National Phytotron Facility, New Delhi

Indian Agricultural Research Institute, Pusa, New Delhi 110012 India

2001 Report to the NCR-101 Committee for
Controlled Environment Technology & Use

Dr. Panjab Singh, Director, psing@iari.ernet.in
Dr. Pitam Chandra, Manager (Engg), National Phytotron Facility,
pc1952@yahoo.com
Dr. K.V. Prabhu, Manager (Biol) , National Phytotron Facility,
kvp_gene@iari.ernet.in

National Phytotron Facility at a glance

A Phytotron is a controlled environment research facility for plants to study the effects of environment on the plant system in order to understand how the environment is shaping it. In the absence of a Phytotron in India, germplasm evaluation and subsequent breeding has generally been conducted under natural open field conditions where the limited time availability in a year and year-to-year climatic uncertainties slow down the progress. Only in a limited number of cases, the germplasm evaluation has been attempted by subcontracting the Phytotron facilities in the U.K. or elsewhere in the world, essentially due to prohibitive costs and difficult logistics. As a result, most of the important crops, i.e., cereals, oilseeds, pulses annual fruits, medicinal and other crops, have not witnessed the kind of quantum research outputs recorded in the countries where such facilities exist.

The return on the investment in a Phytotron can be many and diverse as in the form of a new crop variety with increased yield or stress resistance. It can eliminate the unpredictability of field based data on precise materials, it can generate repeatable data over and over within an year for testing feasibilities of several newer strategies. Research in the Phytotron is one of the best means to study the effect of environmental variables on crop growth and development so as to assess the constraints that limit exploitation of desirable characters. A Phytotron in modern agricultural research is an integral part of genetic, physiological and biotechnological applications for crop improvement and protection. In India, agricultural scientists had been making proposals for establishing a controlled environment facility ever since 1966 and each passing decade since then has brought forth the drawbacks in research advancement in the field of agriculture if a Phytotron was not made available to the plant scientists of India.

. It was in the year 1983 that the Programme Advisory Committee on Plant Physiology and Biochemistry of DST suggested again that a National Facility for Controlled Environments should be set up in India. Subsequently, the steering committee on science, technology and environment of the planning commission recommended the establishment of such a facility at an academic institution during the 7th Plan period. This controlled environment or Phytotron facility was envisaged to be a national facility. The scientists of IARI prepared a scientific proposal and the Department of Economic Affairs, Ministry of Finance, officially submitted it to UNDP in December 1988. The project proposal was suitably modified in the light of comments from the UNDP and it was finally approved for implementation in August 1990. The Food and Agricultural Organization (FAO) of the United Nations became the executing agency for this project.

Objective

To support Indian Agriculture in improving the crop productivity through better understanding of plant growth under precisely controlled environment conditions, aimed at the evolution of new varieties and technologies

Users

- Indian Council of Agricultural Research Institutions
- All State Agricultural Universities
- Agriculture related plant science researchers from National and International Universities and Institutes
- Private industries involved in Agri-business on collaborative bases

Equipment & Support systems

- Twenty two Growth chambers (sizes: 15ft2, 36ft2, 72ft2)
- Ten Greenhouses (size: 45m2)
- Three tissue culture rooms
- Instrumentation lab
- Molecular biology lab
- Engineering workshops
- Harvest room
- Pot filling & washing room
- Computer facility
- Dark room
- 24 hrs/day, 365 days/year accessibility with power backup

Major happenings during 2000-01 at National Phytotron Facility

The facility has been able to handle 42 different research projects some of which were from agencies outside the Institute. The research output from the Phytotron facility has been satisfactory as evidenced by the user scientists' responses. The agricultural researchers, especially, those in the areas of plant molecular biology, plant genetics and breeding, plant pathology and plant physiology are showing keen interest in taking up new research projects which require specific environmental conditions to answer the objectives.

Interesting notes from NPF, New Delhi

a. The Director General, FAO of the United Nations (The agency which undertook the project contract of the National Phytotron Facility on behalf of the UNDP) visited the facility during his one day visit to India. The project was apparently one of the successfully completed projects in the region by FAO and we were given to understand that this would be a model for at least one more facility likely to come up in Africa. Nobel laureate Norman E Borlaug appeared quite pleased with the type of studies being conducted at the Phytotron

b. The Directors General of CIMMYT, Mexico and ICARDA, Syria were keen to involve their institutions in collaborative programmes with Indian scientists housed at the NPF., which when happens, would be one of the major accomplishments that would link Indian Agricultural Research with the upstream ones in advanced laboratories

c. While we had succeeded in standardizing growth media and nutrition from local materials for many crops, Brassica kept us on tenterhook for over two years. Only now we have been able to overcome the antagonism shown by this sensitive crop by introducing a staggered nutrition application of full Hoagland once in 5 days, alternated with 150ml of 0.1% urea solution/kg medium once in two days for the duration of 5 days after germination to 35 days of growth, the period during which the plants seemed to have responded in funny patterns so far. This practice is very close to normal growth of Brassica.

d. The condensers on top of the building running for cooling the growth chambers needed extra daily supervision and tightening of the blade housing on the motor shaft during the summer months of May to July. The Facility had never to be shut down as we had once contemplated.

e. We are doing pretty well among the research community with our original staff of one manager each for engineering and biology, two engineers (one each of refrigeration and electronics) and two technicians to take care of rest of the house and plants maintenance

f. The only missing link, an important one, is the lack of communication with the other phytotrons, because of an inaccessible internet. We hope to get the arrangement soon. We seek your advice.

Communicated to NCR 101 on August 22,2001