

BIOTECHNOLOGY EDUCATION IN INDIA: THE MYTH AND ITS REALITY

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Abstract

Biotechnology education in India is expanding and attracting large number of students but the private institutions offering Biotechnology courses are failing to produce graduates employable by the Biotech Industry in the country. Though Biotechnology offers a vast potential for turning tables in favour of revamping Indian economy, the quality of education in this sector is not up to the mark. The managements of private institutions have created a myth that there is a boom in the Biotechnology sector and undergraduate courses that they offer are the short-cut to fetch jobs in this field. However, the reality is that they are lacking the competent faculty and the infrastructure essential for producing Biotechnologists needed in the employment sector. There is a need to monitor the quality of education in this sector through a regulatory body.

Key-words: *Biotechnology education, associated myths and reality, potential of Biotechnology*

Introduction

The Biotechnology Education has witnessed a phenomenal growth in terms of number of institutions and expansion in terms of the variety of courses they offer. Starting with Post Graduate courses in Biotechnology in five universities with funding support of Department of Biotechnology, Government of India in 1986, by the year 2010 there were “about 380 private institutes offering under graduate, post graduate, M.Phil. and Ph.D. courses and 120 public institutes offering post graduate and Ph.D. courses in Biotechnology” (BioSpectrum, 2010). Despite the fact, that the private institutions charge more than Rs. 3.2 lakh as fee for a two year course and around Rs. 6.00 lakh for a B.Tech course, the demand for these courses is increasing every year.

What makes the Biotechnology courses so charming? Is it the market demand of some other factors? These are the two main questions that are addressed in this article. But before doing this, a brief description of the field of Biotechnology, its scope and potential has been described in brief as a prelude to answering the raised questions.

Biotechnology: The Field and Scope

Biotechnology as a separate field of study has a recent origin from various branches of life sciences. Biotechnology is the application of scientific techniques of biology and technology to modify and improve plants, animals and micro-organisms to enhance their value. It is technology which is based on biology, agriculture, food sciences and medicine. Often Biotechnology is referred to as Genetic Engineering as well as Cell and Tissue Culture technology. However, it is much more than Genes and Cells. Biotechnology has the potential to develop new value added products, processes, techniques/tools in the area of agriculture, human and animal health and environmental protection. In fact, it has a vast potential for unlocking new technological combinations. It can give solutions to many problems related to food and agriculture production, animal and human health and development of eco-friendly products to save our environment and life.

Biotechnology as a field of study has specialized broadly in to the following five branches:

1. *Bioinformatics* - is an interdisciplinary field which utilizes computational techniques to solve biological problems or understand the biological phenomenon. It is also referred to as computational biology and finds vast application in functional genomics, structural genomics, proteomics and in Pharmaceutical sector.
2. *Blue Biotechnology* – involves the study of marine and aquatic life and its technological applications for human use and welfare.
3. *Green Biotechnology* – is related to agricultural processes. It is used in developing transgenic plants/crops to grow in specific environmental conditions with or without the presence of chemicals. Green Biotechnology has the potential to produce better crops with more yields along with more environment friendly solutions.
4. *Red Biotechnology* – is concerned with animals and humans, their health and medicines, genetic engineering and morphology.
5. *White Biotechnology* – is concerned with the industrial application of bio-processes in production of value added Biotechnology products like food items and pharmaceutical preparations.

How Charming is a Career in Biotechnology?

The vast potential of biotechnology in spheres directly related with healthy and happy survival of mankind like possibility of finding remedies of many incurable diseases, increasing food productivity to meet the food demand of ever increasing world population, offering sustainable development techniques to ensure protection of our depleting resources and environment etc. makes Biotechnology a promising field of the future.

No doubt the output of research in biotechnology and its consequent industrial applications and developments that the world has benefitted in the recent years are sufficient proof of the future prospects of Biotechnology. In fact, Biotechnology has potential impact on virtually all domains of human welfare, ranging from food processing, protecting the environment and to human health. As a result, it plays a very important role in employment, production and productivity, trade, economics and economy, human health and quality of human life throughout the world. In addition to this, marked contributions are also made in renewable energy and fuels, chemicals and bio-chemicals, population control, food processing and beverages, mining, crime detection and disputed parentage. Hence, Biotechnology today looks like what information technology was in the 1990s.

Career in Biotechnology is a good option in India as the country has witnessed remarkable growth in biotechnology sector. India has become one of the best destinations for biotechnology industry due to good network of research laboratories, rich biodiversity, well developed base industries, rich agriculture sector and trained manpower. The biotechnology professionals can get good jobs in the pharmaceutical companies, agricultural, chemical and allied industries. They can get the employment in the areas of production, planning and management of Bioprocess industries. The biotechnologists have a great scope in the research laboratories. The biotechnologists in India get employed in various government-based and private universities and research institutes as research scientists or assistants.

The Biotechnology Scenario in India

Realizing the potential of Biotechnology the Government of India established the Department of Biotechnology under Ministry of Science and Technology as early as in 1985 with a clear perspective vision of capitalizing upon the potential of Biotechnology and turn tables in favour of Indian economy. Based upon the experience of capitalizing the field of information technology in

Indian favour, the Department of Biotechnology kept training of manpower in Biotechnology in its top agenda with liberal funding for it. As a result, in a span of ten years almost 30 universities established Department of Biotechnology to launch M.Sc. and Ph.D. level Biotechnology courses.

Simultaneously the Biotech Industry also witnessed a boom resulting in good placement of the Biotechnology post graduates. This resulted in a great demand and supply gap between those Biology graduates aspiring for a PG course in Biotechnology and the number of seats available in the university departments of Biotechnology. While this scenario was prevailing, GATS Agreement was signed between India and it paved way for private institutions to capitalize upon the demand and supply gap. Private education vendors entered in a big commercial way to launch even under graduate courses like B.Sc. and B.Tech. Biotechnology.

Since Biotechnology offers great possibilities in agriculture and animal husbandry the agriculture universities did not lag behind and today almost all the central and state agriculture and veterinary universities offer M.Sc. Agricultural Biotechnology, M.V.Sc. and Ph.D. courses. "By the year 2010 almost 500 institutions, 380 private and 120 public sector, were offering courses like B.Sc., B.Tech., M.Sc., M.V.Sc., M.Tech. and Ph.D. courses in biotechnology in India" (BioSpectrum, August, 2010).

The Myth

The Intermediate/Senior Secondary Biology pass-out students who failed to get a MBBS course seat are lured by the managements of the private institutions which are more than 400 in number today. Heavy investment is made by the private institutions in advertising their under graduate courses in ways as if their courses were even better than the established Engineering and Management courses in getting jobs.

In fact, they have created a Myth through media about the boom in biotech industry and job potential of their undergraduate courses. The courses are advertised in such a way that creates an impression as if their courses will turn out a biotechnologist suitable for the Biotech Industry, who in turn will give them an immediate placement on a good salary package. The success of the myth can be gauged from the fact that average fee of a three year B.Sc. Biotechnology Course is around Rs. 3.00 lakh and for a B.Tech. Biotechnology course it is between Rs. 5.00 to 6.00 lakh and the seats are full. However, this is simply a myth, as these courses are neither turning out Biotechnologists suitable for the industry nor there is the projected demand for such graduates in the employment market.

It is also a myth that Biotechnology field offers promising career in research in this area. Over the year research funding for Biotechnology has been curtailed. For example, under Eleventh Five Year Plan it is observed that a significant amount of money was invested upon sectors like Aerospace science & engineering (approx 1300 crores), Engineering materials, Mining/Minerals & Manufacturing technology (approx 900 crores), Pharmaceuticals, Healthcare & Drugs (approx 1000 crores), Information technology: Resources and products (approx 800 crores). In comparison to these sectors a small amount (approx 800 crores) was allocated to the research in the area of Biotechnology. This is perhaps due to the realization that Biotechnology is not so glittering a field as it is projected. The experience with BT Cotton and GM Rice and controversy related with cloning etc. are some of the glaring examples that have led to a rethinking in Government for heavy investment in this field. Thus it should not be expected that too many research jobs in the field of Biotechnology will be available in future.

Hence the general perception that there is boom in this sector in terms of jobs and salaries and that the under graduate courses offered by private institutions across the country are short-cut to cash

this boom is a myth and one should not be swayed by misleading advertisements.

The Reality

In reality, Biotechnology is the exploitation of biochemical potential of plants, animals and microorganisms for medical, agricultural and industrial purposes. In reference to food production and processing, a biotechnologist would probably define biotechnology as "the application of biological organisms, systems or processes in manufacturing and service industries. Biotechnology is a research-oriented science which fuses of biology and technology. It includes the study of a large variety of subjects like Biochemistry, Genetics, Microbiology, Chemistry, Virology, Immunology and Engineering. It is associated with other subjects such as Health and Medicine, Cropping System and Crop Management, Agriculture and Animal Husbandry, Soil Science and Soil Conservation, Ecology, Bio-statistics, Cell Biology, Seed Technology, Plant Physiology etc. Biotechnology features the use of living cells and bacteria in the industrial process. It can be applied in developing various vaccines, medicines and diagnostics, improving energy production and conservation and increasing productivity.

Being a research oriented science Biotechnology education is expected to train graduates in all sophisticated analytical laboratory skills required of a Biotechnologist who could deliver outputs expected by the Biotech Industry. Private institutions can do this only if their laboratories are equipped with all essential scientific instruments required to analyse and operate at the DNA/RNA and other bio-chemical molecule level. At present hardly a few private institutions have such costly equipment in required numbers.

The education and training students get today is far from satisfactory from the industry point of view. The figures presented by the 2010 survey of the BioSpectrum revealed that hardly 2 to 3% biotech graduate get placements in the average salary package of Rs. 3.2 lakh per annum. In the same issue Sujay Shetty, a pharma industrialist is quoted as saying "There is a strong need for metrics in education. There is no dearth in courses and programmes, but, we need to introspect on the quality of graduates we are creating".

To understand this subject one has to have hands on experience during the laboratory sessions. It is very sad that many institutions in India cannot afford to have such costly equipment. They also lack trained experts who can handle sophisticated biotechnological equipment. The student is the ultimate scapegoat for this whole situation who comes out with a formal degree but lacking practical knowledge. Every year a large section of students come out with degrees in Biotechnology but with the absence of practical knowledge with application skills for either carrying out further research in this area or delivering goods in the industry.

It is clear that a large number of under graduate and post graduate students without desired level of competence, knowledge and skills in Biotechnology fizzle out either as a frustrated lot or compromise with petty jobs in the sales sector of medicine industries. Many of those who studied these courses with a hope of carrying out innovative research in this area also unfortunately end up into some unrelated activities. Some students try to enter the pharmaceutical industry as the opportunities are high in this area and many settle down as teachers in colleges and Universities where often there are limited possibilities to excel in the field of biotechnology due to lack funding and research facilities. Hence these people are bound to teach only the theoretical concepts ultimately producing another chunk of students with undefined destiny.

Conclusion

Given the potential of Biotechnology in various fields, it is no doubt a fascinating and

challenging field which offers possibilities of good jobs in the biotech industries, research establishment and universities. This is true only for those students who are research oriented with post graduate degrees and aptitude, perseverance and skills to carry out fundamental research in frontier areas of Biotechnology.

The subject Biotechnology can prove to be a boon in Indian society only after a large number of changes are made. These changes include enhancing the Laboratory facilities so that the students come up with good practical knowledge and skills. The students should have the knowledge of those biotechnological applications which will help them in their day to day activities. At present majority of education institutions in India are failing to support this due lack of good faculty and essential infrastructure to turn out Biotechnologists required by the Indian Biotech industry to compete with international players to augment Indian economy. Seeing these shortcomings of Biotechnology education in India, the Department of Biotechnology has taken a strong step to have regulatory body under the AICTE to monitor and regulate the quality of Biotechnology education. No doubt it is a welcome step but there is a need to ensure that corruption does not enter in this body, as private institutions come up only with commercial interests.

Having gone so ahead, the Government should not curtail its spending on the research and developments in the field of Biotechnology, as the outcome of this funding is bound yield the desired results in terms of meeting the challenges foreseen in the food, health and environment sector. Our youth has proved their potential in the field of information and communication sector, it will prove its potential in the Biotechnology sector and turn tables to bring an economic boom through this sector.

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