

# COTTON Innovate



Weekly Newsletter from Central Institute for Cotton Research, Nagpur

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## RESEARCH ROUND-UP

### Hydroponics: a tool to study Nutritional Deficiencies in Cotton

A. H. Prakash, S.E.S.A. Khader, M. Sabesh, and Sita Lexmi

The term hydroponics was coined by William Frederick Gericke of the University of California at Berkeley for the culture of plants in water and defined hydroponics as plant growth in mineral nutrient solutions. Hydroponics is a subset of hydro-culture and is a method of growing plants using mineral nutrient solutions from water without soil.

There are two main types of solution culture, static and continuous-flow solutions methods. In our study, we have used static solution culture to study the nutritional deficiencies due to essential and major nutrients viz. Nitrogen, Potassium, Magnesium and Calcium. The germinated cotton seedlings were grown in Hoagland's solution without the element of interest from germination till harvest. In deficiency cultures, the total quantity of applied salts were kept as near as possible to that in the complete solution. The pH and buffer capacity of culture solutions must also be kept uniform. If one element is omitted from the solution (as a cat ion or anion) the corresponding element or moiety in the salt was supplied in the form of another salt (e.g. Cl replaces NO<sub>3</sub> if KCl is used in place of KNO<sub>3</sub>; the K<sup>+</sup> concentration, however, remains the same). The deficiency symptoms were visible within seven days of culture. The pots were continuously aerated and also replenished with nutrient solution regularly.

#### The following nutritional deficiencies symptoms were observed on cotton plant:

N – Chlorosis of the leaves, particularly the older leaves.

P – Stunting; dark purple stems, purpling on upper and lower leaf surfaces; leaves small.

K – Stunting; interveinal chlorosis; leaves small, shiny, and deeply veined; some necrosis.

Mg – Stunting; leaves shiny, with a bronze cast; necrotic spots; older leaves appear normal.



## SCIENTIFIC TALK



As a part of weekly scientific talk at CICR, Regional Station, Coimbatore, Dr. Isabella Agarwal, Senior Scientist (Agricultural Economics) gave a talk on "Organic Fabric Market" on 7th December, 2013. The world top organic cotton producers and consumers were listed highlighting their achievements and future prospects in the international organic fibre market. The Global Organic Textile Standard (GOTS) is the stringent voluntary international standard for the processing of organic fibre-containing products, addressing all the post-harvest processing stages (including spinning, knitting, weaving, dyeing and manufacturing). The major organic fibre producing countries viz., Africa, EMENA & CA (Europe, Middle East, North Africa and Central Asia), South Asia, China, USA and Latin America were elaborated in detail regarding their performance as well as their opportunities in their new venture. Arguments for and against expanding the organic cotton at production, processing, retailing and infrastructure levels were focused upon. India, the largest producer of organic cotton in the world has set an Indian Standard for Organic Textiles (ISOT) of its own. The unique selling proposition (USP) of this standard is that it will cover the life cycle of the cotton fibre right from crop to clothing unlike GOTS.

A bright prospect for India is on the anvil regarding the fulfilment of supply of organic cotton as there is more demand at local as well as global level. India being the largest producer of organic cotton offers tremendous scope for organic textiles production and exports to countries across the globe. The major hitch lies on the necessity to introduce an exclusive Indian standard for organic cotton produce, when there are other global certifications available, genetically modified (GM) products are prohibited in organic farming and since 95% of cotton growing belts in India are cultivating GM cotton; there is a huge risk of contamination of GM cotton with organic cotton. Suitable policy measures encompassing all the stake holders might pave way for fulfilling the huge demand for Indian organic cotton at the global level.



## Guest Lectures



**Dr. S.E.S.A Khader, Principal Scientist**, Plant Physiology, delivered a guest lecture on "Overcoming nutrient deficiency and improving nutrient absorption: Cotton as an example" under UGC – SAP National Seminar at Tamil Nadu Agricultural University, Coimbatore on 4th December 2013.

Nutrient deficiency symptoms with particular reference to cotton were emphasized on all major, minor and trace elements and methods to overcome. Studies on inducing deficiency symptoms of Nitrogen, Potassium, Magnesium, Phosphorous, and Calcium through hydroponics studies at CICR Regional Station, Coimbatore were depicted. Magnesium deficiency induced through hydroponics study did not resemble the leaf reddening under field condition was further highlighted. The topic covered the nutritional disorders like bud and boll shedding, leaf reddening, excess vegetative growth with suitable remedial measures. Major physiological constraints in cotton production like source sink relationship and the possible methods to

overcome the problem were highlighted. The importance of surfactants in nutrient absorption through foliage, the mechanism of foliar absorption, factors affecting nutrient absorption through foliage, different surfactants available, concentration to be used, time of application, effect on metabolic activity, effect on stomatal opening, improving the efficacy of weedicide, improving the yield were brought out through experimental data. The talk ended with future thrust to develop the formula or technique combining hormone, nutrients and chemicals in super optimum concentrations for foliar application in cotton with particular reference to Bt versions to sustain productivity and increase yield further by reducing the physiological negatives. Besides, basic studies on the mechanism of nutrient absorption, ways to improve the foliar absorption efficiency need be investigated.

**Dr. S. Manickam**, Principal Scientist (Plant Breeding) delivered a lecture on "Exploitation of heterosis in cotton through male sterility system" to the trainees at Centre for Advanced Faculty Training on "Exploitation of Heterosis in crop plants" organized by Centre for Plant Breeding and Genetics, Tamil Nadu Agricultural University, Coimbatore on 6th December, 2013. The presentation covered Indian cotton scenario, role of hybrid cotton in improving the production and productivity in India, male sterility system exploited in cotton, characteristics of male sterile based hybrids released in India, comparison between genic male sterility system and cytoplasmic-genic male sterility system in cotton, role of chemosterilants in inducing non-genetic male sterility in cotton, future thrust for exploiting heterosis in cotton including apomictic lines available in cotton.



## MEETINGS

### Meeting to review the IRM- High Density Cotton Production Programme

Dr. Atanu Purkayastha IAS, Jt Secretary TMC, Ministry of Agriculture, Govt of India along with Dr. Anupam Barik (Additional Commissioner, Crops), Ministry of Agriculture, Govt of India visited CICR on 02.12.2013 to review the implementation of IRM – HDPS demonstrations. About 40 senior officials participated in the meeting chaired by the Dr. Atanu Purkayastha. Dr. K. R. Kranthi, Director, CICR welcomed Dr. Purkayastha and other dignitaries. The Joint Director Agriculture (Nagpur), Sri. V. N. Gawate and Joint Director Agriculture (Amravati), Shri. Ashok Lokhande presented a brief report on the status of HDPS cotton crops in their respective Divisions in Vidarbha. The Superintending Agriculture Officers of different districts of Vidarbha also participated in the discussion. Dr. M. V. Venugopalan, Principal Scientist, CICR gave an update on the status of HDPS demonstration in Andhra Pradesh, Karnataka, Madhya Pradesh, Tamil Nadu, Gujarat, Haryana and Rajasthan. Er. G. Majumdar, Senior Scientist, CICR, made a brief presentation on the low cost cotton picker being developed. Dr. Kranthi, Director, CICR, explained about the low cost weed control options using Glyphosate to reduce production cost of production under HDPS. Issues related to scaling up of the demonstrations for 2014-15 season and beyond were also discussed and seed procurement options for the same were explored. Summing up the deliberations, Dr. Atanu Purkayastha expressed satisfaction over the overall implementation but stressed on proper documentation through video films and a complete economic analysis of HDPS system. Earlier during the visit to experimental fields, Dr. Atanu Purkayastha showed keen interest and interacted with the scientists involved in the HDPS experiments and demonstrations. He was also keen in promoting the area under *G. arboreum* (desi cotton) through HDPS to augment surgical cotton production. He also reviewed the live demonstrations laid out as a part of the forthcoming National Agricultural Fair- 'Krishi Vasant'.



### CROPSAP Meeting

Dr Vishlesh Nagrare, Sr. Scientist (Entomology) attended Steering Committee meeting of CROPSAP 2013-14 at State Agriculture Department, Govt of Maharashtra, Pune on 6th December 2013.

**Genome screening for virus in cotton A, D and tetraploids with AD**

Dr. Monga, Head, CICR, RS, Sirsa, shared a newly published paper on presence/absence of cotton leaf curl virus in A/ D genome. Researchers from Agricultural Biotechnology Division, National Institute for Biotechnology and Genetic Engineering (NIBGE) from Pakistan screened diploid cotton species belonging to A, D and tetraploids with AD genome for the presence/absence of components of cotton leaf curl complex. These cotton species are being maintained in a living herbarium for more than four decades under natural conditions. As expected, the two diploid species (*Gossypium arboreum* and *G. herbaceum*) of A genome, were found to be free of virus when screened by PCR and F29 DNA polymerase. The two cotton species of D genome (*G. thurberii* and *G. aridum*) showed the presence of begomovirus. The species belonging to AD genome were found to be susceptible to CLCuD due to the presence of both begomovirus and betasatellite. However, the interesting exception among D genome species was *G. gossypoides*. The results from present study suggest that *G. gossypoides* is a valuable resource for mapping of resistance by developing segregating populations and for developing synthetic tetraploids.

**Reference:**

M. T. Azhar, Z. I. Anjum, and S. Mansoor .2013. *Gossypium gossypoides*: a source of resistance against cotton leaf curl disease among D genome diploid cotton species. *The Journal of Animal & Plant Sciences*, 23(5): 2013, Page: 1436-1440

**CICR In Press**

मंगळवार, दि. 3 डिसेंबर २०१३

# राष्ट्रीय कृषी प्रदर्शनासाठी राष्ट्रपती नागपुरात येणार

## दौऱ्यावर शिक्कामोर्तब : ९ फेब्रुवारी रोजी होणार उद्घाटन

नागपूर : उपराजधानीत प्रथमच होऊ घातलेल्या कृषी विभागाच्या राष्ट्रीय कृषी प्रदर्शनाच्या उद्घाटनासाठी राष्ट्रपती प्रणव मुखर्जी नागपुरात येत असल्याची माहिती पुढे आली आहे. कृषी विभागाच्यावतीने येत्या ९ ते १३ फेब्रुवारीदरम्यान या प्रदर्शनाचे आयोजन करण्यात आले आहे. वर्धा मार्गावरील कापूस संशोधन संस्थेच्या परिसरात ते होणार आहे. सुरुवातीला कृषी विभागाने या प्रदर्शनासाठी जानेवारीच्या दुसऱ्या आठवड्यातील तारीख निश्चित केली होती. परंतु अलीकडेच चार दिवसांपूर्वी मुंबई येथे झालेल्या कृषी विभागाच्या उच्चस्तरीय बैठकीत पूर्वीच्या नियोजनात बदल करून, प्रदर्शनासाठी ९ ते १३ फेब्रुवारी ही नवीन तारीख ठरविण्यात आल्याची माहिती एका वरिष्ठ कृषी अधिकाऱ्यांनी दिली; सोबतच प्रदर्शनाचे उद्घाटन राष्ट्रपती प्रणव मुखर्जी यांच्या हस्ते होणार असल्याचेही ते म्हणाले.

विशेष म्हणजे, गत नोव्हेंबर महिन्यात राष्ट्रसंत तुकडोजी महाराज नागपूर विद्यापीठाचा १०० वा दीक्षांत समारंभ व नागपूर महानगरपालिकेच्या शतकोत्तर महोत्सवासाठी राष्ट्रपती नागपुरात येणार होते. परंतु विद्यापीठातील काही घडामोडींमुळे त्यांचा तो दौरा अचानक रद्द करण्यात आला होता. राष्ट्रपतींचा दौरा रद्द झाल्याने नागपूरकरांचा फार मोठा भ्रमनिरास झाला. (प्रतिनिधी)

Times of India 3.12.13

# 'Enough checks and balances for field trials'

Snehata Shrivastav / TNN

**COS TO CONDUCT TRIALS**

- Monsanto India | Maize, cotton
- Dow Agro Sciences | Cotton, maize
- Syngenta Bio Sciences | Maize
- Bayer Bio Sciences | Maize
- Mahyco | Cotton, wheat, rice
- Pioneer Overseas | Maize
- Ankur Seeds | Brinjal
- Central Inst. for Cotton Research | Cotton

Nagpur: The state agriculture department has given permission to conduct confined fields trials of five genetically modified crops. The Supreme Court had constituted a technical expert committee (TEC) in a PIL filed by environmental activist Aruna Rodrigues in 2005 challenging the MoEF over the bio-safety of open GM trials. The TEC's interim report had suggested a 10-year moratorium on GM trials. This was challenged by the government itself (ministry of agriculture). Finally, the final TEC's report that came out in July 2013 suggested the creation of control conditions for open trials.

The state committee, which included agriculture commissioner Umakant Dangat as member secretary, comprised vice chancellors of state agriculture universities (SAUs), deans and directors of SAUs, directors of some national institutes and organizations like Bhabha Atomic Research Centre (BARC). The committee submitted its report on August 28, 2013, but the government started issuing NOCs only from November 1.

Dangat told TOI that since agriculture was a state subject, the committee and the authorities did not see any harm in letting companies and institutions engaged in research to continue the work. "But, of course, our NOC is subject to Genetic Engineering Approval Committee (GEAC) approval, as it is the final authority constituted for GM crops by an act of parliament. We have also ensured that there are enough checks and balances. There were no guidelines so far for field trials in state, and the committee has drafted these. Restriction to conduct the trials in SAU farms alone, with due supervision, is one of them," he said.

Some 11 companies had applied to start trials, including government institute Central Institute for Cotton Research or CICR. They wanted to test for 32 events (genes or traits) in six crops, and the committee cleared trials for 28 traits in five crops (rubber was rejected) by seven private companies and CICR. The five crops given clearance for trials are cotton, maize, brinjal, wheat and rice.

Of these, NOCs have been given for testing of 10 and 12 traits in cotton and maize, respectively, while rice will be tested for four traits. Main traits include insecticide and herbicide resistance, individually as well as together, drought tolerance, salinity tolerance and nitrogen use efficiency.

CICR director Keshav Kranthi views the NOC as a "very positive step". He says the institute had already developed the transgenic in cotton by introducing genes procured from Indian Council of Agriculture Research two years back. But trials were delayed since the GEAC had made state NOC a precondition for trials. "We have already applied to GEAC for further approval and hope to conduct trials this year," he said.

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