

COTTON Innovate



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Scientific Talk

Dr. Derek Allan Russell, Adjunct Professor, University of Melbourne, Australia, gave a special talk on “Status of GM Crops in Australia” on December 10, 2014, at CICR, Nagpur under the aegis of ISCI, Nagpur Chapter and CICR, Nagpur. He spoke on the global issues of Genetically Modified Crops with an emphasis on reasons for faster development of transgenic crops by the private sector over the public ones. Dr. Russell elaborated on the bio-safety issues of GM crops and highlighted the complex regulatory set-up for GM crops in India compared to US and Philippines. He opined that the delay in development of transgenic crops by public sector is primarily due to fewer incentives which hampered long term planning. Also the success of GM crops primarily depends on the acceptance of the technology by the stake holders and the public in general. He added, if the conventional method could address the problem for which a GM technology is developed, the probability of acceptance will be meagre quoting example of non-acceptance of plum pox virus resistant transgenic plants by US farmers, as the problem could be solved by destruction of affected trees. He concluded the talk by suggesting the public sector to give emphasis on basic research which may provide lead for the future researchers.



Literature Scan

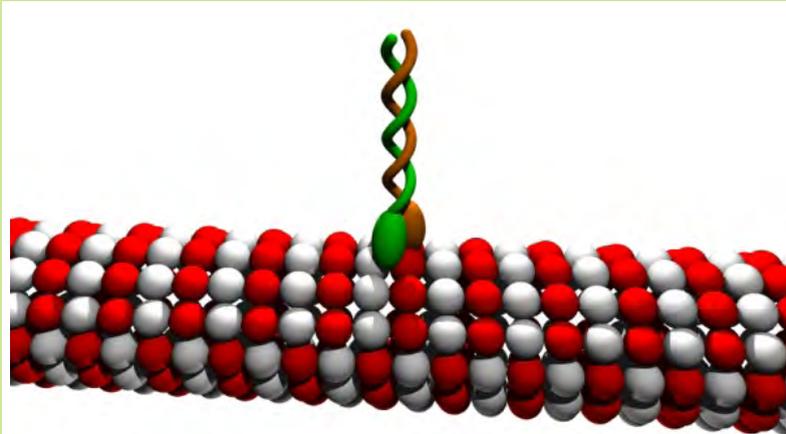
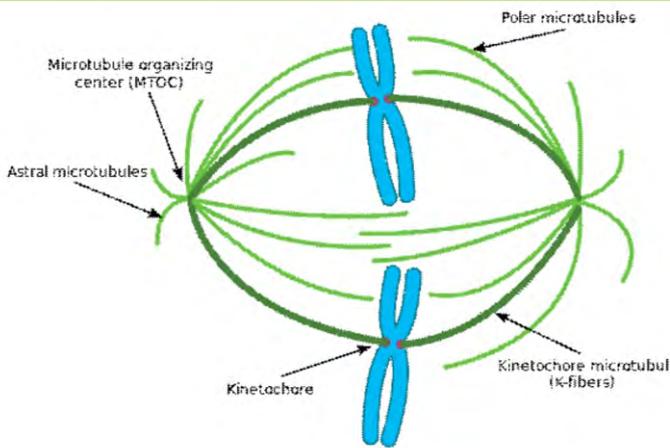
Microtubules, the harbinger of Cell Division processes

The ubiquitous role of microtubules has been visualized in different cellular processes. The association of microtubules with various organelles has influenced the cell division processes. The microtubules bind to various organelles in interphase as reported by Sonobe *et. al.* 2000 and Van Gestel *et. al.* 2002. The evidence for presence of tubular elements in the metaphase spindle and the phragmoplast indicates the organelle association with microtubules. The formation of a cytoskeletal structure unique to plant cells is termed as pre-prophase band (PPB) which appears during the G-2 phase and disappears before metaphase. The PPB is a cortical band of parallel microtubules (MTs) and microfilaments (MFs) that encircle the cell at the future division plane.

The physical properties of microtubules have been visualized with advent of plant cytokinesis occurrence. The anastral spindle apparatus contains a microtubule array with kinetochore fibres at different points, inferring that plant cells harbor diffuse microtubule organizing centres (MTOCs) observed during mitosis and meiosis (Palvetiz, 1993). Plant spindle plays an effective role to segregate the genetic material. Thus the activities viz., organization of spindle poles, attachment of kinetochores with the microtubule plus end; chromatin movement towards poles and microtubule polymerization /depolymerization are dependent on motor proteins acting on spindle microtubules. During mitosis microfilaments play a major role in forming cortical array encaging the two half spindles. Phragmoplast supports the pattern of arrangement of microtubules in an anti-parallel microtubule array fashion. Some of the key organelle structures viz., microfilaments and membranous structures like endoplasmic reticulum, vesicles and other organelles are found in close proximity to microtubules as reported by Staehelin and Hepler, 1996. The discovery of both microtubule and microfilament based motor proteins in plant cells were first elucidated by biochemical means in the late 1980s and early 1990s. The motility of microtubules is triggered by kinesins.

Kinesins play a major role in the following processes viz., organization of microtubules to form the two spindle poles during spindle assembly; nuclear envelope breakdown; attachment of sister chromatids to the microtubules; congression of chromosomes on the metaphase plate; disassembly of kinetochore fibres and movement of sister chromatids/homologous chromosomes towards the poles and spindle elongation. The disruption of microtubule (MTs) in metaphase may lead to a complete loss of normal cell architecture and structural integrity of phragmosome. Two general mechanistic pathways co-exist to facilitate efficient and accurate segregation of chromosomes into daughter cells. The self-organization pathway indicates nucleation of MTs around condensed chromatin and subsequent sorting of the MTs into a bipolar spindle through the action of motor proteins. In another pathway namely search and capture pathway, centrosomes function as dominant centres of nucleation of (MTs).Recent evidences leading to discovery of Cellulose Synthase Interactive Protein 1 (CSI1),a linker between CSCs and microtubules (Li *et. al.* 2012) have been helpful to understand the role and impact of cellulose microfibrils and microtubules in *Arabidopsis thaliana*.

Thus these processes defining the dynamics of microtubules have been better revealed and elucidated due to the advent of advanced cytogenetic protocols viz., immuno-localization of organelles; tomography revealing organelle structure and position; EM studies ; polarizing light microscopy and improved imaging techniques leading to discoveries at the protein level.



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Image Source:

http://en.wikipedia.org/wiki/File:Spindle_apparatus.svg

http://en.wikipedia.org/wiki/File:Kinesin_cartoon.png

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