eco-friendly. In this regard the biological approach (a deliberate use of natural enemies to suppress the growth or reduce the population of the weed species) is gaining momentum. This approach involves two strategies: the classical or inoculative strategy, and the inundative or bioherbicide strategy. In the inoculative approach, an exotic biocontrol agent is introduced in an infested area. This method is slow and is dependent on favourable ecological conditions, which limits its success in intensive agriculture. Whereas in the inundative approach, bioherbicides are employed to control indigenous weed species with native pathogen, applying them in massive doses in the area infested with target weed flora. Bioherbicides offer many advantages. They include a high degree of specificity of target weed; no effect on non-target and beneficial plants or man; absence of weed resistance development, and absence of residue build-up in the environment.

Commercial bioherbicides first appeared in the market in USA in early 1980s with the release of the products Devine[1], Collego[2] and Biomal[3]. Success stories of these products and the expectation of obtaining perfect analogues of chemical herbicides have opened a new vista for weed management.

Plant pathologists and weed scientists have identified over 100 microorganisms that are candidates for development as commercial bioherbicides. Some of these are described here.

Devine, developed by Abbott Laboratories, USA, the first mycoherbicide derived from fungi (*Phytophthora palmivora* Butl.), is a facultative parasite that produces lethal root and collar rot of its host plant *Morrenia odorata* (stangler wine) and persists in soil saprophytically for extended periods of residual control. It was the first product to be fully registered as a mycoherbicide. It infects and kills strangler wine (control 95 to 100%), a problematic weed in citrus plantation of Florida.

Commercially Collego, a formulation of endemic anthrocnose fungus *Collectotrichum gleosporiodes f. sp. Aeschynemone* (cga) was developed to control northern joint vetch (*Aeschynemone virginica*) in rice and soybean field. Dry powder formulation containing 15% spores (condia) of cga as an active ingredient was registered in 1982 under the trade name Collego, having a shelf-life of 18 months. It is the first commercially available mycoherbicide for use in annual weed in annual crops with more than 90% control efficiency.

The successful development of Collego led to the discovery of another *Collectotrichum*-based mycoherbicide, 'Biomal' by Philom Bios Inc., Canada. It contains spores of *C. gleosporiodes* (Penz.) Sacc. *f. sp. Malavae.* It is used to control *Malva pusilla* (round-leaved mallow) in Canada and USA. The most effective period of application is at an early stage, although it can be effective at any stage of weed growth. Further, the rust fungus *Puccinia canalicuta* (Schw) legrah is commercialized under the name Dr. Biosedge for control of *Cyprus esculantus* L. (yellow nut sedge).

Recently the potential of many microorganisms, especially fungus to control weeds in several crops has been reported. Some of them are listed here. *Alternaria cassiae* (Casst), *Cercospora rodmani* (ABG-5003), *Cercospora coccodes* (Velgo), *Collectotrichum orbicular*, *Fusarium aoniflirai*, *Deleterious rhizobacteria* (DRB), *Pseudomonas* spp., *Agrobectarium, Xanthomonas* spp., *Ervinia herbicola*, *Pseudomonas syringae pv. Tagetis (*Pst), *Xanthommonas campaestris pv. Poannua*, (Xcp), *S. hygroscoplus* (Bialaphos).

Besides many advantages of bioherbicides, certain factors have been reported to limit the development of bioherbicides into commercial products. These include biological constraints (host variability, host range resistance mechanisms and interaction with other microorganisms that affect efficacy), environment constraints (epidemiology of bioherbicides dependent on optimum environmental conditions), technical constraints (mass production and formulations development of reliable and efficacious bioherbicide), and commercial limitations (market size, patent protection, secrecy and regulations).

The bioherbicides approach is gaining momentum. New bioherbicides will find place in irrigated lands, wastelands as well as in mimic parasite weeds or resistant weed control. Research on synergy test of pathogens and pesticides for inclusion in IPM, developmental technology, fungal toxins, and application of biotechnology, especially genetic engineering is required. However, bioherbicides should not be viewed as a total replacement to chemicals, but rather as complementary in integrated weed management systems.

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Prospects of filariasis elimination programme in India

Lymphatic filariasis (LF), a mosquito-transmitted disease caused by parasitic worms *Wuchereria bancrofti*, *Brugia malayi* and *Brugia timori*, affects an estimated 120 million people throughout the tropics. In 1998, the World Health Organization had targeted the elimination of this disease and formulated a Global Programme on Elimination of Lymphatic Filariasis (GPELF). The basic features of this programme are Mass Drug Administration (MDA) with appropriate antifilarial drug and morbidity management. Under this programme, annually, on a particular day, the antifilarial drug diethyl carbamazine (DEC) is distributed to all inhabitants of filariasis endemic areas, excluding children below 2 years of age and pregnant women. Though this drug has limited effect on adult filarial worm, it clears microfilariae from the circulation of the affected hosts, thus preventing the mosquito from transmitting the infection. As the fecundity of the female filarial worm is expected to be about 5–6 years, continuation of MDA in these areas up to such period will certainly cut down the transmission of filarial infection to a low level. The effectiveness or success of LF elimination depends on the consumption of the drug by the affected population and intermediary evaluation of the programme.

In India, the filariasis prevalence data basically came from the State health delivery system, which are primarily morbidity data. The microfilariae data available are largely based on information received from the Filaria Control Units (FCU) and filaria clinics as well as limited sample surveys carried out over a number of years. The data, while confirming the widespread distribution of LF in India, have several limitations and cannot be used for estimating the disease burden, *mf* carrier rates or *mf* densities, which are required for planning and monitoring the impact of MDA. Though the morbidity data are indicative of filariasis situation in any area and indicate the gravity of the disease, it is more about past infection and is not an indicator of the present situation. In the absence of microfilariae and CFA data, it will be difficult to evaluate the success of the MDA, as there are no baseline data for comparison. In asymptomatic individuals filarial infection can be examined by detection of microfilariae (night blood smear examination or PCR) or by detecting Circulating Filarial Antigen (CFA). Though CFA detection (Og4C3 ELISA or ICT Card Test) is highly specific and sensitive, it indicates overall presence of filarial parasite. However, it does not differentiate between microfilaraemic and amicrofilaraemic antigen-positive individuals. The main aim of MDA is to remove microfilariae from blood and check transmission. In this context, the evaluation of LF elimination programme should continue with night-blood smear examination or by adopting PCR techniques (in night-blood sample).

While some states are able to achieve high compliance with MDA, others lag behind due to ineffective IEC and the inability to tap all the available resources. In order to attain a high level of IEC, the education system should be involved in all levels, i.e. from primary education to college level. This could be achieved by incorporating information about the disease in the study syllabus, conduction of camps, essay competitions, health 'melas', drawing competitions, etc. and to run these programmes continuously for the entire MDA period. Children should be given the responsibility to find out ways to teach their elders about filariasis. Each school should have a wall painting highlighting the importance of MDA and mosquitocidal activities depicting the life cycle of the filarial parasite. In the absence of vaccine, elimination of filariasis can only be possible once the programme becomes a mass movement.

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