

# Biotechnology News

A Newsletter of Institute for Biotechnology Research (IBR), JKUAT, issue 01, April 2010

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## IBR Links:

- \* JKUATES
- \* KEMRI
- \* ABSF
- \* ISAA
- \* ICIPE
- \* NMK
- \* Universities
- \* ILRI
- \* KARI

## Courses offered at IBR

Initially, IBR was offering short courses only until 2006 when the first group of six MSc students and one PhD student were enrolled. Since then, over 30 MSc students and five PhD students have enrolled with eight already graduated. At the moment IBR offers the following courses; PhD in biotechnology, Master in biotechnology, and various short t r a i n i n g s / c o u r s e s . The PhD in biotechnology course is offered mainly through research and thesis on full time basis. The duration of the course is 36-48 months. Intake is any time of the year when the student has already developed a research proposal. The duration of the MSc in Biotechnology is at least two academic years (18 months) and a

maximum of 36 months from the date of registration. For part time students the course lasts for at least 24 months and a maximum of 48 months from the date of registration. The Master of Science in Biotechnology is done by Course work, examination and thesis. In the first year of study, a student is required to take 5 core units, a compulsory seminar and 5 elective units. The first year of study is devoted to coursework and examinations while the second year is for research project for a thesis. There are two intakes in a year for MSC: May and September. The areas of specialization are microbial biotechnology, animal biotechnology and plant biotechnology

## JKUAT kitchen using Briquettes By B. Momanyi

JKUAT kitchen is using a unique source of energy for cooking. In the year 2007, a survey was done by Mr Momanyi-IBR, to find out the amount of resources within the university that was labeled waste and thus not utilized. The findings led to the use of

appropriate technology to compress materials into flammable blocks, called briquettes, which are used as fuel for cooking and warming. Diverse “waste” materials like papers, charcoal dust, biomass etc are recycled into briquettes (See page 3)

## Message from the Director

The IBR Strategic Plan- 2004-2012 (IBRSP) is positioning JKUAT to capitalize on what many predict will be the biotechnology age. The plan was launched in 2004 and concentrated primarily on strengthening JKUAT's research and development base with investment in infrastructure and capacity building. Considerable progress has been made. Many of the targets set in the 2004 plan have already been achieved. The Institute's profile has risen strongly and the number of products and research has grown. IBR has provided substantial investment in new products to support biotechnology developments and capacity building through training and graduating MSc and PhD students. It has strengthened science and technology base and invested considerable resources and effort in creating new alliances and strengthening existing ones within the university and with research organizations in Kenya.

Dr. Aggrey Bernard Nyende

## EDITORIAL

Welcome to the first issue of Biotechnology news, a newsletter that will always bring you latest news in the field of biotechnology. We promise to keep you updated on what is happening in the Institute for Biotechnology Research (IBR) and in other learning and research institutions particularly in the field of biotechnology. We shall always publish letters and response from our readers in the subsequent volumes. We therefore encourage our readers to feel free to share their views with us by writing directly to the editors. However we shall only publish relevant news based on verifiable facts and on tangible issues but not any information deemed malicious or intended for character assassination. The editors will have the right to accept or reject an article. However, the editors shall not be held responsible for any distortion of facts or second hand communications arising from this publication. We shall introduce a column in our next issue called SUGGESTION BOX whereby we can allow positive criticism. Enjoy reading.

J. Kinuthia and W. Kamau

# IBR commercial projects

IBR prides itself as being the host to most of the IGUs that have made this university a big name. These IGUs are: Tissue cultured bananas, Mushroom spawns, substrate and fresh mushroom. There is also training on organic farming and on mushroom growing. Other new developments include Tissue culture aloe and roses. Tissue culture is a way of propagation whereby a particular plant part eg leaf, shoot, root, stem etc is initiated in a suitable media followed by sub-culturing and hardening after

which it develops into a disease free plantlet. The aim is to have mass production of disease free crops. Organic farming is a system of agricultural production that promotes provision of health foods and protects the environment by excluding artificial fertilizer pesticides, fungicides and drugs. It relies on the laws of nature to enhance production cycles. Mostly it adopts what is locally possible, appropriate and feasible. The system consider soil fertility as one of the key factors to successful farming.

## Growing mushroom in Kenya as an agricultural enterprise by J. Kanyi

Many types of mushroom grow in the wild and various communities harvest and consume them. IBR promotes four varieties namely: Button, Oyster, Shittake and Ganoderma. Mushrooms have now been cultivated by both small and large scale farmers in Kenya since the early 60s, but the main challenge then was availability of good quality spawn (seeds). The small sale farmers gave up growing altogether in the early 1970s. Large scale growers established farms with production capacity of over 30 tons per month, and among them was Eldore' Ltd in Eldoret. There are other smaller commercial farms, but they do not satisfy the market demand. Growing of mushroom has the following advantages: There is a huge market demand hence potential for profitability and improving household income. Mushrooms have high nutritional value as they are rich in protein, fibre and vitamins and very low in cholesterol and fats hence referred to as health foods. Therefore, consumption of mushrooms has huge

medical benefits and is gaining popularity due to people changing their eating habits as they have become more health conscious. These therapeutic benefits include: Boosts immune system by activating the helper 'T' cells, lowers blood pressure, prevent cancers and liver disintegration disease, lowers cholesterol, controls chronic fatigue syndrome, slows ageing and improves overall well being. Mushroom growing requires limited land and is normally done inside buildings. Subdivision of land and population growth have made traditional crops like maize, tea and coffee unprofitable due to lack of economies of scale. Mushroom growing does not depend on the general weather since it's grown indoors. Mushrooms growing utilizes agricultural wastes which would otherwise not be useful. The demand for mushroom in Kenya is insatiable with one Kilogram fetching about KShs 500. IBR trains in mushroom growing and marketing

# Student Research at IBR

Research in IBR mostly offers training opportunities to students of either MSC or PhD and always results into publications in scientific journals. The following is a list of research projects under IBR

	Researcher	Research title	Status
		<b>PhD</b>	
1	Romano Mwirichia	Microbial diversity of lake elementaita in Kenya	Graduated
2	Ms Cecilia Mbithe	Molecular Characterization, Regeneration and Agrobacterium Tumefaciens-Mediated Transformation of Jatropha Curcas (Physic Nut)	Ongoing
3	Mwangi kamau	Distribution, quantification and eradication of banana viruses from naturally infected banana plants in Kenya using PCR and ELISA diagnostics techniques	Ongoing
4	Jacklene ongachi	Metagenome studies of archaea diversity in lake elementaita in Kenya	Ongoing
5	Nyambuga Evans	Studies on transmission density and development of PCR based diagnostic tools for sweet potato virus	Ongoing
		<b>MSc</b>	
6	Mwangi Kinuthia	Enrichment, isolation and characterization of DDT biodegraders from uncontaminated tropical soils	Graduated
7	Karuri Hannah	Characterization of Kenyan sweet potatoes (Ipomoea Batatas L.) Genotypes for sweet potatoes virus diseases resistance and high dry matter	Graduated
8	Makonde Huxley	Assessment of effects of Bacillus Thuringiensis Endotoxin on Nitrogen fixing bacteria in clay soils	Graduated
9	Simasi W. Lily	Isolation, Characterization and Identification of Alkalithermophiles From Lake Bogoria	Awarded
10	Bii Felix	Characterization of Fusarium species in maize (Zea mays) and determination of their mycotoxins in Eastern and Rift valley provinces in Kenya. To graduate	Awarded
11	Juliah Akhwale	Isolation and Characterization of Enzymes From Actinomycetes obtained From Soil	To defend
12	James Munyao	Genetic Characterization of HIV-I Subtypes Vertically Transmitted From Mother To Child	To defend
13	George O. Asudi	Collection and Characterization of Carica Papaya Germplasm in Kenya	To defend
14	Mwenda George	Genetic Diversity and Symbiotic Efficiency of Rhizobia Isolated from Embu, Kenya	To defend
15	Simon Ngare	Genetic diversity and symbiotic potential of of rhizobia isolated from Taita Taveta in Kenya	To defend
16	James Wainaina	Surveillance of Rickettsia infection in domestic animals presented at slaughter houses in Kenya	submitted
17	Ngetich Raymond	Biochemical and Antimicrobial Analysis of Antibiotics from streptomycetes	Ongoing
18	Mukhongo Denis	Characterization of fat tailed sheep in northern Kenya	Ongoing
19	Karanja Edward	Characterization of Enzymes from Actinobacteria isolated from National Parks in Kenya	Ongoing
20	Kiteto Isaiah	Effect of Bt maize expressing Cry1Ab and Cry1Ba $\delta$ -endotoxins on fungal communities in sandy, clay and loamy soils in Kenya	Ongoing
21	Ndegwa Doris	Characterization of Aminoglycoside Resistance in Enterobacteriaceae implicated in Invasive Infections	Ongoing
22	Ng'enh Robert	Micropropagation and Macropropagation of Strychnos Henningsii for Sustainable Conservation	Ongoing
23	Sikhila Hul Wanami	Isolation, Characterization and Identification of Halualkaliphilic Microorganisms from L. Elementaita	Ongoing
24	Kahiu Serah	Biochemical and Antimicrobial Characterization of Antibiotics from Actinomycetes isolated from Soils obtained from Juja area of Central Kenya, from Termite Guts and Termite Nests	Ongoing
25	Miriti Philip Mwenda	Characterization of Aerobic Soil Bacteria Biodegradation Potential of Selected Pesticides Applied in Horticultural Farms in Rift-Valley and Central Kenya	Ongoing
26	Murungi Japhael Mbabu	In vivo investigation of Antiplasmodial and safety properties of Cravsenia anasata and Chitia robusta in a rodent model	Ongoing
27	William Onsembe Nyakundi	Diversity of white rot fungi isolated from selected horticultural farms in Kenya and their potential in biodegradation of pesticides	Ongoing
28	Ojwang Daniel	Molecular characterization of wild Pleurotus species in Kenya	Ongoing
29	Francis Mwatuni	Identification and characterization of viruses infecting cassava in Kenya	Ongoing
30	Mungai Grace	Production of virus free invitro banana plantlets using cryotherapy and chemotherapy techniques	Ongoing
31	Ng'ang'a Peter	Molecular characterization of endophytic fusarium oxysporum isolate of cassava brown streak virus	Ongoing
32	Kwalimwa Anyika	Growth, sporulation and delta endotoxin synthesis and toxicity control during fermentation by Bacillus thuringensis	Ongoing
33	Neondo Johnstone	Tissue culture of Allanblackia stuhlmannii, an economic tree, native of Tanzania	Ongoing

## IBR Staff

IBR has an able team of 20 staff headed by the Director, Dr A.B. Nyende. Among the team are four PhD holders, two PhD and three Masters Students. The others possess various qualifications ranging from certificate to Bachelors degree. According to their job description, there are 5 research staff, 2 teaching assistants, 8 technicians, 1 administrator, 1 secretary, 1 laboratory and 1 office attendant. IBR hopes to increase its staff in future in order to have experts in all areas of Biotechnology particularly in animal, plant and microbial biotechnology.

## Products of IBR

IBR produces the following in its commercial labs: Different varieties of tissue cultured bananas, Aloe vera and Roses. It also produces fresh mushrooms, Mushroom spawns and substrates, organic fertilizers, Biopesticides, worms (vermiculture) and organic vegetables. IBR recently started using waste paper and charcoal dust to make briquettes, good fuel for cooking and warming. IBR also offers training in income generating projects like organic farming and mushroom growing.

### IBR Short courses to be offered this year, 2010

Course Title	Dates	Duration	Cost
Introduction to plant, cell, organ and Tissue culture	May 4th- May 15th	2 Weeks	35,000
Introduction to microbiological techniques	May 18th- May 29th	2 Weeks	30,000
Biosafety & risk assessment, Biopolicy & Bioethics	June 15th-June 26th	2 Weeks	35,000
Introduction to Molecular Biology	June 29th-July 10th	2 Weeks	40,000

## Commercial cultivation of Aloe in Laikipia by Dr. Mercy



Aloe seedling in the Lab

IBR has received an order to supply 200,000 aloe seedlings to Laikipia East constituency. The project is a brain child of the area Member of Parliament, Hon Mwangi Kiunjuri who is also the Assistant Minister for water and irrigation and is worth

Six Million (KShs). The project is funded by the Constituency Development Fund (CDF), NGOs and other development partners. The order was placed in November 2009 and the IBR staff got into action immediately. The IBR-Aloe technical team is headed by Dr Mercy Mwaniki and comprises of Ms Mercy Kidaha, Ms Jane Njambi and Ms Elizabeth. The micro propagation of Aloe as done in IBR involves placing the shoot in a suitable media for initiation, multiplication, rooting and hardening in a green house from where its

transplanted into the field. The first batch of 20,000 seedlings will be released in march. Aloe grows well in ASAL areas, thus having the project in Laikipia. Research has shown that Aloe has medicinal properties, is a source of healthcare and beauty products and for their role in environmental protection and rehabilitation of degraded areas. IBR is determined to put in place a value addition chain in addition to production, marketing and environmental conservation.

### CONTACTS

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# IBR staff research projects

The institute has several ongoing projects by the staff. All of the projects are funded by various agencies after successful and competitive screening of the research proposals among hundreds of other proposals. This demonstrates the uniqueness of the projects and their contribution to science and industrialization of our country. Through the projects, additional equipments like ovens, centrifuges, gel electrophoresis etc have been bought.

**Table 1: IBR Staff research projects**

Researcher	Research title	Funded by
Dr. A. B Nyende Prof. K. Ngamau	▪Macadamia breeding for high oil content	Kenya Agricultural Production projects
Dr. J Onguso	▪Collection and Characterization of wild edible mushroom in Kenya.	NCST
Prof. H.I. Boga Dr. R. Mwirichia	▪Microbial diversity in salt lakes for industrial utility	NCST (Collaboration of Kenya and S. Africa)
Ms Cecelia Mweu	<ul style="list-style-type: none"> <li>• ▪Identification and improvement of useful plants of Tharaka: Melia volkensii and Osyris lanceolata (sandal wood)</li> <li>• ▪Characterization and improvement of Jatropha curcas for biodiesel</li> <li>• ▪Invitro propagation of Roses</li> </ul>	RBG , UK  NCST-For women  JKUATES
Dr. F. Wanzala Dr. A.B Nyende Dr. E. Ateka	▪Breeding of Paw paw for high yield	JKUAT (Research Production and Extension)
Dr. A.B Nyende Dr. M. Mwaniki	<ul style="list-style-type: none"> <li>• ▪Value addition of Aloe Vera</li> <li>• ▪Tissue culture protocols of Aloe Vera</li> </ul>	E.A Venture JKUATES

## JKUATES

JKUAT enterprises limited (JKUATES) is the marketing arm of the university for all the products arising from commercialization of innovations. It therefore offers a one stop shop for everything manufactured or processed within the university. JKUATES also offers training and consultancy services in a wide range of specialties. JKUATES has revolutionized entrepreneurship in JKUAT.

## From page 1- JKUAT kitchen using Briquettes

The use of firewood and charcoal, has led to serious shortages of biomass energy products, deforestation, loss of biodiversity and loss of wetlands. Therefore briquettes are a solution to the environment and energy crisis facing the world today. This initiative from IBR clearly shows that what we call waste are actually resources in the wrong place.



Recycling of “waste” resources into Briquettes

## Expansion of IBR laboratories

IBR is in the process of expanding its research facilities. This will be achieved after completion of the laboratory which is under construction. The building will host a tissue culture laboratory and a proposed biological resource center. This will boost the research potential of the institute and will accommodate more researchers at the same time.

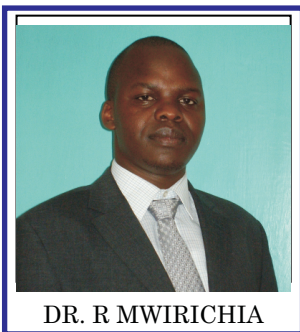
Only an eighth of the proposed building is under construction at the moment. This implies that when the entire building is completed, it will be among the biggest lab facilities in the university.

## Potential for use of DNA forensics in Kenya by J. Kinuthia

There is potential for use of DNA forensics in law enforcement and in wildlife conservation. In law, DNA extracted from samples obtained from the scene of crime is compared with the DNA extracted from a suspect. If there is a match, then the suspect is identified and this evidence is used in prosecution and conviction of the suspect. This technique is very accurate and its evidence is not only admissible in courts but also superior to circumstantial evidence

## Graduates of IBR

IBR graduated its first batch of students in 2009. This saw the first PhD student, Dr Romano Mwirichia and MSc students: Ms Hannah Karuri, Mr Kinuthia Mwangi and Mr. Huxley Makonde awarded their degrees. Dr Romano and Mr Kinuthia are staff of IBR and were recruited from class while pursuing their respective degrees. Dr Romano has since went to USA for a 3 months specialized training after which he will do a post doc. Mr Kinuthia defended a PhD research proposal in the department on February 17th, this year and wants to specialize in forensic science. Mr Makonde has since been employed at Mombasa polytechnic university college as an assistant lecturer. He has already obtained a DAAD scholarship to pursue his PhD. Ms Karuri was lucky to get a funded project immediately after graduation and she is now on her second year of PhD at Nairobi university. This year, IBR expects to graduate more students. The 2010 graduands will be: Ms Lily, Mr Munyao, Mr Asudi, Mr Bii felix and Mr George Mutegi.



DR. R MWIRICHIA



MS. A. JULIAH



MS. H. KARURI



MR. J. KINUTHIA



MR. G. ASUDI



MR. G. MWENDA