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Concepts of tsunami modeling

Since the four global oceans are not simply connected in the hydrodynamic sense, separate tsunami warning systems are needed for each ocean. Each ocean shows different tsunami characteristics, and the numerical models that are required for the tsunami warning system, also have to be different. Murty *et al.* (**page 1073**) have shown that hyperbolic, parabolic, elliptic and parabolic-elliptic approaches are respectively valid for the Pacific, Atlantic, Indian and Arctic Oceans.

Tsunamis can travel vast distances in the Pacific Ocean without suffering too much dissipation through frequency dispersion. Observations of tide gauge records indicate that, usually up to 5 to 7 waves could be generated in a tsunami event generally in the Pacific Ocean, the wave with the highest amplitude lies between the third and the fifth. Unlike in the Pacific Ocean, there are no converging tectonic plates in the Atlantic Ocean, which can generate tsunamigenic earthquakes. The mid-Atlantic Ridge is a diverging plate boundary, which can create new ocean floor, but not tsunamigenic earthquakes. Compared to the Pacific Ocean, tsunami events are quite rare in the Atlantic Ocean.

The Indian Ocean gives rise to both trans-oceanic as well as local tsunamis. If we consider only the populated coastlines of the Indian Ocean, the tsunami travel times are considerably less than those for the Pacific, and hence the available warning system time is much less. Since reflected waves play an important role in the tsunami water levels, the numerical models for a tsunami warning system in the Indian Ocean have to be somewhat different from the models for the Pacific Ocean.

At least four different sets of numerical models will be required for the operations of an Indian Ocean tsunami warning system. The first set of models is for tsunami generation from under-ocean earthquakes, incorporating some real time seismic parameters as input. The second set of numerical models involves preparation of tsunami travel time charts. Since tsunamis are long gravity waves, for practical purposes, one can ignore higher order dispersion effects on tsunami travel times. A third set of models is for tsunami amplitude computation during propagation. These models should incorporate some dispersive effects. A fourth and final set of models is for the computation of coastal inundation.

Mosquito control by natural product

In recent years natural products have been used in the control of pests of agricultural crops as well as the vectors of human diseases. The natural products are easily biodegradable (ecofriendly) and can be produced at a cheaper cost. Most, if not all the natural products are extracted from various plants using various solvent systems. Most of the extracts derived from the plant sources are the secondary metabolic products of the major biomolecules like lipids, carbohydrates and proteins. These secondary metabolites are used by plants to defend against herbivores. Interestingly majority of natural products (plant extracts) contain flavonoids, alkaloids, terpenoids, etc. as major secondary metabolites. One of the best examples of the efficient use of natural products in the management of agricultural

insect pests and vectors is azadirachtin (neem). *Clerodendron inerme* is grown widely in all tropical countries and is being used as hedge plant around the home gardens. The dry powder of *Clerodendron inerme* can be effectively used against a notorious dengue mosquito vector, *Aedes aegypti*. Patil *et al.* (**page 1064**) indicate that the powder contains chemical substances that produce disruption in the growth, and also act on the peritropic membrane of the gut affecting the process of absorption as well as disrupting the protection of the midgut cells against microbes and other toxicants present in the lumen of the midgut.

Free radical scavenging reactions and phytochemical analysis of *triphala*

Free radicals produced continuously in living cells can induce multiple chemical changes in membrane lipids, DNA and proteins. Excessive production of free radicals, termed as 'oxidative stress' has been implicated in many ailments, like heart disease, cancer and other diseases related to ageing. Antioxidants are employed to minimize these unwanted effects induced by excessive free radicals. Among supplementary antioxidants vitamins, polyphenols, flavonoids are important. Of late, many researchers have shown that a small dose of mixture of antioxidants is more effective than a single dose of one antioxidant substance. In this context herbal and plant extracts used in ayurvedic formulations are preferred because they are of natural origin and have lesser side effects as compared to the synthetic antioxidants. The World Health Organization also has recognized the importance of traditional medicine. *Triphala* an equi-proportional mixture of fruits of three medicinal herbs, *Emblica officinalis*, *Terminalia chebula* and *Terminalia bellerica*, is an ayurvedic formulation, commonly prescribed by most health care practitioners in India. It strengthens different tissues, prevents ageing, and promotes health and immunity. Recently *triphala*, has been found to exhibit potent antioxidant and radioprotecting ability. Naik *et al.* (**page 1100**) discuss some of the unique factors contributing to the antioxidant ability of *triphala*, employing time resolved and chromatographic techniques. Quantitative estimation of the scavenging ability of hydroxyl radicals and superoxide radicals by *triphala*, whose excessive formation is implicated in oxidative stress, has been made along with the estimation of total antioxidant capacity in terms of ascorbic acid equivalents. HPLC analysis confirmed the presence of polyphenols and prominent among them is gallic acid. A good correlation was achieved by different methods.