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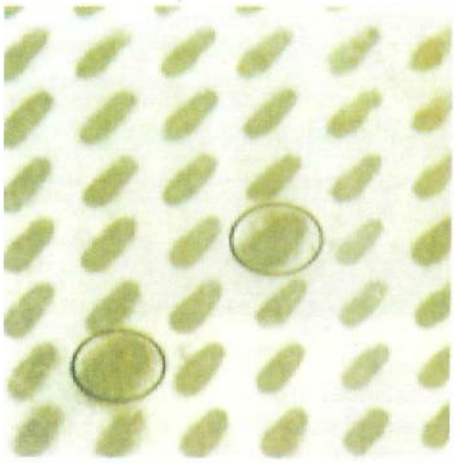
PROMISING TECHNOLOGIES

CONTENTS

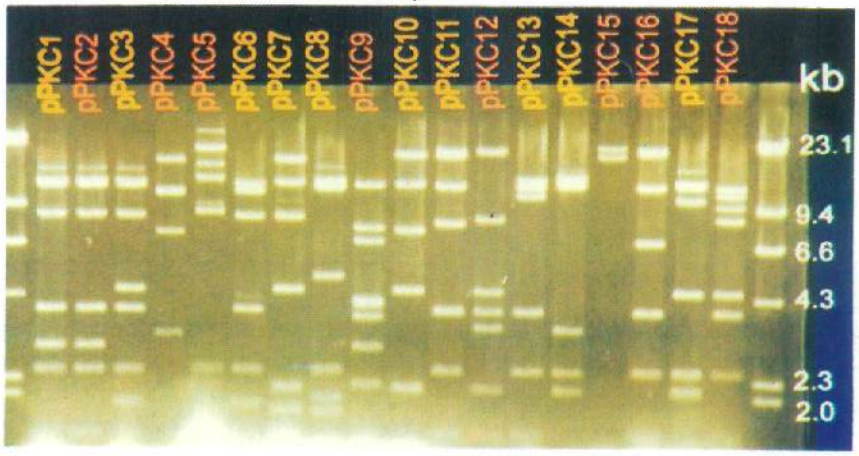
Pathogenicity Genes Cloned from *Xanthomonas axonopodis* pv. *malvacearum* as Diagnostic Tool

There are 19 well-documented races of cotton bacterial-blight pathogen *Xanthomonas axonopodis* pv. *malvacearum*. African strains of this pathogen are the most virulent, and are yet to be assigned a race designation. These strains can evade or overcome all commercially utilized bacterial-blight



Colony hybridization of recombinant cosmid clones from XcmN library with *pthA* (Strongly hybridizing positive clones are encircled)

*Eco*RI/ *Sst*I double digestion of 18 *pthA* positive clones (Clones indicated in orange-red are selected for activity assay on cotton)



Indian Council of Agricultural Research, Krishi Bhavan, New Delhi 110 001, India

- Dr R.S. Paroda, Director-General, ICAR; Tel.: 91-011-3382629; Fax: 91-011-3384773; e-mail: rsp@icar.delhi.nic.in
- Dr I.P. Abrol, OSD (DIPA), ICAR; Tel.: 91-011-5753361; Fax: 91-011-5753361; e-mail: abrol@kab.delhi.nic.in
- Dr R.D. Sharma, Director (DIPA), ICAR; Tel.: 91-011-5718649; e-mail: rds@kab.delhi.nic.in

Global climatic change has emerged as a major scientific, economical and political issue of our times, which would take us into the next millennium with a challenge to human ingenuity, creativity and wisdom. Almost twenty years ago, talk on climatic changes had started when changes in composition of CO_2 in the atmosphere and decrease of ozone in the stratosphere were observed. The discovery of the ozone hole at the Antarctica resulted in a global action, bringing in an agreement called the 'Montreal protocol'; for reducing emission of chloroflourocarbons (CFCs) to protect stratospheric ozone. All gases, carbondioxide, methane, nitrous oxide and CFCs have some unique properties which do not allow return of thermal radiations back into the space, resulting in a greenhouse effect, causing warming, which influences global climate. It is, therefore, essential that science of climatic change is understood, and if possible, factors contributing to this change are regulated. The United Nations recognizing the importance of this change, established an Intergovernmental Panel on Climate Change (IPCC). And the first report of the IPCC was presented to the UN in 1990, and in 1992 at Rio, where, the Framework Convention on climate change was adopted in the United Nations Conference on Environment and Development (UNCED). The objectives of this included stabilization of greenhouse gas emission to prevent dangerous anthropogenic interference with climate system, and ensuring food production and other preventive measures.

Dr R.S. Paroda, Director-General, ICAR

In this context, the agricultural scientists in India also have an important role for protecting the environment in the next millennium. Their goals should be to identify and provide realistic estimates of various greenhouse gases which are linked with agriculture such as methane and nitrous oxide; and to study effects of increasing levels of carbondioxide, temperature, precipitation and radiations on the agricultural systems.

Though the projections of climate change are uncertain but we do realize that changes in precipitation or temperature can cause considerable effect on agricultural production. For example, a very good wheat-crop can have reduced production if temperature suddenly rises in the month of March or earlier. We need to analyse now, if there is a possibility of resilience against such a variation. Internationally most of the studies on the impact of climate change have been done on wheat and rice, but food security means much more than these two crops. It is important to know as to how oilseeds, millets, maize, sorghum, tuber and root crops are likely to respond to variations in temperature, water deficit and CO_2 concentration. Can we identify the crops which would provide stability in the changing environment? And how vegetables and fruits are likely to be affected by climatic factors? Let us also attempt to assess contribution and sequestering of greenhouse gases from the agricultural system and their potential impacts on agricultural systems and biological systems. Recent observation on damages to corals in Gulf of Mannar and around Lakshadweep may be used as pointers to future impacts.

In view of all this, at present, we need to identify no-regret options for adoption in agriculture, for example, an improvement of nitrogen-use efficiency, which while giving economic benefits, would reduce emission of nitrogen oxides; incorporation of crop residues in the soil instead of burning will help improving soil health; and agroforestry systems of 10 years cycle or more will help in sequestering carbon; and reduction in energy-use in various operations, such as appropriate matching of tube-well and pump, higher efficiency of pumps, will be economically beneficial. It is for us to identify systems and develop technologies which would help reducing greenhouse gas emission.

A vision and action plan to address global warming and climate change related issues should, therefore, receive attention of all the scientists, as we enter into the next millennium. A futuristic strategy would have to be put in place, so that we are not caught unaware of the likely impacts of the climate change on our Indian Agriculture.

(R.S. Paroda)