

Dynamics of Ethnopharmacology

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Biological Evaluation of Effectiveness of Traditional Medicines is the Need of the Hour

I am delighted to be at 12th International Congress of Ethnopharmacology with the theme “Traditional Medicines and Globalization – The future of Ancient Systems of Medicine”. My greetings to all of you. I am happy that this Congress is being held for the first time in India with a focus on some crucial and contemporary issues on the scientific studies and development of natural products and has a mission of globalizing local knowledge. In this ambience, let me share some thoughts on the topic “Dynamics of Ethnopharmacology”.

1. Ayurveda a best form of prevention of disease

Ayurveda’s basic foundation is consciousness. Originally, consciousness is flat — nothing is happening. It is unbounded and infinite. Eventually consciousness creates fluctuations. It creates those vibrations, and the original vibrations, it creates are the laws of nature. This law of nature means acquisition of knowledge. These laws of nature are structured in consciousness, they are not man-made. They are eternal, they are everywhere. These laws of nature function through the structure of DNA in different species. All DNA is basically the same, the same four bases that repeat themselves. But the majority of DNA is not active. The part which is active is activated through these laws of nature, through these vibrations. This will be different in different species. Then, as the consciousness is charging up the DNA, what happens? These vibrations, or fluctuations of consciousness, get materialized. That ultimately produces the body, whether it is an animal body, or plant body, or human body or the planets, the cosmos, or whatever. This is how it is produced, by the materialization of the fluctuations of consciousness.

Now, in the human body, different Vedas, or different laws of nature materialize at different rates, and that creates different structures. Like a liver, or a kidney. Each one of them is working at a different vibration. If these fluctuations or vibrations are distorted and they are not in the right frequency, either due to psychic disturbances in the mind, or due to food, drink, the environment, or other influences

— whatever it is — it distorts the vibrations of these organs. When the vibrations do not work properly as per the structure originally formed and has different vibrations, it becomes diseased.

I understand, there are two types of formulas in Ayurveda. The first is the rasayanas, which are generalized rejuvenation and longevity enhancers. According to the texts, these rasayanas are supposed to suppress aging, enhance immunity, and create homeostasis. The second type involves special formulas for different disorders. You can think of the rasayanas as vitamins, but they are much more than that. Health can be maintained and disease can be prevented. Though technology is advancing, people are still falling sick. Health care costs keep on increasing, and there is no way to reduce that unless you introduce prevention. The best prevention is through Ayurveda, because it is a very comprehensive system, since it is based on natural medicine, which is devoid of toxicity. It is indeed a challenge to Ayurveda. Hence, the challenges lies before us, how Ayurveda and other traditional medicine systems can be used to prevent the diseases by understanding the disease pattern, its genetic formations and its DNA structure by carrying out integrated research with the modern biotechnology, proteomics, genetics research on medicinal and aromatic plants so that the appropriate medicinal formation can be evolved in the form of drugs to prevent the major diseases from the childhood or from the mother's womb. Let me now analyze various possibilities of research and development in the field of herbal products.

2. Medicinal and aromatic plants

Medicinal and aromatic plants are emerging as the new opportunities of entrepreneurship for farmers and have become the resource for drugs, flavor and fragrances for pharma and aroma industries. The molecules responsible for aroma or drug activities are produced in these plants as secondary metabolites. Therefore, the understanding of metabolic pathways in these plants becomes a necessity to create useful genotypes. Such approaches which can lead to understanding of the complete network of metabolic pathways in the plant are referred as meta-bolomics. This approach enables increased production of desired molecule (drug) through nature's route (the plant). Desirable recombinants are obtained to produce required, nutrition, drug, trait (character) through plant system which eliminates synthetic production. This would facilitate organic mode of production or multiplication of important drugs. By using plant Genomics knowledge new type of plants with desired traits need to be available to serve the society without adverse effects on the environment.

3. Bio-factories

'Plant Genomics' is the new emerging area of research, which deals with functional and structural definition of genes both in terms of their location in the genome and their expression for defining the precise regulation to control the whole metabolism. Thus this field opens up new avenues to modulate the gene expression in such a way that plants can be converted into proficient genotypes or varieties to be used as the bio-factories producing useful proteins, therapeutic molecules, nutritional compositions, and stress tolerant varieties to meet the current and futuristic requirement of the society in eco-environment friendly manner.

4. Genomic research to reinforce traditional medicine

Unlike the western agricultural system, the Indian food chain had health as an important component in herbal medicine like turmeric, neem, pepper, garlic etc., but due to the scientific process of evolving allopathy medicine facing extreme competition in India, our medicinal plants have resurfaced from the western source through systematic scientific processing, packaging and marketing. The plant genome researchers in India can study these plants and genomic signature which will enable us to patent these plants for medicinal use with adequate protection of intellectual property rights. You are already aware of the struggle India has to face on the neem patenting rights.

5. Nutritional research

Throughout the world there are three major nutritional deficiency disorders or diseases namely Iron deficiency – women (mostly 50% of the population) by and large are anemic at one or the other period in their life span. This affects their performance and health. There is need to overcome this by developing Iron rich crops (vegetables, fruits etc.) using knowledge of plant genome. Another major deficiency disease - Impaired vision / eye sight, night blindness is mainly caused by deficiency of vitamin 'A' (Carotenoide). Plant genome research like in potato and rice crop should cover large number of fruits and vegetables to provide enough vitamin 'A'. This vitamin should also not get destroyed during processing of the produce on higher level of heating. This is the challenge for the Scientists working on enhancement of vitamin 'A' in crops using plant genome knowledge. The third major problem is Iodine deficiency leading to Thyroid etc. The Iodine content of Iodine rich crop need to be enhanced / improved by using the knowledge generated on plant genome centres.

The enhancement in nutrition content or drug molecule in selected crops should meet the requirement of society. It should be commercially viable rather than being

used in the extension farms. Our plant genome scientists should become civic scientists in this regard. If crops or crop varieties rich in vitamin A, Iodine, Calcium and Iron can be developed by incorporating appropriate genes, this nutrition deficiency problem can be minimized. One of the Indian examples of the leadership in this field has been reported by Dr. Asish Dutta and his team in isolating and characterizing the perfect protein gene “*Ama*” from *Amaranthus*, the plant as a source of grains (*Ramdana* used traditionally in India for fasting by the women). The perfection on this protein is in terms of amino acid composition that combines qualities of both cereals and pulses in one grain and hence providing the opportunity to take care of protein malnutrition in Indian population. This gene now has been cloned and expressed even in potato to make it a better nutritional source combining starch and protein. This opens up the opportunities for evolving novel food crops of the future.

6. Development of designer crops

Relating the ‘genome’ of the plant with ‘metabolome’ is the emerging field of functional genomics, a successor of gene, which finds large scale application in medicinal and aromatic plants to develop designer crops which will specifically produce the drug molecules and accumulate them in large quantities for use by pharma industry.

Central Institute of Medicinal and Aromatic Plants (CIMAP) at Lucknow is working on the functional genomics research for highly important plants like anticancer plant *Catharanthus roseus* (Periwinkle), anti-malarial plant *Artemisia annua* (Quinghao), pain therapeutics yielding plant *Papaver somniferum* (Opium poppy), revitalizing immuno-modulator plant *Withania somnifera* (Ashwagandha), traditionally most valued aromatic-cum-medicinal plant *Ocimum* (Tulsi) and the mint yielding aromatic plant *Mentha arvensis* (Menthol mint), the plant which has also created history to place India on the top position for production and export of menthol competitively in the global market. I would suggest a collaborative multi-institutional project on medicinal and aromatic plants to evolve new varieties with high value addition. CIMAP has also dissected out the genomic component of *Mentha arvensis* and *Mentha piperita*, and isolated the genes responsible for key regulation in its pathway not only to produce larger amount of menthol but also for producing designer mints with variety of aromatic flavours useful right from confectionary to pharmaceutical purposes. The results will be of assistance to the farmers.

Microbial genes: Microbes are very useful in maintaining soil health and yielding food products for human being. They possess useful genes. These can be used by transferring them to desirable crops and providing their own quality produce like mushrooms, bio-fertilizers, bio-pesticides and algae.

7. Challenges and opportunities in genomic research

As discussed earlier, there are enormous challenges and opportunities for plant science laboratories of the country on genomics research with defined targets which could range from nutraceutical crops rich in vitamins or essential amino acids, medicinal crops for fighting various diseases, making hill crop to grow in plains and vice-versa, enhancing yield of food crops several folds, disease and pest resistant crops or crops that can tolerate weather extremities like drought, flood, salinity, scorching heat, low temperature frost and so on. Crop varieties responding to organic mode of cultivation if can be developed using knowledge of plant genome would lead to great service to the humanity environment and soil health.

8. Ginger

I came across a book called “Ginger” written by an American, who is a friend of India. The author feels that the drug based on Ginger will replace aspirin and other similar medicines with no side effects and his mission is to propagate Ginger as a drug. He is assisting the production. After I finished reading the book I asked him, you are a friend of India, why your company is purchasing Ginger from other two countries in Asia and South America for making the drugs. He answered that there are twelve ingredients in Ginger, out of which six are very important from medicinal point of view. Indian ginger when analyzed, we find that four of these ingredients are missing. According to him, the reasons for this are, even though India produces large amount of ginger, farmers have not been trained about the right time of cultivation during the year, right soil characteristics, right duration of the crop, right nutrient to be added during its growth and the right type of water management and finally the right timing of harvesting. Ginger varieties of Indonesia or some other place can be studied and gene(s) responsible for production of desired molecules can be incorporated in Indian ginger using knowledge of plant genome. The quality of Ginger crop as a function of needed parameters should be studied by the scientists and solution should be found using plant genomic research. Genomic research should also lead to ginger transferring into drugs. Now let me talk to you how a key plant molecule helps in combating cerebral malaria.

9. Combating cerebral malaria by *Artemisia annua*

Artemisinin is the key plant molecule, derived from the plant *Artemisia annua* which is presently the most effective alternative when the malarial infection takes place due to chloroquine resistant parasite *Plasmodium falciparum*. The demand of this drug is on a continuous rise and currently not even 50% of the drug demand worldwide can be fulfilled mainly because of unavailability of raw material (plant herb, the source of drug molecule). Around 500 million cases of malaria are reported each year in the world and result in loss of human lives. The manufacturers of artemisinin derivatives (the drug) in India have been presently importing artemisinin from international sources like China & Vietnam but the non-availability of raw material has forced Indian industry to seriously think of cultivation of this crop indigenously for self reliance. But till recently no variety with high artemisinin was available in India.

'CIM-Arogya' developed by CIMAP is a true product of molecular breeding leading to genetic enhancement of meta-bo-lite through pathway engineering. CIMAP technology package from cultivation to processing is providing competitive advantage to the industry to meet the global demand of artemisinin. The availability of the drug developed on the CIMAP technology will provide a powerful tool towards eradication of malaria in India and other third world countries through eco-scale greener means of plant derived bio-molecules. It is estimated that in coming two years with the seed now produced for genotype CIM-Arogya India will be able to assume leadership position in the world for production of artemisinin based anti-malarial drugs for malaria free world while enabling farmers to double their farm income.

10. Demand for herbal products

Particularly, in the herbal area there are potential applications for developing multiple products for nutrition, prevention and cure of diseases. On the whole, India is stated to have 45,000 plant species. Out of these, about 3,500 species are of medicinal value. Harnessing this potential, according to experts, will not only boost our exports but also go a long way in the development of dry land agriculture in the country. The demand for medicinal plants is increasing every day. The World Health Organization (WHO) has projected the global market for herbal products to increase to US\$ 200 billion in 2008 and US\$5 trillion in 2050.

Of the global herbal product market of US\$ 80 billion, China has a share of around US \$ 6 to 7 billion, whereas India's share is not even US \$ One billion. There are tremendous opportunities for growth in this area. India has similar potential for promoting floriculture and aquaculture in a big way. Knowledge-based value addition for these natural resources would mean exporting value-added products rather than merely the raw materials. Ancient knowledge is a unique resource of

India for it has the treasure of a minimum of 5000 years of civilization. It is essential to leverage this wealth for national well being as well as to seek global presence for the nation.

11. Conclusion

Ultimately, it is prevention better than cure. Traditional medicine's basic foundation is consciousness. "Consciousness" primarily means moral conscience. Conscience is the light of the Soul that burns within the chambers of our psychological heart. It is as real as life is. It raises the voice in protest whenever anything is thought of or done contrary to the righteousness. Conscience is a form of truth that has been transferred through our genetic stock in the form of the knowledge of our own acts and feelings as right or wrong. When you keep conscience clear, righteousness will prevail upon you.

Righteousness

Where there is righteousness in the heart
There is beauty in the character.
When there is beauty in the character,
there is harmony in the home.
When there is harmony in the home.
There is an order in the nation.
When there is order in the nation,
There is peace in the world.

For achieving peace in the world the starting point is righteousness. Who will give righteousness in the heart, only three people can give, who are they? Father, mother and primary school teacher. Hence, for leading good quality and healthy life, again righteousness in the heart is essential. So, dear friends, all human sufferings start whether it is mind or body, when you deviate from righteousness. It is our duty to uphold righteousness in all our minds. When you are all in the mission of removing the pain of people through ancient systems, it is essential to work for creation of enlightened citizens respecting their conscience, leading to a disease free world.

With these words I inaugurate the 12th International Congress of Ethnopharmacology. My best wishes to all the members present here success in their mission of quality human resources needed for promoting the disease free nation and world.

May God bless you!!!