Bt cry genes and events are prevalent in the seed market. Detection kits based on PCR and ELISA are available for *Bt* genes, which have strengths and weaknesses. PCR is a powerful and sensitive test, but can yield false results due to inadvertent mixtures, DNA decay, poor technique, etc. It will fail to detect *Bt*-cotton seeds if the transgene is for herbicide tolerance and hence, for each transgene, a PCR protocol is needed. The protein-based ELISA tests provide quantitative detection in addition to qualitative, but may fail to detect a true *Bt* variety if it has tissue-specific expression in the plant only and not in the seed. This may not be an issue at present, since all the available hybrids have constitutively expressing 35S promoter in them along with the *Bt* gene. No single test should be considered definitive and a decision should be based on several test results. Seed quality control system in India works under the Seeds Act, 1966 and has always recognized that a 100% purity is not possible, which is why standards/thresholds have been set by the Indian Minimum Seed Certification Standards. The Government of India has fixed a standard of 90% for *Bt* purity, which needs to be tested from a sample size of ten seeds, which appears to be too small. Once the Seed Bill, 2004 is operational all seeds, including transgenics sold will be regulated after a compulsory registration. Under the generation system of seed multiplication, field and seed standard will have to be reviewed and determined for *Bt*-cotton separately. During foundation seed production, the parental line of *Bt*-hybrid will have to be tested for stability in *Bt* expression before certification. The genetic purity of *Bt*-hybrids by the Grow Out Test will have to include *Bt* purity testing in addition to varietal purity. It is reported that significant variation for Cry1Ac expression exists in different *Bt*-cotton hybrids, despite having a common gene-insertion event. Intra-plant and in-seasonal variability in Cry1Ac expression levels has also been observed in *Bt*-cotton. Hence the Grow Out Test can be confronted with the issue of threshold level for *Bt* expression in the hybrid. It has also been reported that high amount of variability exists for Cry1AC expression in different plant parts, with highest level in the leaves of seedlings followed by squares, bolls, rinds and flowers[1] which also raises another issue on selecting ideal plant parts as well as stages to be examined for cry protein expression. Transgene effect on seed composition (protein and oil) may also affect seed quality of *Bt*-hybrids, which can be assessed only by comparing them with their non-*Bt* counterparts differing solely in *Bt* gene. These may have pronounced effect when *Bt* varieties in addition to *Bt*-hybrids enter the seed market, where farmers save and re-sow the seeds and seed storability becomes important. Thus considering the seed as a carrier of new technologies, an authentic seed quality testing system based on scientific studies is the need of the hour in *Bt*-cotton.

1. Kranti, *et al.*, *Curr. Sci.*, 2005, **89**, 291–299.
2. The Seeds Bill, Department of Agriculture and Co-Operation, Ministry of Agriculture, Govt of India, New Delhi, 2004.
3. APCoAB, *Bt*-Cotton in India – A status report of the Asia Pacific Consortium on Agricultural Biotechnology, New Delhi, 2006, p. 34.

V. SANTHY*
B. M. KHADI

Division of Crop Improvement,
Central Institute for Cotton Research,
P.B. No. 2, Shankar Nagar,
Nagpur 440 010, India
**e-mail: santhy100@yahoo.com*

Lower recession rate of Gangotri glacier during 1971–2004

Kireet Kumar *et al.*[1] suggested that the recession of Gangotri glacier has slowed down since 1971. The authors have estimated the total recession during 1935–1971 as 954.14 m. These data contradict the most authentic recession data of Gangotri glacier collected meticulously by the Geological Survey of India (GSI) over the last many decades[2] (Table 1). Vohra[3] reported that the Gangotri glacier receded by only 600 m during 1935–76 and Tewari[4], in his survey of September 1967, recorded that the glacier has receded around 600 m since Auden's survey in 1935. All these past data indicate that the recession of the glacier during 1935–71 (36 years) was around 624 m, with an average rate of 17.33 m/yr. This shows that Kireet Kumar *et al.* have overestimated the recession of Gangotri glacier during 1935–71 by 330 m. The reference cited by the authors suggests that they used information provided by Vohra[3] to occupy the 1971 snout position. However, this article did not mention the positional details of the 1971 glacier termini, but showed the 1975 snout position in the sketch. This suggests that authors have made some error in occupying the 1971 snout position to re-estimate the recession of Gangotri glacier during 1935–71. Authors may try to occupy the 1956 and 1967 snout positions as loca-

Table 1. Recession rate of Gangotri glacier at different time periods since 1842. Source C. P. Vohra[2]

Period of observation	No. of years	Ice cave retreat (m/yr)
1842–1935	93	7.35
1935–1956	21	10.16
July 1956–March 1962	5.6	18.75
March 1962–September 1971	9.5	32.21
1971–1975	4	28.87
1975–1977	2	36.50
1977–1990	13	28.80
1935–1996*	61	18.8

*(Ravisankar and Srivastava[7])

Table 2. Estimation of glacier recession based on Vohra[2] and Kireet Kumar *et al.*[1]

Period	No. of years	Total retreat (m)	Recession rate (m/yr)
1935–1971	36	624	17.33
1971–2004	33	895	27.12
1935–2004	69	1519	22.0

tion of the snout from the Auden's point are available[4]. If we accept the present measurement of Auden's 1935 snout location and 2004 snout position, the Gangotri glacier has receded 1519.13 m during the last 69 years at a rate of 22 m/yr. If we consider the measurements of GSI in 1967, 1971 and 1975, what emerges is the accelerated recession of Gangotri glacier during 1971–2004, at a rate of 27.12 ma^{-1} compared to 17.33 ma^{-1} during 1935–71 (Table 2).

Kireet Kumar *et al.*[1] have also stated that 'lower recession rate during 2004–05 possibly indicates the high and frequent snowfall recorded in that area during the 2004 winter'. Glacier recession is a complex process and there is no established scientific basis to link yearly glacier recession to yearly variations in weather, as suggested by the authors. Glacier termini changes are directly linked to the glacier mass balance[5] and glacier termini respond to the mass balance changes with a delay, generally called as 'response time'. Response time of a glacier is determined by the mass balance gradient and glacier geometry, including mean surface slope and length[6]. Thus different glaciers in the same climatological set-up respond differently to the changing climate. Hence, prudent understanding on climate change impact on Himalayan glaciers requires in-depth, sustained, long-term studies on glacier mass balance and glacier dynamics. Gangotri is the longest and biggest glacier in the region and its response time could also be the highest. The smaller glaciers of <5 km length, constitute more than 85% of the glaciers in the Ganga Basin and could be better suited for the study to decipher the story of climate change impact on Himalayan glaciers.

1. Kireet Kumar *et al.*, *Curr. Sci.*, 2008, **94**, 258–262.
2. Vohra, C. P., In *Harnessing Eastern Himalayan Rivers* (eds Verghese, B. G. and Ramaswamy, I.), Konark Publishers, New Delhi, 1993, pp. 60–69.
3. Vohra, C. P., In *The Himalaya: Aspects of Change* (eds Lall, J. S. and Moddie, A. D.), 1981, pp. 138–151.
4. Tewari, A. P., *Rec. Geol. Surv. India*, 1971, **106**, 248–256.
5. Paterson, W. S. B., *The Physics of Glaciers*, Pergamon Press, Oxford, 1994.
6. Oerlemans, J., *Science*, 2005, **308**, 675–677.
7. Ravisanker and Srivastava, D., In Symposium on Snow, Ice and Glacier, Lucknow, 9–11 March 1999.

RENOJ J. THAYYEN

National Institute of Hydrology, Western Himalayan Regional Centre, Satwari, Jammu Cantt. 180 003, India
e-mail: renojthayyen@gmail.com

Response:

The comment regarding the position coordinates of snout in different years (1935 and 1971) is not factual, as the paper clearly presents the position coordinates of the snout in different years in table 1. Referring to figure 3 of our paper as a sketch is also not correct, as it is a diagram drawn to scale and indicates magnitude and direction of snout positions in different years obtained after occupying ground positions. The comment about occupying the snout position of 1971 incorrectly, is also not acceptable as the snout positions are well marked on ground based on past work done by different researchers using snout monitoring and geomorphological evidences[1].

Thayyen's suggestion of occupying some more snout positions from different years is agreeable to further reduce the uncertainties in annual retreat rates of different years. But, this would require more information on snout position in different years.

Thayyen has mentioned nearly the same values of total retreat (~600 m) between 1956–67 and 1956–71, which may need explanation in the light of high annual retreat rates (27–35 m/yr) reported[2] post-1956.

The results obtained through GPS survey in our paper have generally shown agreement with past retreat rates as obtained through pioneering studies of the GSI and others. There was a reportedly sharp rise in retreat rates up to 38 m/yr (i.e. by nearly three times) after 1956 and it continued[2] till 1977. These calculations of retreat rates are mostly done using arithmetic averages of two epoch data (e.g. from 213 m retreat between 1935 and 1956, and 600 m retreat between 1935 and 1967)[3]. The continuous decline in retreat rates is also reported after 1975–77 by GSI[2]. There has been a general agreement about lower retreat rates (~18 m/yr) after the 1971–77 surveys and mainly in late eighties and beyond[4]. Our study also reconfirmed this trend with precise GPS measurements. The results of snout monitoring conducted during 2007 by our team also indicate a retreat rate of about 11.80 m/yr (with snout position at 30°55′28.052″N and 79°04′47.921″E).

There have been some discrepancies in calculated retreat rates due to different averaging periods and lack of information about measurement errors. Additionally, frequent shifting of ice cave has been reported as the possible cause of these discrepancies in calculation snout retreat[2]. The only possible way of avoiding this discrepancy could be frequent monitoring of snout using precise instrument. An attempt is made by us in this direction using GPS surveys.

The comment made about glacier response to climate change is known for some time. Our paper did not conclude anything on this. In this case, the influence of recent snowfall events (i.e. 2004) may not be significant on mass balance of a large glacier like the Gangotri. As such, there are no data to support or reject this. But, in a compound glacier like the Gangotri, which is fed by tributary glaciers of different sizes, disintegration of ice cave and its shifting may be influenced by melt-water flow from these tributary glaciers, and can play a role in snout retreat. Effect of winter snowfall in controlling melt-water generation might be one of the important factors in such cases, which has been mentioned in our paper. In the present stage, this may be a qualitative statement as no quantitative information is available about glacier response as a whole. However, efforts can be made to undertake well-designed experiments in this direction for both small and large glaciers using appropriate methodologies.

1. Sharma, M. C. and Owen, L. A., *J. Quat. Sci. Rev.*, 1996, **15**, 335–365.
2. Srivastava, D., Proceedings of the Workshop on Gangotri Glacier, Special Publication, GSI, Lucknow, 2004, vol. 80, pp. 21–32.
3. Tewari, A. P., *Rec. Geol. Surv. India*, 1975, **106**, 248–255.
4. Raina, V. K., *J. Geol. Soc. India*, 2004, **64**, 819–821.

KIREET KUMAR*
RAKESH K. DUMKA
M. S. MIRAL
G. S. SATYAL
M. PANT

G.B. Pant Institute of Himalayan Environment and Development, Kosi-Katarmal, Almora 263 643, India
**e-mail: kireet@gbpihed.nic.in*