

Preface

From the dawn of human civilization man is in close contact of nature and is still trying to find out solutions of their problems from natural sources. The plants have been considered as the most natural of all the other natural things and, therefore, attracted the attention of scientific community. There was a time not too long ago when most compounds came from plants. But beginning about 50 years ago, chemistry took over the charge from botany and started synthesizing the compounds. Infact, with increasing population, maintenance of our current standard of living and improvement in our quality of life forced the society to depend on the products of chemical industry. The 20th century has been highly successful in this regards. However, with advent of 21st century, a wave of environmental awareness and consciousness is developed regarding the side effects of used and generated hazardous chemical substances. An increasing concern is realized for using renewable natural resources in a manner which does not diminish their usefulness for sustainable development of future generations. Today, chemists, botanists, microbiologists, environmentalists, engineers and medicos have joined their hands for **greening the chemistry** and working for the search of remedies from natural resources.

The research all over the world on known and unknown plants has resulted in good amount of natural magic bullets. These researches have created interest and awareness among the people and they are changing their taste.

The picture of advertisements noticed these days demonstrates the unmistakable trends of popularity of natural green products.

Phytochemicals are classified as primary and secondary plant metabolites. Various primary metabolites like vegetative oils, fatty acids, carbohydrates, etc are often concentrated in seeds or vegetative storage organs and are generally required for the physiological development of the plant. The less abundant **secondary plant metabolites**, on the other hand, have apparently no function in plant metabolism and are often derived from primary metabolites as a result of the chemical adaptation to environmental stress. Thus, unlike compounds synthesized in the laboratory, secondary compounds from plants are virtually guaranteed to have biological activity. Plants are known to produce a wide range of secondary metabolites such as alkaloids, terpenoids, olyacetylenes flavanoids, quinones, phenyl propanoids, amino acids etc which have been proved to possess useful properties. Ten of thousands of secondary products of plants have been identified and there are estimates that hundreds of thousands of these compounds exist unexplored. These secondary metabolites represent a large reservoir of chemical structures with biological activity. With introduction of modern scientific methods of research, our knowledge in Plant Products has expanded vastly. Discoveries of physiological and pharmacological functions of medicinal plants, has initiated extensive research to utilize the properties of the plants in human needs and sufferings.



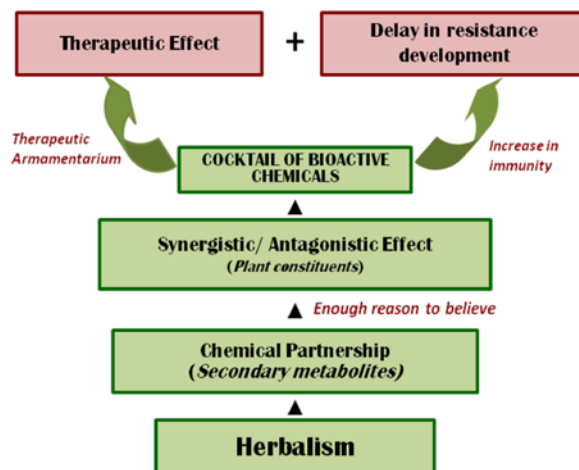
Presence of multiple active phytochemicals in plants offers exciting opportunity for the development of novel therapeutics, production of eco-friendly value added materials including agricultural, food products, enzymes, nutraceuticals, personal care products, herbal cosmetics, industrial products and sources of energy generations.

Our country has a long tradition of using plants derivatives for curing diseases. Rigveda and Atharveda describe various plant products used by our forefathers for various ailments. The varied climatic conditions have bestowed our country with a rich natural flora. Indian Material Medica shows that more than 90% of the drugs mentioned therein are of plant origin. A common Indian kitchen with onion, garlic, ginger, turmeric, tejpat, coriander, pepper, Ajowain, Jeera, tea, tulsi and neem leaves etc is actually a small herbal medical store.



Is it a fashion or mass hysteria which has gripped the world? Millions of people have started taking juice of roots; shoots, flowers and stem bark of the plants or incredibly dilute aqueous alcoholic solutions of Homeopathic drugs. **Herbalism** is in great demand and giving wake up call for conventional. Society is increasingly shopping for health, trying all the available options in magazines newspapers and on the Internet. Plants are the source of half the pharmaceutical in our modern medicine cabinet. Herbs could lead us away from synthetic bullets and towards a new generation of drugs. There are various health disorders from depression to multiple sclerosis for which no magic bullets are suitable.

Is crude extract more potent than isolated chemical? The issue is debatable and closely associated with the use of herbalism. Why to take a risk by swallowing something as unpredictable as plant material when modern science can isolate the active gradient and serve it to you straight. This approach has initiated intensive scientific research towards the isolation and characterization of bioactive principle of numerous plants for their respective pharmacological properties. While the Herbalists are of their views that as: mixtures are better than pure chemicals. Several biologically active compounds in a plant work together to produce greater effect than single chemical on its own. The mixture of chemicals found in herbs can be more potent than the single purified ingredient so beloved of drugs companies. **Chemical partnerships** explain why whole herbs can work better than single purified ingredients. In other words, the mixture has an effect greater than the sum of its parts. The synergism arises when two or more factors interact in such a way that outcome is not additive but multiplicative. The compound impact of the relationship can be so powerful that the result may be a whole order of magnitude greater than the simple sum of the components. The observation suggests that synergistic or antagonistic effect of various components of plant material in its crude natural state may enhance therapeutic effects and reduce side effects, which may not occur when one or more isolated chemical component are used alone in purified forms. Synthesizing the bioactive ingredients would inevitably reduce or eliminate that benefit. Anyway, herbal extract hopefully would delay resistance against diseases, while bioactive principles can become our therapeutic armamentarium.



In recent years, research attention revolves around the trends of bringing technology into harmony with natural environment and to achieve the goals of protection of ecosystem from the potentially deleterious effects of human activity. Research findings have clearly raised strong doubts about the use of conventional methods based on the use of synthetic coagulants for water purification. Several serious drawbacks viz. Alzheimer's disease, health problems carcinogenic effects of alum lime, aluminum sulphate, polyaluminum chloride, polyaluminosilico sulphate, iron hydroxide, iron chloride, soda ash, synthetic polymers and the reduction in pH of water resulting from such treatments have not been appreciated.

Phytoremediation involves processes that reduce overall treatment cost through the application of agricultural residues. This green process of remediation by plants lessen reliance on imported water treatment chemicals, negligible transportation requirements and offer genuine, localized and appropriate solutions to water quality problems. Regeneration of the plant biomass further increases the cost effectiveness of the process thus warranting its future success. Sorption using plant biomass thus has emerged as potential alternative to chemical techniques for the removal and recovery of metal ions. Structural modifications onto the biomaterials leading to the enhancement of binding capacity or selectivity are, therefore, in great demands. A special emphasis has been paid on chemical modifications resulting into tailored novel biomaterials improving its sorption efficiency and environmental stability making it liable for its commercial use as simple, fast, economical, ecofriendly green technologies for the removal of toxic metals from waste water particularly for rural and remote areas of the country.

Plants have also been explored for the generation of energy resources. The energy of sunlight has been harnessed through the process of photosynthesis not only to create the plant biomass on our planet today but also the fossil fuels. The overall efficiency of plant biomass formation, however, is low and cannot replace fossil fuels on a global scale and provide the huge amount of power needed to sustain the technological expectations of the world population now and in the future. However, the photosynthetic process is

the highly efficient chemical reaction of water splitting, leading to the production of hydrogen equivalents and molecular oxygen. This new information provides a new dimension for scientists to seriously consider constructing catalysts that mimic the natural system and thus stimulate new technologies to address the energy/CO₂ problem that humankind must solve. After all, there is no shortage of water for this cyclic non-polluting reaction and the energy content of sunlight falling on our planet well exceeds our needs.

India, with its rich floral wealth still needs intensive research on plants for their multidimensional uses. This resource is largely untapped for use. Several issues are to be resolved before such ideas can become a reality. No one expects these experiments to yield commercial benefits soon; there is growing awareness that basic studies implants biology may reap impressive and unusual harvest in the future and plants will be proved a dominant source of preventive and therapeutic safe drugs. Several plants' extracts have been characterized for various bioefficacies, but not many have reached to the level of **commercialization**. In fact, mainstream pharmaceutical industry is not really interested in herbs because they are difficult to patent. The marketing of herbal derivatives with patent protection are to be based on complete clinical trials. Manufacturers try to ensure the safety, along with the efficacy. The side effects must be taken into account for herbal preparation exhibiting any beneficial activity. Without the support of the pharmaceutical industry, herbs are likely to remain mired in uncertainty. There should be general worldwide guidelines for the registration of herbal products and special guidelines should be provided for natural products by various regulating agencies which will help in a long way in their promotion. It is time to think.

The present conference offers chemists from diverse areas to come to a common platform to share the knowledge and unveil the chemistry and magic potentials of phytoproducts leading to level of commercialization.

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