vitella) and tobacco caterpillar (*Spodoptera litura*). Cry1Ac is highly toxic to *H. armigera* and *E. vitella*, moderately toxic to *P. gossypiella* and not toxic to *S. litura*[4–6].

There have been many concerns about the efficacy and durability of Cry1Ac toxin expression in *Bt*-cotton. The major one relates to the development of resistance in insects.

(i) The insecticidal activity of transgenic cotton declines significantly as the plants mature[7] and *H. armigera* and *P. gossypiella* are exposed to sub-lethal concentrations of Cry1Ac. This encourages some insects to complete their development late in the season. Their survival would eventually lead to the emergence of resistant insects. Promoters that are active during boll development and reproductive phase are needed to express insecticidal protein genes.
(ii) Cry1Ac is not an ideal toxin to manage pink bollworm. Long-term exposure to Cry1Ac may lead to *Bt*-resistant pink bollworm, which may also have cross-resistance to Cry1Aa and Cry1Ab toxins.
(iii) Deployment of refugia is an essential component of resistance management[8]. Non-compliance of refugia requirement is a problem in transgenic cultivation (http://www.colostate.edu/programs/lifesciences/TransgenicCrops/news.html#still breaking). Effective monitoring and supervision mechanisms are needed for strict compliance of the refugia guidelines.
(iv) Faster introduction of *Bt*-crops carrying multiple insecticidal protein genes, preferably with differing mode of action/receptor binding, is imperative[9]. Cotton expressing Cry1Ac, Cry2Aa, Cry1F and Vip3A toxins together will tolerate all the major pests in addition to containing a durable resistance management package.
(v) Avoidance of expressing the same gene (e.g. *crylAc*) in multiple crops (cotton, chickpea, pigeonpea, tomato, sorghum, sunflower, etc.) is necessary. An insect species such as *H. armigera*, with a high propensity for resistance development, should not be exposed to varying levels of Cry1Ac expression throughout the year, and spread over large tracts of cultivation.
(vi) It is advisable to avoid expressing toxins (e.g. Cry1Ab), which are moderately toxic to pests such as *H. armigera*. Exposure of *H. armigera* to such toxins will encourage resistance development and eventually cross-resistance to other Cry1A toxins.
(vii) Strict legal measures should be taken by the government to prevent illegal development and cultivation of *Bt*-crops (http://www.biotech-info.net/illegal_cotton_India.html). Failure to do so will lead to faster development of resistant insects and loss of a valuable biopesticide.

In working towards the development of insect pest-resistant transgenic crops, the following may be important.

(i) Critical evaluation of the target pest, its biology and susceptibility to a range of insecticidal proteins (*Bt* and non-*Bt* sources).
(ii) Selection of two or more effective toxins based on their efficacy, mechanism of action and receptor binding.
(iii) Evaluation of the biosafety of insecticidal proteins.
(iv) Optimization of gene expression as evidenced by studies in model systems like tobacco.
(v) Selection of suitable and effective promoters based on spatial and temporal aspects of insect infestation.
(vi) Expression of multiple insecticidal genes driven by different promoters in transgenic crop of interest (either via co-transformation or by plant breeding).
(vii) Selection of the transformed plants with single copy transgene insertion and high levels of toxin expression.

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Trachycarpus takil Becc. is not a 'rare' palm

During our botanical collection programme in July 2003, we noticed a population of palm trees in *Quercus*[1,2] forest at Kalamuni pass near the Kalamuni temple. This palm had been a subject of controversy from 1995 to 1996 with regard to its status and type locality.

Trachycarpus takil (Figure 1) was then understood to be a rare palm and was placed in the *Red Data Book of Indian plants*[3]. According to the information in this book, this palm grows on mount Takil (misspelled for Thakil) in Kumaon at 2000–2500 m. Rana *et al.*[1] stated that 'Thakil referred to all palm-like plants, and a part of the hill with an abundance of these palms at one time was named as Thalkedar Hills', which lies ca 15 km south of Pithoragarh. They concluded Thalkedar to be the type locality of this palm.

Kulkarni and Pawar[4] reported the type locality of *Trachycarpus takil* to be probably Takal, situated near Kalamuni pass between Kalamuni pass and Munsai (misspelled for Munsiyari) in Pithoragarh District of Kumaon Himalayas. They had seen abundant trees of this palm in this area

Figure 1. A mature plant of *Trachycarpus takil* Becc.

and also in Badkot forest between Pandavkuli and Badkot of Almora District. In all these regions the palm occurred at an altitude of 2000–2500 m. This palm is also cultivated for ornamental value at Chaubattia gardens in Ranikhet and in Nainital in front of the boat club.

We noticed hundreds of these palms in two populations, one in the same area as mentioned by Kulkarni and Pawar[4], and another in Girigaon which lies just before Kalamuni. In both these populations we found the palms in all stages of growth from seed, seedlings to mature trees. These were therefore naturally multiplying populations. Hence, in all, at least four naturally multiplying big populations of this palm are established, namely – Thalkedar, Girigaon, Kalamuni and Badkot forest. We therefore conclude that *Trachycarpus takil* is a naturally multiplying palm species and occupies the Himalayan belt ranging from 2000 to 2500 m altitude in Kumaon Himalayas. *Trachycarpus takil* Becc. can no more be categorized under 'rare' species and should by deleted from the *Red Data Book of Indian Plants*[3]. Further, no IUCN category is applicable to this naturally multiplying palm species.

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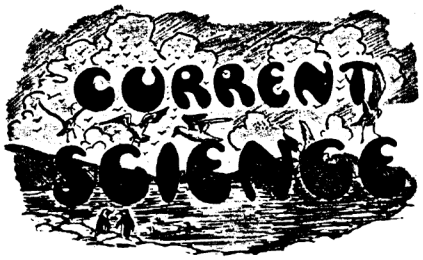

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Dairy industry and its future

The value of annual contribution of the bovine population to Indian economic wealth has been assessed at a colossal figure of one thousand crores of rupees. Of these, at least one-third is due directly to milk and milk products. Cattle maintenance is thus of great importance to India. It supplies not only a vast deficiency in our nutritional requirements but it is closely connected with the national economy. In spite of its magnitude, the present state of the dairy industry in India is rather sad. It is still steeped in orthodox sentiments, no attempt being made to fit in with the changing times and conditions. It is one of the most unorganised industries of the country and is carrried out on individualistic basis. It is only a fortunate coincidence that the Indian populace is subconsciously aware of the nutritional importance of milk and its products.

In the past, on many an occasion human-made catastrophes have proved blessings in disguise. For example, it required the last Great War to teach the English farmers the benefits of properly organising their dairy industry and since then the development has been tremendous. In most of our urban centres, the situation is almost parallel to that existing in England at the time and considering the high prices the farm products fetch at present due to the war, it is to be hoped that this will provide a suitable opportunity for organising the dairy industry of this country on which a wider structure could be built later.

The prime function of the diary industry is to produce enough milk to satisfy the needs of the country. The present production can at least be increased six-fold to achieve this end. This increase in milk market should no doubt bring in its train a better living standard for those engaged in this industry. Increase in production of milk is closely linked up with the number of the cattle population. India is in a paradoxical position that it has more cattle than it needs. India possesses about a third of the total cattle population of the world, yet the annual output of milk is hardly 12 per cent of the whole. The average production of her animals is nearly one-fifth of those in New Zealand and one-eighth of those in Denmark. For milk production, food and right type of food, has to be provided to these animals. The present conditions in India do not permit this maintenance of such a large number of stock. . . .

As in all other walks of life, the need for co-operative organisations cannot be over-emphasised. Production of milk, economically and in a reasonably clean state is an intricate process, starting from the production of right type of fodder to the disposal of the milk. Probably a small farmer never thinks about these details