

## CORRESPONDENCE

ments. Then only will this system be able to deliver the goods.

Every now and then reports appear of cases of students being subjected to undue exploitation through practical examinations.

It is high time, therefore, that we found a lasting solution to this problem. Mere banning and penalizing of the tuition and coaching institutes has not proved effective. One way of ridding the students of these exploitations is by rendering the performance of the candidate in practical exams irrelevant, so far as the final aggregate or the division awarded is concerned. But in doing so, care must be exercised, to ensure that the sincerity and involvement of the students

in practical laboratory classes and subsequent examinations is not compromised. Otherwise the very objective of developing scientific temper and raising the level of confidence, and creativity, through practicals, will stand defeated.

The performance of the candidates can alternatively be judged by awarding grades, instead of numeric marks, which add on to make up the final aggregate total.

Enforcement of this system will make students more confident and their minds free from the fear of their divisions getting spoiled.

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1. Chakraborty, T. K., *Curr. Sci.*, 2002, **82**, 1069.

2. Sathyamurthy, N., *Curr. Sci.*, 2002, **83**, 196.

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## Non-conventional energy

The Ministry of Non-conventional Energy Sources has provided 1083 crores of rupees for the financial year 2003–2004, which happens to be much more than the revised estimate for financial year 2002–2003 (888 crores of rupees)<sup>1</sup>. One of the highlights of the budget is that 40,000 solar cookers are to be installed in remote areas. The main drawback of such solar cookers is that the time required to cook any food is more than for conventional cooking methods. This is a hurdle in its popularity and widespread use.

While installing or providing such a cooker, care has to be taken to see that the solar cooker user should have suffi-

cient time to use it. Normally these facilities are meant for poor people in tribal and *adivasi* areas. The daily routine of such people starts with sunrise and ends on sunset. They are not able to sit at their huts during daytime. It is hardly possible, therefore, to cook food by a poor or tribal family using a solar cooker. Such devices, then, are to be installed in middle class or rich family homes where the user has sufficient time to use it. One cannot expect the use of such a solar cooker in a family all whose members work in a factory or in a forest. Hence around 400 lakhs of Rupees (40,000 × Rs 1000) will be wasted. Simi-

lar reports have already been published in national dailies regarding some state governments' activities where not a single cooker is being used in a few thousands supplied.

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1. Sen, N., *Curr. Sci.*, 2003, **84**, 620.

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## Mahyco–Monsanto's *Bt* cotton fails to perform

Gene Campaign has conducted a field study to collect data on the performance of *Bt* cotton and non-*Bt* cotton. The survey was conducted in selected locations in Maharashtra and Andhra Pradesh and included a total of 100 farming families selected by random sampling. The *Bt* cotton varieties compared were *Bt* 162 and *Bt* 184 belonging to Mahyco–Monsanto and the non-*Bt* cotton varieties were the local hybrids Brahma and Banni.

Average yield per acre was found to be lower in the case of *Bt* cotton in all categories of land holdings. Non-*Bt* cotton varieties yielded between 15 and 17 per cent more than the *Bt* cotton.

The *Bt* cotton was found to be a shorter duration crop (90–100 days) than the non-*Bt* cotton (100 to 120 days) but the plants showed less vigorous growth, with fewer branches and smaller leaves. A major problem reported everywhere was the premature dropping of bolls in *Bt*

cotton which were on average smaller in size than the non-*Bt* cotton bolls.

A comparison showed fewer bolls and shorter fibre length in *Bt* cotton. Non-*Bt* cotton was graded as A and B quality whereas *Bt* cotton was graded as B and C, fetching on an average Rs 300/quintal less on the market.

One of the most significant findings of this study was the indication that these *Bt* cotton varieties do not offer protection against pink bollworm (*Pectinophora*

*gossypiella*). Pink bollworm attack was found to be severe after 60 to 70 days. There are two possible reasons for this. The first is that the period of expression of the *Bt* endotoxin does not coincide with the time of the bollworm attack. The other explanation is that the pink bollworm is not susceptible to the *Bt* endotoxin.

Morin *et al.*<sup>1</sup> report that field populations of pink bollworm harbour three genetic mutations that confer resistance to *Bt* toxin.

The economics of cultivating *Bt* cotton is clearly not in favour of farmers. The seed is about four times more expensive than the good local hybrids. The difference in the price of seed is approximately Rs 1200 per (450 g) bag, while savings on pesticide averaged only Rs 217 per acre.

The total investment per acre is much higher for *Bt* cotton than for non-*Bt* cotton varieties. The *Bt* cotton farmer had to invest on average, Rs 983 more per acre than his non-*Bt* counterpart.

Net profit from *Bt* cotton was lower per acre compared to non-*Bt* cotton in all types of fields (low to high yielding). In fact, 60% of the farmers cultivating *Bt* cotton were not even able to recover

their investment and incurred losses averaging Rs 79 per acre.

A number of factors have probably contributed to the failure of Mahyco-Monsanto's *Bt* cotton. The first is the poor quality of the varieties. It is known that *MECH* 162 and *MECH* 184, which were transformed to *Bt* 162 and *Bt* 184, are poor to modest performers. A better variety would give a better *Bt* cotton so the GEAC must answer why it approved this *Bt* cotton when better quality *Bt* cotton hybrids belonging to Indian companies were in the pipeline.

Because of the expensive seeds and modest pesticide saving, the economics of the *Bt* crop is not favourable for the farmer. Tilting the balance further is the fact that *Bt* cotton must be grown with a refuge, necessary for resistance management. This is recommended as 20% of the cultivated area by the GEAC. 'Wasting' 20% of the land on managing resistance makes the *Bt* cotton even more nonviable, especially for small farmers.

A further problem appears to be the vulnerability of *Bt* cotton to pink bollworm, which is a significant cotton pest in India. If this is indeed the case as this study demonstrates, then the *Bt* strategy for cotton is likely to fail because if the

*Bt* endotoxin protects only against the green bollworm and not against the pink bollworm, then farmers will have to continue pesticide sprays.

One of the most shocking revelations of this investigation was the fact that neither state level nor district level committees had been set up in either Maharashtra or Andhra Pradesh where *Bt* cotton was being commercially grown. This is a breach of law and a direct violation of the prescribed rules for the manufacture, use, import, export and storage of hazardous microorganisms and genetically engineered organisms and cells, under the Environment Protection Act, 1989.

1. Morin, S. *et al.*, *Proc. Natl. Acad. Sci.*, 2003, **100**, 5004–5009.

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## Importance of palliative care services for patients with gall bladder carcinoma

Gall bladder cancer (GBC) is the commonest abdominal malignancy in northern India, with an estimated incidence of 6 per 1,00,000 population<sup>1</sup>. GBC is a fatal disease with poor prognosis. Even with the numerous diagnostic tests available, GBC is frequently first diagnosed during laparotomy or laparoscopy procedures, which are expected to confirm the presence of benign gall bladder diseases<sup>2</sup>. Approximately 2% of patients who have operations for gall stones are diagnosed with cancer at the time of surgical exploration. In India, however, the majority of GBCs are found to be at an advanced stage during ultrasonography for upper abdominal symptoms<sup>3</sup>, making it difficult for initiating any curative treatment. Hence, majority of patients are considered for palliative treatment. We conducted a survey-based study in

which a questionnaire was mailed to 153 patients with GBC (male : 50; female : 103), who had received treatment in our institute. Seventy-two patients or their relatives responded. The details of the study are given in Table 1.

On the basis of our survey we would like to emphasize that majority of Indian patients with GBC require palliative care (PC). Unfortunately, the concept of PC for cancer patients is relatively new to India<sup>4</sup>. The benefits of pain relief, con-

Table 1. Response to questionnaire-based survey

No. of patients to whom questionnaires were mailed	153
Patients residing in urban area	65 (42.5%)
Patients residing in small township/village	88 (57.5%)
No. of patients who received curative treatment in hospital	39 (25.5%)
No. of patients who received palliative treatment in hospital	114 (74.5%)
No. of patients who responded	72 (47.5%)
No. of patients who sent back incomplete questionnaires	8 (11.1%)
After leaving the hospital:	
No. of patients who faced problem of pain management	28 (38.8%)
No. of patients who faced problem of management of jaundice	21 (29.1%)
No. of patients who faced problem of management of ascites	10 (7.2%)
No. of patients who faced problem for nausea and vomiting	12 (16.6%)
No. of patients who went for alternative cancer therapy	15 (20.8%)