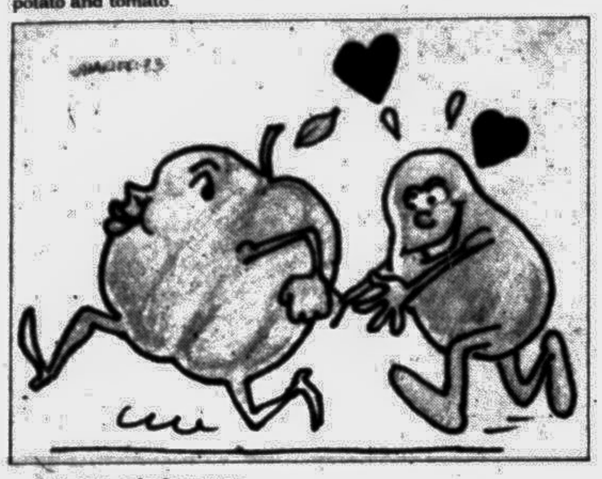
## Feature — Science and Technology

# Culture that Enhances Crop Quality

**by Raffat Binte Rashid**

HERE is an interesting poem by Nirmala Maheshwari. In this piece the poetess brings in the fundamental theme of tissue culture through an imaginary dialogue between potato and tomato.



A tomato asked a potato
Will you fuse with me?
You red rotund and luscious,
Me brown fat and delicious
An alliance so novel and fractious
Oh! Goodness gracious
What name will our progeny bear?
Topato Pomato, little do I care?
Come closer,
Let's fuse together:
No no, not sexually ever
Parasexually my dear,
How that?
In a Petri dish with a protocol
Straight out of inventors Melchers and all
That's blasphemy, note my dissent
I withdraw my consent.
Come on come on it will be fun,
We will both watch our progeny come
Don't you know our ancestors are one?
Be so nice, give me a cell,
Let it be from anywhere,
Leaf, stem, root or even tuber,
I'll squirt mine too into a mixture
Of enzymes all jap to hydrolyze the barrier.....

Tissue culture is actually the growing of detached pieces of tissue or woven fabric of similar cells, of plants or animals, in nutritive fluids. Science is always very confusing as well as intriguing. There is nothing called impossible in the world of science.

Plant genetic engineering and plant tissue culture are hardly a new idea, they are half a century old. But got started in Bangladesh very recently, only in 1977. A three-day international plant tissue culture conference in Dhaka was inaugurated by the Prime Minister Begum Khaleda Zia recently.

A completely new initiative, this conference called for the sponsors to take steps in establishing an institute in Bangladesh to help boost the country's agriculture.

"Knowledge is power and power can bring about revolution," was the main aim of this international meeting according to Professor A S Islam, Chairman Organising Committee.

This conference organised by the Bangladesh Association for plant tissue culture (BAPTC) was attended by Agriculture, Irrigation and Flood Control Minister Majid ul Haq, State Minister for Science and Technology Professor M A Mannan, FAO expert Dr R B Singh, BARC Executive Vice-Chairman Dr M S U Chowdhury, BAPTC President Dr M A S Jalil and Chairman of the Organising Committee Professor A S Islam.

"The theme of the conference is very relevant to our situation. Any topic of science and technology which aims at alleviation of poverty is desirable to us", emphasized Prime Minister Begum Khaleda Zia. "Plant tissue culture has ushered in a new revolution in the quality production of different crops, we can also develop our agriculture if we could more and more apply this technology," Begum Zia said.

"Bamboo plantation has greatly reduced due to its use in rural housing and pulp for paper mills. The 'kadam' tree which is used in making match boxes is now in short supply. I am happy to know that technology for rapid multiplication of these two valuable products of nature through tissue culture has, in the meantime, been evolved in Bangladesh. This technology should be applied commercially to replenish the dwindling stocks of bamboo and kadam trees. I am glad to know that this conference will deal with diversified use of 'Neem' including its use as an indigenous insecticide. Chemical insecticides have proved to be environmentally hazardous," the Prime Minister said. We should, therefore, give more attention to factors of bio-insecticides instead of the chemical ones.

Plant tissue culture and genetic engineering are inter-related. In many cases application of one is not complete without the other. The joint application of genetic engineering and tissue culture is needed for the development of quality pulses with high protein, this will provide an impetus to the ongoing 'Daal-Bhaat' programme for poverty alleviation. The scientists from home and abroad could come forward to develop high protein pulses. Such pulses can free the poor from hunger and malnutrition, the Prime Minister added.

"Our scientists need modern equipment and other infra-structural facilities to take up tissue culture. Despite resource constraints we will take necessary steps in this regard. Countries around us have modernised their agriculture through proper application of science and technology. We cannot afford to lag behind," she urged.

"You are aware that we have attached priority to tree plantation and afforestation. Plant tissue culture can bring momentum in our programme. We can use it as a strategy for poverty eradication. We should, therefore, be more active to popularise this latest technology," she said.

Major General M Majid ul-Haq, Minister for Agriculture, Irrigation, Water Resources and Flood Control stressed the need for development of this new technology in our country. Making the academics of science and technology much more easier and understandable for the general people to grasp should be the main purpose of such important conferences, Majid-ul-Haq felt. "We have to go for commercialization, it is a must in our country and tissue culture being a very new step, our entrepreneurs should be ensured that there is a market," he said. All requirements should be properly addressed, positive steps towards commercialization and export potentially should be taken too, he urged the scientists at home and abroad.

Dr R B Singh of FAO, Rome strongly believed that modern agricultural biotechnology holds considerable promise to meet the challenges of improving global food security, nutritional adequacy and sustainable agricultural development.

South and Southeast Asia, including China, accounts for about 50 per cent of the world's population but even less than 25 per cent of the world's arable land. Despite significant increases in agriculture production during the past three decades, more than 50 per cent of the world's malnourished are concentrated in this region. Given the past and projected population growth, the situation will worsen if the pace of agricultural production is not accelerated. Hunger persists in several parts of the globe. Therefore, to feed the world in the 21st century plant tissue culture is an essential initiative that must be undertaken, Dr R B Singh stressed.

This three-day international conference is attended by 60 scientists from 16 different countries.

# *Plant Tissue Culture : Commercial Realities and Possibilities*

**by Dr Jitendra Prakash**

THE human population is likely to double in about 35 years. More than 10 billion people will have to be fed, clothed and provided with jobs under conditions of shrinking land and water resources for agriculture, expanding biotic and abiotic stresses, increasing genetic erosion and raising cost of fuel energy reserves.

With the on growing demand for the economic products of plant origin relentless efforts are underway to increase the productivity of plants and quality of produce and also to develop plants of agronomic relevance through newer technologies as that of biotechnology.

The impact of biotechnology should be felt through solving the basic problems of food, fibre, fuel and medicine. Our main objective should be to improve the plants' inherent ability to be more productive which can best be achieved through a combination of conventional plant breeding techniques and biotechnologies.

The tools of biotechnology can help raise the productivity of major crops through an increase in total dry matter production which can then be partitioned in a way favourable to the economic part. The term biotechnology is currently being used to connote a wide variety of biological manipulations. The immediate application would be tissue culture for the fast multiplication of superior clones of various plants.

### Biotechnology in developing countries

Biotechnology could help solve some of the most pressing problems of the developing countries like:

Health, Nutrition, Industrial Development, Environment Protection and Energy production.

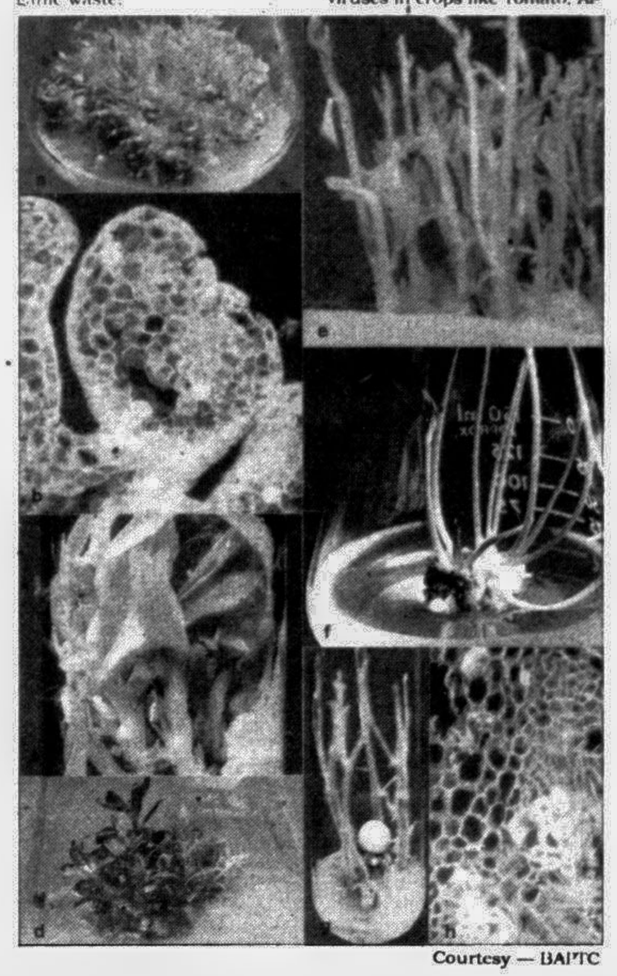
Several plant species are poor in protein, quantitatively and qualitatively. Introduction of specific genes into those plants can help production of great quantities of proteins which are as nutritional as human milk.

Similarly, the production of plant species of greater use (such as rice, wheat, maize) can be increased by introducing in their genome, those genes which assume resistance to different stresses such as unfavourable climatic conditions or harmful biological agents like insects, fungi or viruses.

One obvious application would be, introduction in plants of genes for nitrogen fixation, which would enormously reduce the costs deriving from the wide usage of chemical fertilizers in agriculture.

Further more plants can be engineered to produce molecules of particular value such as drugs of complex protein structure. In this way, expensive drugs could be derived from plants cultured at low price, assuring continuous and high level production of useful molecules.

Biotechnology industries offer environmental friendly industries to flourish. Further more, living organisms can be useful to obtain macromolecules to depollute land, for improved utilization of agriculturally valid land in condition of scarcity of water, for the degradation and depollution of organic waste.



Courtesy — BAPTC

Tissue culture techniques such as protoplast culture, somaclonal variation, endosperm culture, limited gene transfer, embryo rescue techniques, another culture and gametoclonal variation can speed up the process of introduction and induction of variation at the cellular level in most of the economically important agricultural and horticultural crops. In plants like Cotton, Potato, Tomto, Tobacco insect resistance can be built using Bacillus thuringiensis (BT) Crystal protein genes.

Using recombinant DNA techniques resistance has been built for a wide spectrum of viruses in crops like Tomato, Alfalfa, Tobacco, Potato, Rice etc. Of recent herbicide tolerant Soyabean, Cotton, Corn, Oilseed rape, and Sugarbeet have been developed for herbicides such as bromoxmyl, atrazine and glyphosate. In future we may expect plants developed to tolerate heat, cold, drought, salt and heavy metals.

We need technology which can improve continuously the productivity, profitability, stability and sustainability of our major farming system.

Biotechnology is highly capital intensive and since delivering of large volumes are targeted at specified times, the per plant cost becomes prohibitive. Though an extensive technology has been developed, there are still some major difficulties especially those associated with expansion of this technology to a variety of crops, production cost, seasonal nature and heavy peak demands, personnel/organisation problem and contamination control.

The market for most of the foliage plants is throughout the year.

But for most of the flowering and plantation crops the market is seasonal, demanding voluminous supply of plants within a short span of 2-3 weeks. On the export scene, non availability of appropriate packaging material at affordable price, high air freights, unsuitable air connection lengthy phytosanitary, custom and other export documentation formalities make this non-traditional highly perishable export commodity much less interesting as compared to the potential it has.

### Conclusion

Micropropagation has received worldwide attention and globally over 562 million plants are produced per year through this method. Micropropagation offers much scope and has been estimated that there is an ultimate potential of 15 billion US $ market for micropropagation plants. The parallel area of development to the tissue culture laboratory production is the establishment of hardening houses, on growing greenhouses and cut flower industry. Effective management techniques in combination with favourable government policies could develop this sector into a viable invertment centre.

## Star Special — Computer

# Computing Bytes

## The Daily Star Computer Awareness Course

**by Yousuf M Islam**

*(Continued from last session)*

### Complete Instruction Includes Data (Fig 1.11)

Try the following on a calculator. Press the Plus (+) sign followed by the Equal (=) sign. What happens? Press "6+" then the Equal sign. What happens? Without data or with inadequate amount of data the calculator is unable to execute/process the instruction. Hence, a complete instruction has to include sufficient and correct data to enable execution/processing.

The computer we are constructing currently has a CPU (ALU+ CU+RAM) and a selection of permanent storage mediums which include floppy disc, hard disc and tape. Devices which can physically read and write to these media are also required.

**Q. 1.11 How would we communicate with the CPU? How would we input instructions and data? How would we see the output?**

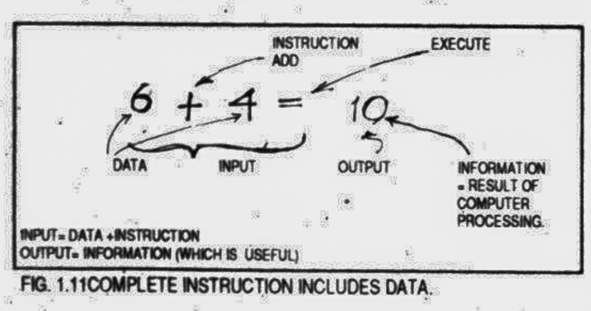



FIG. 1.11COMPLETE INSTRUCTION INCLUDES DATA.

### Elements of a Computer System (Fig. 1.12)

A computer system must include:

- devices for putting in instructions and data, e.g. keyboard
- devices for putting out information which can be read e.g. printer, monitor, etc.
- devices to enable saving to and READing from storage media such as floppy discs, hard discs and tapes.

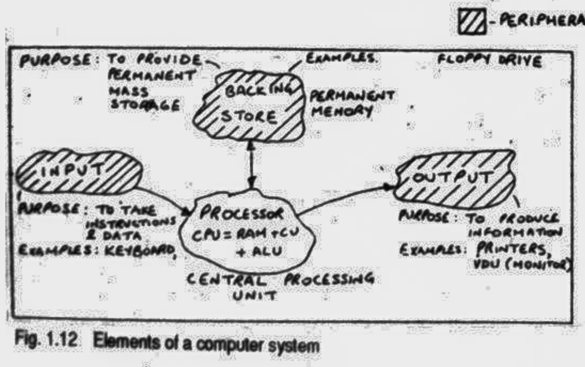



Fig. 1.12 Elements of a computer system

All these devices are connected to the CPU and are known as PERIPHERALS.

The KEYBOARD is similar to a typewriter keyboard. It includes all alphabets and numbers. It also has special keys which are different from that of a typewriter keyboard. A keyboard is used to input instructions and data into a computer. As manually typing on a keyboard is a slow and error prone process many automated input devices have been invented to input data into the computer.

The PRINTER is similar to the typing mechanism of a electric typewriter. There are many types of printers. These essentially vary in printing speeds and quality of print. A MONITOR or VDU (Visual Display Unit) is similar to a television screen on which instructions and data may be viewed if desired. Monitors are usually of two basic types: monochrome or colour.

As the floppy disc can be likened to a tape, the FLOPPY DRIVE can be likened to a cassette player. The floppy drive includes a read/write head (similar to the play/record head) to read from and save to the floppy disc. The head has to be lowered onto the surface of the once the particular floppy has been inserted into the floppy drive (compare pressing the play button on the cassette player). This normally needs to be done manually. However, sometimes the head is lowered automatically depending on the construction of the drive.

**Q.1.12. Where can a computer system be used and how would we get the results required from the computer?**

**Ans. 1.11** *We would need physical devices for putting in instructions and data. We would also need devices to enable us to see the output i.e. the results of processing.*

**Ans.1.12** *We have to carefully study manual work situations to identify areas where processed information is required. Instead of a manual data processing system we could instruct the computer to do the processing. For the computer to do the processing, complete instructions and requisite data would have to be provided.*

# IBM Spain and SCO Sign OEM Distribution Agreement

SCO and IBM Spain announced an OEM agreement which enables IBM to pre-install the SCO UNIX, SCO Open Server and SCO Open Desktop product lines on the new Personal System/2 (PS/2) platform. SCO's complementary products, including development systems, networking and upgrade products, will also be available through IBM Spain.

For the first time, Spanish corporate customers of both companies will be assured of a powerful UNIX solution and first class technical support from a single vendor. The combination of SCO open systems software with PS/2 servers is an effective configuration for large, corporate customers seeking the high-performance rightsizing solutions.

Bernard Hulme, Vice President, Field Operations for SCO Europe, Middle East and Africa states, "IBM's choice of SCO open systems software for PS/2 demonstrates, once again, that SCO delivers the most mature, reliable and compatible systems software on the Intel platform today.

Our joint production, marketing, sales and support activities with IBM will give SCO the opportunity to expand our major accounts focus in Spain, especially in the targeted domains of government, finance, and branch automation."

As part of the agreement, the newly formed IBM UNIX Support team will be trained by SCO in SCO open systems software on the PS/2. SCO training is also available by Authorised Education Centers in Spain to supplement customer training requirements.

# PCs Catch Criminals Using Fingerprint Analysis

TAIPEI — When it comes to industrial espionage, spies can disguise their identity, alter ID cards, and crack passwords, but they cannot change their fingerprints. With that immutable fact in mind, two companies have developed products that use advanced image-processing techniques to capture, encode, and match fingerprints to identify criminal suspects and prevent unauthorized entry.

The idea behind the products of Hsinchu, Taiwan-based Startek Engineering (+886 35 785388) is to use a fingerprint identification system to control access into a computer, transaction-processing equipment, or a physical location like a laboratory. To achieve this, Startek's technology combines optics and accurate matching algorithms to compare a new fingerprint to ones stored in a computer.

Startek offers to products, each of which can store 1000 fingerprints. The FC100 is used for computer and transaction-processing security applications. It consists of a stand-alone FingerCheck fingerprint verifier, an AT-bus interface card, and a software application interface and library. The second product is the FC200, which is an embedded version of the FC100. The FC200 consists of FingerCheck and an RS-232 interface. Both systems are for access control applications and can process a fingerprint in 2 to 3 seconds.

In computer security applications, FingerCheck is connected to a 386 or 486 PC through the AT-bus card. To use the FC100, you place your finger three times on the reader window, a small, red LED screen that's located on top of FingerCheck. A CCD (charge-coupled device) camera inside the unit takes optical snapshots of your fingerprints at one-thirtieth of a second. Fingerprint images are digitized in an image-grabber processing module, resulting in 2-D images of your fingerprints on a computer screen.

Meanwhile, Startek's software automatically extracts 13 feature points of your fingerprint images. Each feature point is translated into binary images and stored in the software library. A single fingerprint is stored in a file of up to 256 bytes. The next time you attempt to gain access to the PC, it will accept or reject your fingerprint.

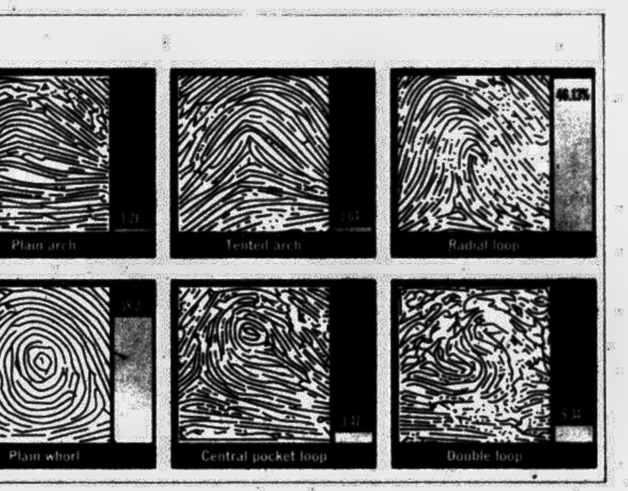
The company's proprietary matching algorithms perform the accept/reject operation. By using an automatic planar-point-pattern device, the program compares the vectors of your binary images to those in the PC. Startek claims the false rejection rate is less than 1 percent. Startek's FC100 costs $ 2700. Prices for the FC200 depend on configuration.

New Delhi, India-based CMC also uses fingerprint verification, but to solve a different problem. Startek's products are designed to control access to sensitive data and locations. CMC's FACTS (Fingerprint Analysis and Criminal Tracing System) uses the power of the computer to reduce the amount of time required for a person to compare fresh fingerprints to thousands of fingerprints in an existing database, a task that — when performed manually — is herculean. Agencies like the FBI use mainframe computers to store and match fingerprints, but Tim Fontenot, spokesman for CMC, says FACTS is a scalable solution that can run on a 386 or 486. This makes it suitable for small cities or developing countries.

FACTS consists of several components that connect over a network. A control machine handles the matching and encoding functions. An input workstation converts a fingerprint received on paper or as a photograph to a digital image. Once FACTS has extracted the important features from a fresh fingerprint, the system compares it to those in the database and gives a short list of likely matches. At that point, a human expert can examine the list and identify the correct match. CMC, which has a subsidiary in the US called Baton Rouge International (504) 296-8440), says FACTS is being used by the National Crime Records Bureau in New Delhi.

Although started and CMC are solving different problems, both are combining the power of the PC with mathematical algorithms to catch criminals by their own hands.

**Courtesy: BYTE**




# Cyrix 486 Chips Run at 33, 40, 50 MHz

**by Mahfuza Koly**

CYRIX Corp will ship by year end its line of Intel Corp. 486DX-compatible chips with speeds of 33 MHZ, 40 MHZ, and 50 MHZ on several DX and DX2 models, according to company officials.

Cyrix says it will be delivering 33MHZ, 40MHZ, and 50MHZ 486DX processors, 40MHZ and 50MHZ 486DX2 processors, and a 3.3-volt, 33MHZ 486DX chip. OEM prices will range from $289 to $349.

The new chips will be equivalent to, or exceed, the comparable Intel chips on features and will undercut or parallel the Intel chips on price. Cyrix official said.

The chips use microcode that Cyrix developed independent of Intel and include an integrated math coprocessor, 8KB of write-back cache, and clock-doubling and power-management features.

The DX2 clock-doubling chips will operate at 50 MHZ, while the rest of the system operates at 2.5 MHZ. Because of the large base of 25MHZ 486 systems, Cyrix executives said the pin-compatible 50MHZ DX2 should prove very popular.

The chips higher performance, perhaps as much as 15 percent, is achieved through the incorporated write-back cache, the company said. Intel's 486 line of processors use a write through cache. By comparison, Cyrix chips cache both reads and writes, offering better performance on all operations, the company said.

Cyrix's previous line of 486-based processors eliminated the math coprocessor and offered a 1K cache.

The chips were designed to be pin compatible with Intel's 386sx and 386DX line. Separately, Cyrix said its M1 superscalar chip, a Pentium workalike, is scheduled to be announced by the end of the year.