Nobel Prize for artemisinin research: Indian side of the story

The Nobel Prize for Physiology or Medicine 2015 awarded to Youyou Tu is heartening to all the researchers around the globe who have been involved in the application of traditional systems of medicine for developing modern methods of therapy. Particularly, it is a matter of joy and satisfaction for artemisinin researchers across the globe, including those in India. The main reason for this highest scientific recognition to Tu and her outstanding work stems from the success of Artemisia annua extracts, artemisinin and its derivatives in saving the life of millions in Asia and Africa.

Realizing the enormous anti-malarial potential of sesquiterpene lactone compound (artemisinin) in the early eighties, Nitya Anand (the then Director of CSIR-CDRI, Lucknow) brought seeds of A. annua to India. Akhtar Husain (the then Director CSIR-CIMAP, Lucknow) and his team were successful in growing A. annua at the experimental farm of CIMAP in Kashmir\(^1\). The plant was soon acclimatized for cultivation at the experimental farm of CSIR-CIMAP, Lucknow, and later in the plains of Uttar Pradesh. Since the available variety of A. annua had very low artemisinin content (less than 0.1%), an intensive breeding programme was launched at CSIR-CIMAP to increase the artemisinin content up to 0.8–1.0%.

Due to technological interventions of CSIR-CIMAP, including development and popularization of artemisinin-rich plant varieties, and improved processing technologies (27 patents, including 14 in the US), the cost of production of artemisinin was brought down from about Rs 40,000/kg to about Rs 10,000/kg. Optimization of the processes for extraction and purification of artemisinin at CSIR-CIMAP led to the production of kilogram quantities of artemisinin for its chemical transformation to more soluble and stable derivatives (Figure 1). While scientists at WHO focused on β-artemether, those at CSIR-CDRI and CSIR-CIMAP teamed together to initiate work on α,β-artether\(^2\). Extensive pharmacological investigations and clinical trials on α,β-artether at CSIR-CDRI eventually led to its development as a drug for the treatment of severe falciparum malaria. These dedicated attempts then led to a series of patents (27, including 14 US patents) and eventually the technology for the production and distribution of indigenously developed anti-malarial drug α,β-artether was transferred to M/s Themis Medicare, Mumbai and distributed as ‘E-mal’. In 2007, α,β-artether was included in the National Drug Policy for the control of malaria by the Ministry of Health and Family Welfare, Government of India.

The technology package for cultivation of improved varieties of A. annua developed by CSIR-CIMAP was licensed to several pharma companies to link farmers for assured price cultivation of Artemisia in a public-private-partnership (PPP) mode, not only to enhance industrial productivity and business, but also to enhance rural incomes. Later, M/s IPCA Laboratory, Ratlam entered into consultancy agreement with CSIR-CIMAP, and introduced contract farming of the ‘CIMAP-Arogya’ variety of A. annua covering about 2700 acres of land in Uttar Pradesh, Uttarakhand, Gujarat and Madhya Pradesh by 2012–13. It was demonstrated that cultivation of A. annua provides a high return (Rs 65,000 per hectare) to the farmers in a short span of about four months\(^3\). As a consequence of this synergy among the scientific teams and farmers, the technology was initially transferred to some farmers in Uttar Pradesh and later expanded to Uttarakhand, Gujarat and Madhya Pradesh.

Co – This symbolizes the cosmos – all formed and/or organized matter (e.g. atoms, cells, stars) and energies of the universe.

h – This symbolizes chaos – all unformed, unorganized particles, plasma, energies and unknown things.

U – This symbolizes the universe; not known or conceived fully, but by cosmos and chaos together. The central part of the logo consisting of intellect, cosmos, chaos and the universe can be considered as a seal of the universe.

M. J. VARKEY

A1G2 Prabhu Residency,
Porvorm 403 501, India
E-mail: Knowwell1098@yahoo.co.in

Figure 1. a. Artemisia annua (field view). b. Artemisin isolated at the CSIR-CIMAP pilot plant in Lucknow.
Disaster victim identification – a need to create zone-wise scientific working groups

More than 8600 lives were lost and 2.8 million people were displaced in a series of earthquakes that rocked Nepal in April–May 2015 (ref. 1). Unfortunately, hundreds of thousands of people are killed in disasters such as floods, cyclones, earthquakes, tsunamis, fires, storms, landslides, airplane crashes, road and train accidents, terrorist attacks, bomb blasts, etc. The year 2014 witnessed several natural disasters throughout the world which were thought-provoking in terms of the number of casualties. For such events, the recovery and identification of the disaster victims is important from humanitarian as well as legal point of view. Disaster victim identification (DVI) is the process of identifying the victims of mass disasters/mass fatality incidents through the application of scientifically proven techniques. The positive identification of the victims of mass fatality incidents is greatly expedited by the advent of modern technologies such as DNA typing, comparison of antemortem and post-mortem records using forensic odontological techniques, fingerprints and other anthropological methods. The DVI process can be long and time-consuming as it depends upon the nature of the mass fatality incident. The main aim of the DVI team is to correctly identify human remains; therefore, the team may apply a number of identification methods depending upon the available parts and condition of the deceased and the human remains. The commonly used methods include DNA profiling of the human remains, finger-