

In this issue

Institutional Herbal Garden

For biodiversity and citizen science

The College of Horticulture and Forestry, Pasighat, Arunachal Pradesh had set up an herbal garden and, by 2014, the garden had 20 medicinal plants. That year, in tune with India's Biodiversity Action Plan-2008, the National Medicinal Plants Board extended support for herbal gardens in the north-eastern region. This funding enabled the collection of planting materials of medicinal and aromatic plants from different parts of India. But the plants from other agroclimatic zones did not survive.

So the researchers involved the citizens in the region in collecting planting materials from the region itself. And the collection quickly grew into more than 160 species – more than 50% of about 300 medicinal and aromatic plants found in various institutional herbal gardens in India. Besides improving biodiversity and protecting threatened species, the herbal garden has benefitted thousands of people including students, farmers, researchers and unemployed youth.

There are about 3000 plant species that are of medicinal importance and are traded in different parts of the world. More than 1700 are found in the Himalayan region. Setting up institutional herbal gardens with the support of citizen scientists will ensure that the medicinal plant diversity of India is not threatened by trade. The General Article on **page 1033** in this issue shows the way.

Vaccine Varieties and Platforms

Routes of administration

Vaccines are of different kinds: those that elicit immune response to toxins produced by the pathogen and those that target the pathogen itself. The second type of vaccine may be a subunit protein of the pathogen, inactivated whole pathogen or live attenuated pathogen. DNA, RNA, recombinant and viral

vector vaccines have also emerged in recent years.

Some are administered subcutaneously, some orally and others nasally. Intramuscular, intravenous and intradermal administration is also used.

A Review Article in this issue by researchers at IISER Tirupati takes stock of the differences in the immune responses to the vaccine varieties and to the routes of administration. They also rationalize the successes and failures in vaccine development so far, from the point of view of the life history traits of the pathogens and provide a perspective for future vaccine development. Read on from **page 1039**.

Slope with Layered Rock

Anchoring against seismic loads

During earthquakes, layered rocks on steep slopes become unstable and come tumbling down as landslides, causing major calamities on human populations. Anchoring the top layer to the one below using bolts is one of the ways to preclude that eventuality. However, the best way to bolt down a layer of rock is not easy to find using experiments on mountain slopes. This is where numerical models come in handy.

In a Research Article in this issue, Chinese researchers present their results using Fast Lagrangian Analysis of Continua in 3 Dimensions or FLAC3D, a numerical modelling software for geotechnical analysis. They consider a triangular layer of rock resting on a layer that has a slope of 45 degrees, thus creating a steep slope of 75 degrees. The anchor bolts can then be perpendicular to the layer underneath or parallel to the top of the triangular layer.

They then checked the horizontal displacement due to the acceleration of seismic loads and identified the time duration at which the unbolted layer undergoes abrupt increases in horizontal displacement and, therefore, becomes unstable. They tested again with the two options with bolts in place.

Read on from **page 1088** to find out which option works best and which bolt experiences the maximum axial force.

Better Bitter Gourd

Selection using SSRs

Bitter gourd, a nutraceutical vegetable, is cultivated in most tropical areas. Some are dark green and some light green, some are long and some short, some have irregular tubercles and discontinuous ridges while others have continuous ridges and more regular tubercles, some are slightly bent at one end, others are straight... The consumer preference for the varieties varies. So does the yield.

Breeding and selecting bitter gourd for higher yield with preferred traits is complex. The plant, with male, female and, sometimes, hermaphrodite flowers, is mostly cross pollinated. Assessing the hybridity in the first generation is a tedious and time-consuming task. So ICAR scientists identified 100 simple sequence repeat markers for parental polymorphism and 10 with limited polymorphism were selected as markers to determine hybridity.

Armed with the SSR markers, they could assess hybrids when they crossed Pusa Purvi, the variety with small dark green fruits, and S2, a variety with green, long fruits curved at one end. An analysis of the progeny over six generations provided clues about gene interactions that determine the traits. While continuous ridges or conspicuous tubercles are monogenic traits and, therefore, easier to select, yield is a complex polygenic trait. So breeding for higher yield should be undertaken only after the other traits have stabilised, say the researchers.

Read on from **page 1058** for more.

K. P. Madhu
Science Writing Consultant
scienceandmediaworkshops@gmail.com