Acid Rain — Potent Killer of China’s Forests

Air pollution and acid rain are on the rise in China due to the increasing number of modern industries and amount of energy consumption, threatening to cause irreversible damage to forests, especially in South and Southwest China. Researchers at the Chinese Academy of Sciences (CAS) and the Chinese Academy of Forestry (CAF) reported in their recently published thesis that China is the world’s third most polluted region after Europe and North America.

Studies on acid deposition, though initiated in Sichuan Province even before 1982, was not conducted on a regular basis until 1982 when the State Environmental Protection Administration launched a project at the national level to monitor acid deposition. The project revealed widespread acid deposition in the southern and southwestern areas of the country. It also indicated that 4.18% of the total forest area or 6.52% of timber area is damaged. Zhejiang province in Southern China suffered the worst damage with some 3,829 square kilometers or 9.58% of its forest area being affected by acid rain.

Acid rain causes damage to trees resulting in losses in the timber industry. The total volume of forest loss of seven provinces studied amounted to 7 – 20%, with acid deposition accounting for 24.5 – 37.91% of the losses. Zhejiang province alone is losing about 384,100 cubic meters of its forest every year equivalent to an annual economic loss of US$5.3 million and a somewhat more significant annual ecological loss of US$227.7 million. In a study at a larger scale, encompassing five more provinces, the researchers reported a US$5.3 billion loss from reduction in growing timber, and US$6.5 billion through crop reduction. Besides direct damages inflicted by acid rain, certain losses are difficult to quantify as they are expected to only be seen some time in the future. Some of these include the long-term weakening of the trees, and reduced resistance of trees to pests.

The main cause of acid rain is the coal-combustion-related emission of sulfur dioxide which had increased from 18 million tons to 23.5 million tons between 1993 and 1997. The extent of damage depends on the frequency and duration of leaf exposure to acid rain. During the initial stages of soil acidification, soil fertility is temporarily improved but as pH reduces further due to acid accumulation in the soil, ions of aluminium, iron and other harmful substances increase dramatically, which could ultimately lead to complete destruction of forests.

In Northern China, where soil alkalinity is higher than normal, acidification of the soil is a more gradual process, thus explaining the limited areas in this part of China that is badly damaged by acid rain. Besides this, low rate of precipitation and low humidity prevalent in this region help prevent acidification. However, evidence points to the progressive albeit slow acidification of the north. One researcher predicts that acid deposition will continue at least for another decade, by which time, most of North China will also witness serious acidification.

The CAF has been studying the possibility of saving forests affected by acidification. One such experiment conducted in a pine forest which was already highly acidic in Guangzhou of Guangdong Province, showed that the content of magnesium was only 52.8% of a similar forest not affected by acid rain. They tested the usage of nutrition management to increase the mineral content and saw a glimmer of hope in controlling the effects of soil acidification.

The project conducted by the researchers so far, though of great importance, is still very far from solving the problem of soil acidification. The studies, could at best be described as preliminary and much more extensive studies are needed for the whole process of acidification, their implications, and effects to be understood. Areas that need further studies include the relationship between pollution sources, pollutant transportation and acid rain formation, and, the direct and indirect effects of ozone and oxides of nitrogen. Certainly more financial support and research efforts are required to establish proper protocols for saving the damaged forests.
The Indian Cotton Industry
Recent Developments

Successful Field Trials of Integrated Pest Management Module

The field trials of an integrated pest management (IPM) module developed by the Indian Council of Agricultural Research (ICAR) for cotton cultivation in dryland regions was completed recently. The module which was tested in a village in Maharashtra proved to be a success as pesticide usage was reduced by 99 per cent and cotton yields almost doubled.

In this module, the seeds were first treated with the insecticide — imidachloprid in order to provide protection against sucking insects such as leaf-hoppers, white-flies, jassids and aphids. This was supplemented with the following ‘biological control’ methods.

• Maize and cowpea were planted around the cotton crop. These crops attract the lady-bird beetle, which is a natural predator of the sucking insects.

• Setaria plants were planted every 9th and 10th row of cotton. Several bird species which feed on the larval population of Helicoverpa moths (bollworm) were attracted by these plants.

• ‘Pheromone traps’ were set up. When the incidence of Helicoverpa moths were detected in the ‘pheromone traps’, Trichogramma were released, and the site was sprayed with home made neem seed extract. The population of Helicoverpa was monitored and maintained below a certain level rather than totally eradicating it. The reason behind this is that, when Helicoverpa is totally eradicated by spraying broad spectrum insecticides, they eventually return with even greater resistance. This will lead to more frequent pesticide spraying, and in an even larger dosage.

According to the director of ICAR’s National Centre for Integrated Pest Management, Dr. S N Puri, the IPM module is highly cost-effective. However, the only setback with the technology is the limited availability of such as biocontrol agents and bio-pesticides.

Concern Over Monsanto Cotton

The assistant director-general (plant protection) of ICAR, Dr. A K Raheja, has warned that in the absence of proper integrated pest management, bollworm resistant to Monsanto’s bollgard cotton, could evolve. Monsanto’s bollgard cotton has been considered as the ultimate answer to bollworm attacks because it is resistant to lepidopteran insects.

The bollgard cotton was developed by incorporating the Bacillus thurigiensis (Bt) into the cotton germplasm using advanced genetic engineering techniques. The Bt gene, which is present throughout the plant, produces a protein that cannot be digested by the digestive system of the pests. When the bollworm larvae feeds on the bollgard cotton, the Bt protein binds with specific receptors present only in the guts of lepidopteran insects. When this happens, the larvae stop feeding and eventually die. With the ‘in-built’ resistance to lepidopteran insects, the only pesticides which has to be sprayed are those targeted against sucking pests.

However, Dr. Raheja feels that the specific tolerance of bollgard cotton towards bollworms is a transitory phenomenon. He said that the time frame concerned is too short to gauge the effectiveness of any variety against pests and that reports on target insects beginning to develop resistance to bollgard cotton have already appeared in journals such as Nature and Science. He added that without an appropriate IPM back-up strategy, the bollgard cotton will not be able to succeed in India. Dr. Raheja also said that one way to prevent resistance build-up to the bollgard cotton is through planting ‘refuge crops’ (plants that do not contain the Bt gene) close to the bollgard cotton field. The non-resistant insects will then feed on the non-Bt refuge crop, which would cause them to remain susceptible to Bt. Even if a few of them develop resistance to Bt, their mating with the majority of susceptible insects will dilute any resistant genes in the overall genetic pool.

Tamil Nadu Government to Form State Cotton Development Committee

During a recent meeting on Cotton Development Programme (CDP), the Tamil Nadu state government decided to form a State Cotton Development Committee (SCDC). This committee will be looking into the implementation of a cotton development scheme which involves the preparation of a comprehensive program for the development of cotton. Under the program firms and corporations will be identified for cultivating cotton under commercial/contract farming basis. The cultivation of cotton will then be propagated with adequate support.
What is Alternative Medicine and How Popular is it?

What is Alternative Medicine?

When traditional medicine is introduced into Western culture, it becomes complementary and alternative. There are vast differences between alternative medicine (also termed complementary, integrative, or unconventional) and conventional medicine, especially in terms of the mode and nature of practice. Believers of science and evidence are naturally non-supporters of the use of alternative medicine. They argue that randomized clinical trials have not been conducted to test alternative therapies and thus such forms of treatment should not be held in high regard. An expert panel from the National Institutes of Health confirmed this by stating that current evidence is inadequate for development of practice guidelines for alternative therapies. However, there are also advocates of alternative medicine who argue that alternative therapies cannot be subject to the same scientific trials as conventional therapies, instead must depend on beliefs, testimonials, and opinions to justify continued use.

How Popular is Alternative Medicine?

Despite the controversies, the popularity of alternative medicine is on the rise. Where conventional medicine has failed, alternative therapies have been offered as a possible solution. Eisenburg et al.\textsuperscript{1} reported that the prevalence of use of at least 1 of 16 specific alternative therapies during the previous 12 months has increased significantly (from 33.8% in 1990 to 42.1% in 1997). The therapies on the increase the most include: herbal medicine, massage, acupuncture, megavitamins, self-help groups, folk remedies, energy healing, and homeopathy (a system that uses highly diluted remedies). Accompanying this explosion in the practice of alternative medicine is the increase in the number of insurance companies and managed care organizations offering programs and benefits for alternative medicine. Biomedical research organizations are investing more substantial amounts towards investigation of these practices. For example, the Office of Alternative Medicine at the National Institutes of Health has just become the National Center for Complementary and Alternative Medicine, with a budget of US$50 million. Two criteria for priority funding of research projects are in cases where previous studies have shown encouraging results for alternative therapies, especially for common conditions, and those for which conventional medicine has not been effective.

Presently, efforts are being made to integrate alternative practices into the mainstream. More than 50% of medical schools have begun to teach about alternative medicine practices. The main reasons for the increase in the proportion of the population seeking alternative therapies lie in the cost-effectiveness of alternative remedies and the waning popularity of conventional medicine. Health care costs are expected to double in the next ten years. It is predicted that most people will not be able to afford conventional medicine as a solution to their ailments as a result of the escalating medical costs. Many feel that conventional medicine is too harsh for the treatment of chronic and non-life threatening diseases. Severe treatments such as bloodletting, purging, and toxic metals by conventional medicine are frowned upon. Iatrogenic disease caused by conventional medicine is a major cause of death and hospitalization in the US. Conventional medicine, on the other hand, uses a “gentle” approach, by focusing on the patient’s inherent capacity for self-healing.

Although most studies on alternative therapies yielded mixed results, one cannot ignore the fact that there are a considerable number of cases where alternative medicine was found to be highly effective. Four cases cited in The Journal of American Medical Association where alternative medicine therapies were effective for the treatment of common clinical conditions. Cardini and Weixin\textsuperscript{2} found that moxibustion (stimulation of an acupuncture point by heat generated from burning a specific herb) is helpful for correction of breech presentation in late pregnancy. Bensoussan and colleagues\textsuperscript{3} found merit in Chinese herbal treatments for irritable-bowel syndrome, a gastrointestinal disorder that strikes 10% to 20% of the population in many industrialized countries and for which conventional medicine offers only symptomatic relief. Garfinkel and co-workers\textsuperscript{4} reported that a yoga-based intervention may help in the relief of some symptoms of carpal tunnel syndrome. Finally, a systematic review by Wilt et al.\textsuperscript{5} of all the studies conducted on saw palmetto (Serenoa
repens) found significant improvement in urine flow in men with enlarged prostates.

Throughout the years, many have announced the miraculous remedies derived from plants. More and more Americans are turning towards herbal healing and relying less on prescription medicines. In 1998, 7.5 million Americans have chosen to consume an extract made from a bright yellow flower called St. John’s wort (Hypericum perforatum) instead of Prozac or psychotherapy to relieve mild to moderate depression. Or, like 7.3 million Americans, choose to swallow a capsule made from echinacea (Echinacea purpurea), a purple-petaled daisy native to the Midwest, to help boost the immune system. Ginkgo biloba, made from the fan-shaped leaf of a tree found from China to South Carolina, is used by 10.8 million Americans for preservation of mental alertness.

However, the skeptics of alternative medicine will be quick to point out the areas where such approaches have failed. For example, Bove and Nilsson6 documented that chiropractic spinal manipulation is not effective for episodic tension headache. Shlay and co-investigators7 demonstrated that acupuncture is no more effective than amitriptyline or placebo for relieving pain due to human immunodeficiency virus-related peripheral neuropathy. Heymsfield and co-workers8 reported that Garcinia cambogia, a common component of commercial weight loss products, lacks efficacy as an anti-obesity agent. More recently, reports confirmed that many have suffered liver damage from sipping teas brewed from comfrey, an herb that is used in poultices and ointments to treat sprains and bruises and should never be taken internally. In May 1998, the US Food and Drug Administration verified industry reports that certain shipments of ginseng (Panax ginseng) were contaminated with high levels of a fungicide. Elaine Kang-Yum a pharmacist at the Hudson Valley Poison Control Center in Tarrytown, New York, who tracks herbal medicines, says some imported Chinese remedies have been doped with valium and other prescription drugs.

As seen above, alternative therapies yield very distinct results in different circumstances. However, one thing seems clear, in order for alternative treatments to be effective, they must be used correctly and in moderation. Consumers of alternative medication must be made aware of any side-effects of the potions or pills that contain various medicinal herbs, vitamins and minerals. Previously, people regard alternative practices as hoaxes concocted by quacks and Chinese physicians. Today, this unorthodox approach has come a long way in gaining worldwide acceptance and recognition.

References