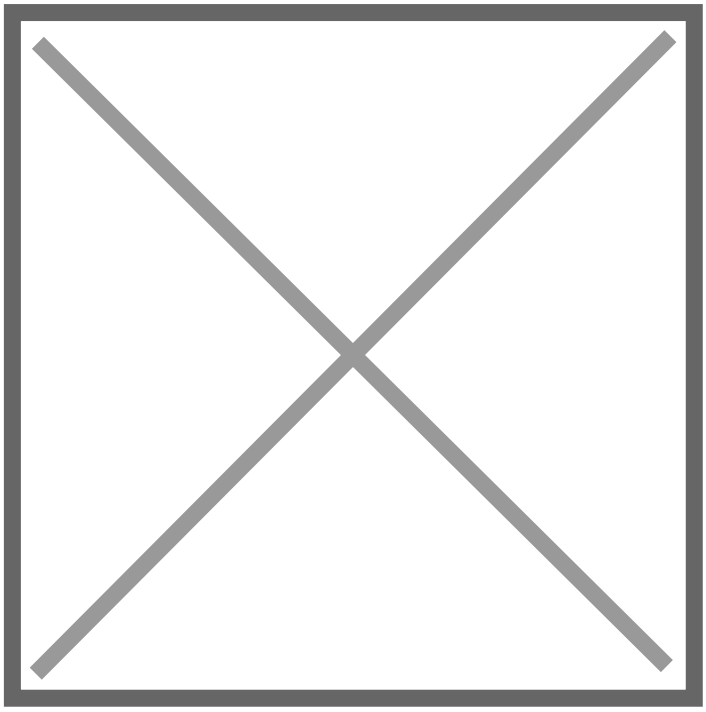
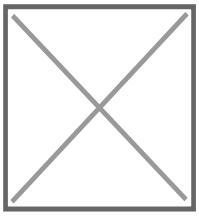
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GM research with little sense

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At the national symposium on Relevance of GM Technology to Indian Agriculture and Food Security, organised by Gene Campaign some months ago, two issues were raised repeatedly. One that India needed to tailor its GM research program carefully to specifically target problems faced by Indian agriculture. This is especially important because public research budgets are modest and the money must be spent wisely. The second point was that the system for regulating GM crops in India was appalling and needed to be overhauled immediately. In light of these strong sentiments expressed at the national symposium, it is distressing to note the direction of the GM research agenda being funded by the Department of Biotechnology in India. So much of the research is copycat, merely repeating what scientists elsewhere have already done. Much is peripheral to the needs of Indian farmers. Some is plainly nonsensical.

The Department of Biotechnology at the University of Agricultural Sciences (UAS), GKVK Campus, Bangalore has two projects on developing GM crops that illustrate what I mean.

One project is on edible vaccines where the scientists are trying to put the cholera vaccine gene into muskmelon; the reasoning probably is that vaccination can be made simpler by putting the vaccine into a food that can be consumed easily. The other is a project on putting the insulin gene into groundnut, as a potential treatment for diabetes. The reasoning here is that diabetics could take their insulin by eating the doctored groundnuts.

Edible vaccines look attractive as a concept but their implementation in India could turn into a nightmare. How, for example, would one distinguish between a vaccine carrying fruit and non-vaccine muskmelon? What would happen if one were to eat too many muskmelon containing the vaccine because the vaccine fruit reached the fruit vendor due to some mix up at harvest/sale? One muskmelon would look pretty much like another. Or, suppose the muskmelons were eaten when they were raw or overripe? What would happen to the prescribed dosage in that case? Would a child have eaten too much vaccine? Too little? What consequences would this have?

This is like putting the cart before the horse. Is the research concept of an edible vaccine in a perishable, seasonal fruit like muskmelon, a sound one? Muskmelon in India is essentially a crop of the river sandbanks in the plains of north India. It is a summer crop, which ripens and is at its best in May and June, before the onset of the monsoon around mid-July. Muskmelon does not grow in winter, it does not grow on the hills and it does not grow, for instance, in Kerala or Kutch. So this edible vaccine would be available only in a specific geographical region and only during a specific season. It would not, for example, be available to handle a cholera outbreak in Mussoorie or Darjeeling. Being a seasonal fruit with high water content muskmelons are highly perishable with a short shelf life. They are also difficult to transport and are hence unsuitable as a crop

to carry vaccines. This kind of research should have never been sanctioned. In fact the whole concept of edible vaccines is a flawed one as pharmaceutical plants landing up in the food chain show.

The research on inserting the insulin gene into groundnuts to find a cure for diabetes is even worse. Insulin is a protein. If there were indeed an insulin-carrying groundnut, once it was eaten, the insulin in it would be digested by the gastric juices just like all the other protein in the groundnut and lose its identity as insulin. Proteins are broken down in the digestive tract into amino acids, which are then absorbed by the body as nutrition. The same thing would happen to insulin. So an insulin-containing groundnut would deliver amino acids to the diabetic, not the insulin that the patient needs.

As insulin gets broken down in the stomach, no oral form of the medicine, like tablets or capsules, have come to the market. The insulin dependent diabetic can be treated only with injections since this is the only way that insulin retains its integrity when it reaches the bloodstream. In that form, it can break down the sugar that is collecting in the blood and keep the disease under control. So the insulin-in-groundnut research is conceptually flawed, headed nowhere and is a waste of the taxpayers' money.

This is another research project that should not have been sanctioned but the question is, who is granting scarce research funds to these dead end projects? Who is taking these decisions? Are the top science echelons themselves incompetent or is there apathy of such high order that no one cares about wasting money and making laughing stocks of ourselves? We need a thorough review of the GM research program in India and we need to set up a competent multistakeholder body that will decide on India's research priorities after an appropriate consultative process.

By Dr Suman Sahai

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