

## 'Terminator . . .' back again?

In the early 90s, the US government and Monsanto took a joint patent on a scientific discovery nicknamed the 'terminator gene'. This genetic breakthrough made it possible to create seeds that can grow into full-fledged plants and yet can never reproduce: their seeds will all be sterile. The terminator gene was all about commerce. Once farmers plant crops that cannot reproduce, they have to buy seeds every year.

The terminator technology is a threat to food security, food sovereignty and farmers' rights. RAFAI, a non-profit international civil society organization headquartered in Winnipeg, Canada, together with civil societies, farmers' and indigenous peoples' organizations worldwide has campaigned for a global ban on these suicide seeds. Terminator technology has become synonymous with corporate greed, and it was met with intense opposition all over the world. Buried under an avalanche of public opposition, Monsanto has decided to abandon plans to commercialize terminator technology. UN declared an international moratorium on the terminator gene. But such plans are rarely abandoned, especially when the powerful know that huge profits can be made from them.

The biotech industry is currently developing Genetic Use Restriction Technology (GURT). Companies, including Monsanto, are working to control important genetic traits of plants with external chemical catalysts. Once perfected, genetic trait(s) of a seed could be turned on or off with the application of a proprietary chemical, such as an herbicide or fertilizer. The Scientific Advisory Panel to the United

Nations Convention on Biological Diversity has recommended a moratorium on GURT until it can be proven safe for the environment and human health. The Canadian Food Inspection Agency challenged this moratorium at a meeting of the United Nations Convention on Biological Diversity in Bangkok during February 2005 and declared that Canada was going to abandon the ban on terminator gene crops.

So what is the problem with the GURT terminology? GURT is a general term that refers to the restriction of any genetic trait in plants that can be switched on or off by the application of an external chemical inducer. This could include the trait for sterility, or any other trait such as colour, ripening, cold tolerance, etc. T-GURT refers to the restriction of a specific trait in a plant. This is what the ETC Group (formerly RAFAI) calls 'traitor technology'. V-GURT refers to restriction of the variety by engineering plants whose seeds will not germinate if replanted. This is terminator technology. The companies argue that genetic trait control will offer farmers a menu of traits that can be turned on or off depending on their needs. Unfortunately, GURT is a confusing terminology, and the gene giants are using this to their advantage in intergovernmental negotiations. For example, a recent paper of the International Seed Federation authored by Harry Collins of Delta & Pine Land, and Roger Krueger of Monsanto, extolling the potential benefits of GURT for small farmers, indigenous peoples and local communities, makes no reference to terminator or V-GURT, but only to GURT. Using the

general term GURT, the seed industry argues that T-GURT could have potential benefits for farmers and agricultural productivity, but dodges the clear-cut case against terminator technology and the calls to ban it. Industry is hiding behind GURT, thus making it more difficult for government negotiators to take decisive action against terminator technology. In a self-serving but well-reasoned memo, UPOV, the international body that coordinates plant breeders' rights, concluded that terminator technology 'has considerable disadvantages for society'. Stung by negative publicity related to the escape of DNA from genetically modified (GM) plants, industry continues to 'greenwash' terminator technology by promoting it as a biosafety tool for containing unwanted gene flow from GM plants.

It is nature's genius that the cycle of life repeats itself again and again. The galaxies wheel in orderly patterns, the seasons succeed each other with soothing regularity, and one generation passes on its double helixes to the next. Of course, nature never repeats itself exactly – everything is always evolving – but the ecosystem has a built-in stability. Restricting reproduction disturbs that stability. It is time we ask the question: Should humankind be allowed to exercise power over evolution?

ASHALATHA S. NAIR

*Department of Botany,  
University of Kerala,  
Kariavattom,  
Thiruvananthapuram 695 581, India  
e-mail: ashahot2004@yahoo.co.uk*

## Need for self-assessment of educational institutions

I would like to share a few thoughts in response to the skepticism expressed by Dharmapalan<sup>1</sup> over the NAAC system of accreditation. He has questioned the validity of the NAAC accreditation process and has raised certain issues regarding functioning of libraries, donations, honouring the peer team, etc. in NAAC-accredited colleges.

Our college went in for NAAC accreditation and our attempts to prepare and fulfil mandatory requirements for accreditation,

viz. departmental inputs and self-analysis report, helped identify our strengths and weaknesses. The NAAC peer team visit also helped us get useful feedback on our performance. Today, if we are clear and purposeful in our activities, it is because of the NAAC accreditation process. Parameters for evaluating institutions include curriculum, infrastructure, organization and management, teaching and evaluation, research, consultancy and extension, healthy

practices, and other such components. In short, it is an evaluation of the overall style, structure and performance of an institution. Our experience shows that mere window dressing cannot help.

Our report included only facts and we boldly admitted our shortcomings too. Our innovations in teaching methodology and our involvement in research and extension activities contributed to our securing 'A' grade.

Of course, as pointed out by Dharmapalan, there may be one or two shortcomings. However, considering the overall health of higher education in India, every institution has the responsibility to take these acid tests. NAAC has made it mandatory for accredited colleges to establish a quality advisory committee and an internal quality assurance cell to monitor qualitative growth of the institution. Accredited institutions are expected to submit annual quality assurance reports.

I do agree that several libraries in our state-affiliated colleges run without librarians and are understaffed. Similarly, the departments too suffer for want of teaching

faculty. But, NAAC cannot be blamed for this situation or for commercialization of education. NAAC is only an assessing cum accrediting body and has no power regarding the filling up of vacancies. It is the duty of the State Governments to fill up the vacancies, as without adequate teaching faculty no institution can perform its role effectively.

Apart from all this, accountability is needed in every field of activity. Agmark, ISI (BIS), CRISIL, ISO, FPO, etc. are there to evaluate, standardize and accredit products and producers of different sorts. In these days of globalization, it is meaningless to say no to accreditation of higher

educational institutions. Of course, accreditation is an evolutionary process requiring frequent revisions of evaluation methods and monitoring mechanisms. From our experience, we feel that NAAC is moving in the right direction.

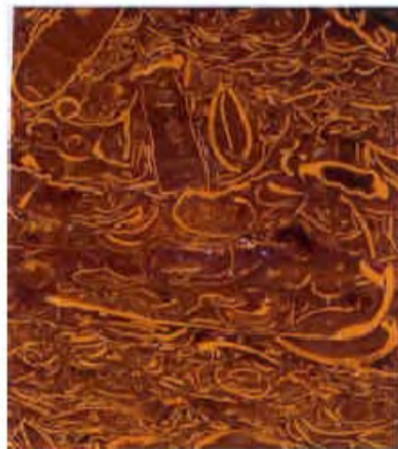
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V. RADHAKRISHNAN

V.O. Chidambaram College,  
Tuticorin 628 008, India  
e-mail: vrkgeologist@rediffmail.com

## Can Habur Limestone curdle milk?

Rajasthan has a fascinating array of rocks and minerals, one of which is fossil-rich Habur limestone (also referred to as Abur limestone<sup>1</sup>), named after the village Habur (27°19'N : 70°33'E). This rock is considered of lower Cretaceous–Aptian age<sup>1</sup>, which makes it 125–112 million years old<sup>2</sup>. The brown coloured, ferruginous clay-bearing limestone is rich in small fossils that give it a unique, eye-catching calligraphic texture (Figure 1). It is because of this exceptional feature that this stone finds prideful place amongst valuable décor-stones from Rajasthan. Narrow and small exposures in remote desert areas add to its



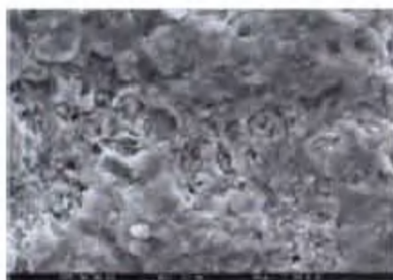
**Figure 1.** Fossil-rich ferruginous Habur limestone displaying unique calligraphic texture. Sample width = 6 cm.

value because of the 'rarity factor'. It is erroneously believed that Emperor Akbar obtained this stone from Arab countries to be used in the Fatehpur Sikri Fort, because of God's own handwriting on it! The myth still persists.

Recently, a sample of this limestone was sent to us to find out what makes it curdle milk, as reported by people in the villages of Jaisalmer area, Rajasthan. Local people use this stone for curdling milk instead of adding curd culture. Samples of this 'magical stone' are gifted to close friends and relatives in the region! The aim of this correspondence is to dispel any myth or attempt to spread wrong and superstitious information about this rock. Being ferruginous and with small fossil content, the

limestone contains numerous small cavities and is more porous than other stones of the area (Figure 2). Its unique and rare appearance adds to the legend woven around its supposed magical properties. This stone must have been used for curdling milk, similar to the use of dried yeast for baking dishes. Obtaining curd culture in the sparsely populated desert area must have been a problem in the region. Therefore, keeping the culture in a suitable receptacle must have been an ingenious solution to the problem, which in due course of time has become a myth. The bacteria in the pores of the limestone are activated when the curd-soaked limestone piece is put in warm milk, which results in the curdling of milk.

Humans learned to make curds at least 3000 years ago<sup>3</sup>, but the earliest curd-making method may not be to the liking of many a reader. Curd is now made by adding common strains of bacteria to milk. Complex protein chemistry is involved in the curdling of milk<sup>4</sup>; in households a portion of the previous day's curd is used as culture. Normally 4 to 5 h at +40°C is needed to form curds. Calcium ions form cross-links between the hydrophobic portions of the milk proteins to form larger curds<sup>5</sup>. But it is highly unlikely that calcium from Habur limestone has any significant role, if any, in curd-forming. In several parts of Rajasthan a small piece of curd-soaked muslin cloth is used as starter culture for curdling milk. The dry and hot climate of Rajasthan ensures longer 'shelf-life' for the ingenious curd cultures in which the fermenting



**Figure 2.** SEM photomicrograph of curd-soaked Habur limestone chip displaying pores and micro-cavities that provide suitable sites for curd-forming microorganisms. Two white spheres (~3 µm each ↑) and 'crust' (→) are of curds. Bar = 3 µm.