

# COTTON Innovate



Weekly Newsletter from Central Institute for Cotton Research, Nagpur

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A weekly newsletter from ICAR-CICR

As a part of weekly seminar, Dr. K. Sankaranarayanan, Principal Scientist, delivered a talk on El Niño and its impact. The term El Niño refers to the large-scale ocean-atmosphere climate phenomenon linked to a periodic warming in sea-surface temperatures across the central and east-central equatorial Pacific. The international impact of El Niño includes affect local fishing in South American Coast; affect commodity prices and the macro economy of different countries including Australia, Chile, Indonesia, India, Japan, New Zealand and South Africa by low rainfall. But benefit from an El Niño weather shock is reported from Argentina, Canada, Mexico and the United States. Boost the GDP of the United States by about 0.5% and reduce the GDP of Indonesia by about 1.0%.

The El Niño affects rainfall pattern of South west Monsoon. The higher rainfall deficit of 58% and 54% in Punjab and Haryana reported respectively. Among all the regions, northwest India reported the highest rainfall deficiency of 34% followed by 26% in the east and North East. The central region reported 12% deficiency. Since 1980, all the six droughts faced by India were in the El Niño years, but still not all El Niño years led to drought in the country. In the six El Niño years, Equatorial Indian Ocean Oscillation (EQUINOO) was unfavourable and thus leading to droughts. On the contrary, favourable phase of EQUINOO in 1997 and 2006 negated the effect of El Niño and resulted in higher rainfall.

El Niño years, Northeast Monsoon brings normal or above normal rains. NEM during the El Niño years after 1976 had on average become considerably more copious than during the period from 1950 to 1976. In 2015, a combination of factors, including El Niño, Southern Oscillation and Siberian High, has been the driving force behind torrential downpour in southern peninsular India.

## Visit of Students from Cornell University to ICAR-CICR, Regional Station, Coimbatore

Fourteen Students and two faculty members from the Department of Fiber Science and Apparel Design (FSAD) Cornell University New York, USA along with one representative from Sathguru Management and Consultants Pvt Ltd, India, which represents Cornell University's College of Agriculture and Life Sciences (CALS) in India, had visited Central Institute for Cotton Research (CICR), Coimbatore on 13.01.2016. The program was chaired by Dr. N. Gopalakrishnan, Principal Scientist and Former Assistant Director General (Commercial Crops). At the start, he welcomed the visitors and then delivered a lecture on "Beneficial Agriculture for All with Special Reference to Cotton". Dr. S. Manickam, Principal Scientist (plant Breeding and Genetics) delivered a talk on "Varieties and Hybrids released from ICAR-CICR" and also clarified the queries raised by the students about colour cotton. Dr (Mrs) S. Usha Rani, Senior Scientist (Agricultural Extension) spoke on "The origin, activities and achievements of ICAR-CICR, Coimbatore". The students also visited the Regional Station of ICAR-CICRCOT, Coimbatore and observed the demonstration

on "Fibre testing". The program was ended with a vote of thanks proposed by Dr (Mrs) S. Usha Rani.

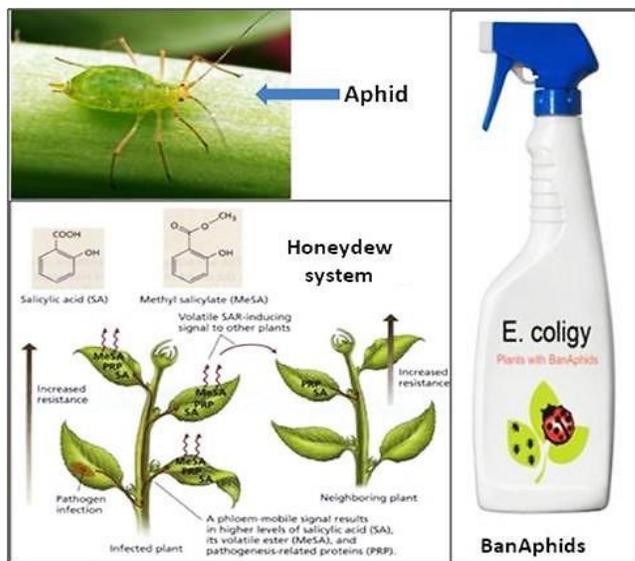
## Scientific Talk : El Niño and its impact

*Dr. K. Sankaranarayanan,  
Principal Scientist, CICR, RS, Coimbatore*



## BanAphid - An innovative HACKERS

T Prabhulinga, Rakesh Kumar and H B Santosh,  
Scientists, ICAR – CICR, Nagpur



Source: - [http://2013.igem.org/Team:KU\\_Leuven/Project/HoneydewSystem](http://2013.igem.org/Team:KU_Leuven/Project/HoneydewSystem)

Aphids - the little insects of the super family aphidoidea are the important polymorphic pest of many agricultural and horticultural crops with annual crop losses worth hundreds of millions of dollars. These are sap sucking pests which draw their essential amino acids from plant phloem. Since the plant sap is poor in amino acid and rich in sugar contents, aphids suck more sap to meet their amino acid requirement and excrete excess sugar in the form of droplets of honeydew. Chemical control methods are not eco-friendly and insecticide resistance problems also arise due to high fecundity rates owing to high probability of random mutations and selections. However, in lieu of developing an eco-sustainable pest management strategy, iGEM KU Leuven team has developed an innovative method by exploiting aphid's communication systems. They have engineered E.coli cells to imitate the effect of insecticides by using the aphid's own alarm pheromone, E- $\beta$ -farnesene (EBF) to repel them off the plant. They call these genetically engineered E. coli cells, the BanAphid (meaning 'to ban aphids' as well as with 'benefits'). EBF is the most universal aphid alarm pheromone which is released from the cornicles of the aphids to warn during dangerous situation, such as entry of the natural enemy. The aphids undergo a change in gene expression that motivates them to mobilise and leave the plant but because EBF is highly susceptible to oxidation, that's why here bacterial cells called "BanAphids" used to produce EBF regularly. In addition, Methyl Salicylate (MeS), a phyto-hormone released by plants when they are under attack, for instance upon aphid infestation. It activates plant defence systems, as well as attracts aphid predators, such as the ladybug or the green lacewing. They have also focussed on increasing the MeS production of an existing brick, by increasing the production of its precursor, chorismate. Initial system for the production of MeS and EBF relied on direct interaction between the bacteria and the aphids and BanAphids would be sprayed on the plant. This is ethically and practically challenged since engineered E.coli cells "BanAphids" could end up in the environment.

Since engineered E.coli cells "BanAphids" could end up in the environment. Therefore, in an alternative strategy, BanAphids are kept in semi-permeable pouches. These allow the pheromones to disperse in the air yet the bacteria themselves remain in the bags. Consequently, the presence of aphids secreting honeydew cannot be used as a trigger for the production of both pheromones. Since constitutive production of EBF rapidly renders aphids insensitive, concentrations should fluctuate to prevent habituation. This is typically achieved in an oscillator. These factors along with input from potential end users all played a role in the design of the present form of strategy called "Honeydew system".

In Summary, BanAphids produce MeS and EBF a phytohormone and a pheromone, respectively. MeS will activate plant defence systems and attract natural aphid predators and parasitoids. Furthermore, EBF will repel aphids off the plant and, as a secondary effect, also attract natural aphid predators and parasitoids. MeS and EBF are naturally used in the communication between plants, predators and aphids. Consequently, BanAphids will blend into the ecosystem and enhance the communication between plants, predators and aphids. Various experiments conducted with both plants and insects demonstrated the effective control of aphids in eco-friendly manner.

### Suggested Readings:

- o Martin V., Pitera D., Withers S., Newman J. and Keasling J (2003) Engineering a mevalonate pathway in Escherichia coli for production of terpenoids. *Nature Biotechnology* 21(7): 796-802.
- o Gaille, C., Reimann, C. and Haas D (2003) Isochorismate synthase (PchA), the first and rate-limiting enzyme in salicylate biosynthesis of *Pseudomonas aeruginosa*. *The Journal of Biological Chemistry*, 278(19):16893-16898.
- o Hu, C., Jiang, P., Xu, J., Wu, Y. and Huang, W (2003) Mutation analysis of the feedback inhibition site of phenylalanine-sensitive 3-deoxy-D-arabino-heptulosonate 7-phosphate synthase of *Escherichia coli*. *Journal of Basic Microbiology*, 43(5): 399-406.
- o Website:  
[http://2013.igem.org/Team:KU\\_Leuven/Project/HoneydewSystem](http://2013.igem.org/Team:KU_Leuven/Project/HoneydewSystem).

### Meetings attended

- Dr. K.R. Kranthi, Director, ICAR-CICR, Nagpur attended the meeting to finalize NFSM Technical Programme on 18th January, 2016 with Additional Commissioner, Ministry of Agriculture, New Delhi.
- Dr. K.R. Kranthi, Director, ICAR-CICR, Nagpur attended meeting on "Infestation of Whitefly on Cotton Crop" on 18th January, 2016 at NCIPM, New Delhi

## Other Activities

Dr. S. Manickam, Principal Scientist (Plant Breeding) have been nominated by the Director, Centre for Plant Breeding and Genetics, Tamil Nadu Agricultural University, Coimbatore to act as External Expert in the Technical for Establishment of a Medium Term Cold Storage Facility in the Paddy Breeding Station, Tamil Nadu Agricultural University, Coimbatore under the DBT sponsored project. The Technical Committee meeting was held under the chairmanship of Dr. Ganeshamurthy, Director, Centre for Plant Breeding and Genetics, Tamil Nadu Agricultural University, Coimbatore on 19-01-2016 to discuss the design and technical specification of the Storage facility.

Dr. S. Manickam, Principal Scientist (Plant Breeding) have been nominated by the Dean, Post Graduate Studies, Tamil Nadu Agricultural University, Coimbatore to act as the External Examiner for the final viva-voce of the Ph. D. student, Sh. D. Nagarajan in the Department of Plant Breeding and Genetics, Agricultural College and Research Institute, Madurai, Tamil Nadu. The public defence followed by viva-voce was held on 20-01-2016 at Seminar Hall, Department of Plant Breeding and Genetics, Agricultural College and Research Institute, Madurai, Tamil Nadu.

Dr. S. Manickam, Principal Scientist (Plant Breeding) as the Principal Investigator of Plant Breeding, AICRP on Cotton, monitored the Breeding trials of AICRP on cotton in the Voluntary centres of TNAU at Arupukottai and Kovilpatti on 21-01-2016.

Dr. S. Manickam, Principal Scientist (Plant Breeding) have been nominated by the Director, ICAR- Sugarcane Breeding Institute, Coimbatore to act as External Member of Selection Committee for the selection of one number of Project Fellow under the Contract Research Project entitled "Conducting trials on Sugarcane with MIDAS (Seaweed Product)". The selection committee meeting was held on 22-01-2016.



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