Promotion of *Bt* cotton in India

The paper by Zhang *et al.*[1] is a critical analysis of the results reported in the paper by Qaim and Zilbermann[2] (Q&Z). In particular, Zhang *et al.* pointed out that it is untenable to project high yields for all GM crops in all developing countries on a single set of small trial data of *Bt* cotton from one season, under poor cropping management. More deficiencies in the data of Q&Z and much more in their interpretation have also been highlighted.

We have earlier reported[3] a detailed point-to-point analytical investigation of the results of Q&Z, after receiving their answers to a number of queries on their data and inferences. It took us by surprise that the data reported are not only from actual field trials but also from those of a survey conducted by them. This factual information was, however, not found in their paper.

We logically concluded that for trials, major cotton-growing Indian states were left out, the sampling of farmers lacked logical basis in the yield data and in the manner collected, suffered strength inferences were made despite standard errors exceeding averages (for example, the 0.62 times pesticides spray on *Bt* cotton, referred to by Zhang *et al.*[1], had an SE 1.28) and not even a simple ANOVA was done on yield trial data. Our analysis also led to questioning the raw data and the unsupported ambitious conclusions. Our work, that would have added strength, has unfortunately missed the attention of Zhang *et al*[1].

However, an article by Dong *et al.*[4] has pointed new facts dislodging the conclusions of Q&Z. They highlighted that the yield increase of *Bt* cotton in China over non-*Bt* cotton varieties was only marginal and therefore breeders in China have to work for breeding a better hybrid. Using *Bt* cotton and a conventional cotton line as parents, they have developed a hybrid that gave a yield increase of about 20%. In this light, the yield increase of 80% of *Bt* cotton in India, estimated by Q&Z[2], appears high and unrealistic. Further, a number of communications in journals and newspapers have appeared, highlighting the vast gap between actual and projected advantages of *Bt* cotton in India.

Thus an urgent need is obvious for further rigorous scientific evaluation of *Bt* cotton in India before deciding its further promotion.

1. Zhang, B., Wang, Q., Wang, K., Zhou, D. and Liu, F., *Curr. Sci*., 2004, **86**, 758–760.
2. Qaim, M. and Zilbermann, D., *Science*, 2003, **299**, 900–903.
3. Arunachalam, V. and Bala Ravi, S., *Curr. Sci.*, 2003, **85**, 1117–1119.
4. Dong, H., Li, W., Tang, W. and Zhang, D., *Curr. Sci*., 2004, **86**, 778–782.

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Reply to the comments by Mathur (*Curr. Sci*., 2004, 86, 761–762)

Mathur[1] appears to have taken overtly amiss the purpose for which the write-up on *Rajasaurus narmadensis* was published in *Current Science*[2] as a news item of general interest and therefore, purposely kept bereft of any serious academic deductions. At the same time, Mathur has rightly refrained from commenting on the two illustrations that accompany the text but do not form part of the parent scientific publication[3], for these represent mere caricatures of impressions based on fragmental scientific inputs.

The close phylogenetic affinity of *Rajasaurus* to *Majungatholus* from Madagascar and *Carnotaurus* from South America[3] does not however debar the Indian dinosaur to acquire unique morphological features in time through evolution affected by endemic geographic features. Even the end-forms of the same phylogenetic line can be variable as the Mongoloids from the Aryans or the Sinhalese from the Tamils, as in the case of the *Homo sapiens*, influenced by the local geographic parameters. Needless to state, using the phrase 'truly Indian dinosaur' in a purely scientific paper[3] was likely to have amounted to unscientific usage of the phrase, though the project team was convinced of its unique endemic features that it decided to bestow upon *Rajasaurus*, a name having local etymological flavour.

In the event of *Rajasaurus* sharing a closer ancestry with *Majungatholus* and *Camotaurus*, 'the area cladogram implied by these phylogenetic relationships offers apparent support for the hypothesis that Africa broke away from other Gondwanaland masses before land connections were severed between India, Madagascar and South America'. However, uneven temporal sampling among these four land masses strongly cautions against this interpretation[3]. In view of these imperfect palaeogeographic deductions, 'the most popular palaeogeographic reconstructions that depict India as an island drifting independent of other Gondwanaland masses in the Late Cretaceous'[1] has been used in the text[2].

If it were assumed that Africa was severed from the Gondwanaland mass prior to that of India, according to the present hypothesis, it is expected that the African Late Cretaceous (Maastrichtian) form would exhibit a greater degree of endemism than that from India. This, however, cannot be verified, due to the poor record of Maastrichtian forms from Africa[3].

1. Mathur, U. B., *Curr. Sci*., 2004, **86**, 761–762.
2. Bhatt, D. K., *Curr. Sci*., 2003, **85**, 1661.
3. Wilson, J. A. *et al.*, *Contrib. Museum Paleontol*., *Univ. Mich.*, 2003, **31**, 1–42.

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