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Biological nitrogen fixation with non-legumes

Crop species other than legumes are not capable to fix atmospheric nitrogen, and consequently their yields are dependent upon high dosages of chemical fertilizers, which consume large amounts of energy and add to the cost of production. One way to conserve this energy and to check high production cost with environment protection too is by enhancement of biological nitrogen fixation through the genetic engineering of the genes responsible for nitrogen fixation. Various attempts have been made to extend the host range of *Rhizobium* from legumes to non-legumes through plant genetic manipulation. The transfer of *nif* genes along with others for functional nitrogen fixation was considered to be the most suitable strategy to achieve symbiotic N_2 fixation in non-legumes. But the highly complicated system of gene regulation posed a great hindrance in achieving a functional N_2-fixing transgenic system. Genetic engineering through biotechnological means has seen little or no success in achieving the induction of symbiosis between cereals and diazotrophs. Induction of nodulation has therefore been the main target of researchers over the past few years. Looking to the future, will we see *Rhizobium*-nodulated non-legume crops 'down on the farm'? At present it is impossible to say. The results discussed by Saikia and Jain (**page 317**) are interesting, but much more needs to be done before we can expect to see nitrogen-fixing nodules in, for example, a field-grown crop of oil-seed rape. However, the work of the different groups has opened the way and hopefully will stimulate further research.

Sea ice

Sea ice may be defined as the frozen seawater that floats on the ocean surface covering millions of square kilometers of Polar Regions. Sea ice forms and melts with the polar seasons, affecting both human activity and biological habitat. While multi-year sea ice can be found in the Arctic, almost all Southern Ocean or Antarctic sea ice is 'seasonal' meaning it melts away and reforms annually.

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Even though sea ice occurs primarily in the Polar Regions, it influences our global climate. Sea ice regulates exchanges of heat, moisture and salinity in the polar oceans. It insulates the relatively warm ocean water from the cold polar atmosphere. The thickness of sea ice, its spatial extent, and the fraction of open water within the ice pack can vary rapidly and profoundly in response to weather and climate and therefore, sea ice acts as a sensitive cryospheric climate indicator. The movement of ocean waters is also affected by sea ice. During sea ice formation, most of the salt is released into the ocean water below the ice, making water below sea ice denser than surrounding ocean water, and so it sinks. Thus, sea ice contributes to the ocean's global 'conveyor-belt' circulation. Changes in the amount of sea ice can disrupt normal ocean circulation, thereby leading to changes in global climate. This is particularly important as the Southern Ocean or Antarctic Ocean is the only ocean which is connected to all the oceans of the Earth. See **page 345**.

Melting of glaciers

Our present understanding of the effect of enhanced glacier melting on the river flow in a changing climate is highly influenced by the IPCC 2001 report, which stresses that the enhanced glacier melt during the initial phase of warming will increase the flow of glacier-fed streams owing to the additional contribution from the storage of glacier ice followed by decline in the river flow once the glaciers shrink below certain threshold size. However, Thayyen *et al.* (**page 376**) suggest that the enhanced melting of glaciers will not increase the river flow in the areas where winter snow and monsoon precipitation determine the regional hydrology. Changes forced on the regional hydrology by changing precipitation characteristics, especially the snow cover characteristics such as amount, extent and duration could reduce the stream flow significantly, even when increased glacier melt contributing to these streams. The study carried out in a micro scale catchment in the Ganga basin shows 45% runoff decline in a discharge station at 2360 m asl in a short span of three years while the glacier outflow at 3800 m asl showed stable discharge regime with enhanced glacier degradation. The authors suggest that the glacier contribution critically influences the headwater river hydrology during the years of low summer flows.