

## 1. Personal Data

<b>Name: Dr. Steven Runo</b>
<b>Title/Qualifications: B.Sc., M.Sc., PhD</b>
<b>Department/Unit/Section: Department of Biochemistry and Biotechnology</b>
<b>Contact Address: Kenyatta University   Department of Biochemistry and Biotechnology   P. O. Box 43844-0100 Nairobi, Kenya   Email: <a href="mailto:smruno@gmail.com">smruno@gmail.com</a> or <a href="mailto:runo.stephen@ku.ac.ke">runo.stephen@ku.ac.ke</a>   Tel: +254-727-346-496</b>
<b>Position: Lecturer</b>
<b>Area of Specialization: Molecular Biology, Biotechnology</b>
<b>Research Interests:</b> My research interest focuses on use of modern tools in Molecular Biology to overcome biotic and abiotic constraints of food production as well as enhancing the understanding of modern biotechnology. Specifically, my research revolves around five interrelated areas; i) long distance RNA trafficking between parasitic plants and their hosts, ii) RNA interference (RNAi) as a resistance mechanism against parasites – <i>Striga</i> and <i>Cuscuta</i> , iii) genetic engineering strategies for enhancing drought tolerance in tropical crops, iv) <i>Agrobacterium rhizogenes</i> transformation of cereals as a functional genomics tool for plant-parasite interactions, and v) molecular mechanisms of parasitic plants/host plants interactions.

### 1. Conference Presentations

1. **Runo S, David-Schwartz, R., Townsley, B., Machuka, J., Sinha, N.** siRNAs Against Parasitic Plants: A Trojan Horse Approach. Bio-Earn/ VIREN Scientific Conference Harnessing Bioresources for Socio-economic Transformation for Eastern Africa; 2009 24th - 26th November, 2008; Speke Resort and Conference Centre Kampala Uganda, Kampala Uganda; 2009.
2. **Runo S, Oduor, R., Binnot, J., Machuka, J., Thomson, J.** Genetic transformation of tropical maize for drought tolerance. Third World Academy of Sciences Biosafenet workshop on Plant Abiotic Stress Tolerance 2009 10-12 June 2009; Rome, Italy; 2009.
3. **Runo S, David-Schwartz, R., Townsley, B., Machuka, J., Sinha, N.** Biotechnological approaches to parasitic plants control Breeding and Seed Systems for African Crops 2007 26th - 29th March, 2007; Instituto de Investigacao Agraria de Mocambique (IIAM), Maputo Mozambique; 2007.
4. **Runo MS, David-Schwartz, R., Townsley, B., Machuka, J., Sinha, N.** RNAi as a resistance mechanism against parasitic plants. International Symposium on Integrating

New Technologies for Striga Control: Towards Ending the Witch-hunt 2006 November 5-11, 2006; Hilton Hotel Addis Ababa, Ethiopia; 2006.

5. **Runo MS.** Striga *KNOX1* RNAi as a resistance mechanism in maize and sorghum. 48th annual maize genetics conference; 2006 9th-12th March 2006; Asilomar conference grounds. Pacific Grove, California USA; 2006.

6. **Runo MS.** Striga *KNOX1* RNAi as a resistance mechanism in maize. 47th annual maize genetics conference. Grand Geneva resort. Lake Geneva, Wisconsin, USA.; 2005.

7. **Runo S, Townsley, B., Machuka, J., Sinha, N.** A strategy to make maize resistant to Striga. 2nd general meeting of The Rockefeller Foundation-supported program Biotechnology, Breeding and Seed Systems for African Crops. Safari Park hotel Nairobi, Kenya.; 2005.

## 2. Funded projects

1. Enhancing sorghum adoptability to climate change – *Striga* resistance and drought tolerance. Association for strengthening agricultural research in east and central Africa – ASARECA (2011-2014). Lead PI with Dr. Mohammed Abdulla Sorghum Breeding and Genetics Program ARC, Sudan and Dr. Kahi Ngugi University of Nairobi, Kenya (USD 420K)

2. Production of maize hairy roots induced by *Agrobacterium rhizogenes* and infection with the parasitic plant *Striga* – Novel tools for *Striga* research in Africa. International Foundation for Science (January 2012 – January 2013). Lead PI (USD 10K).

3. Genomic approaches to understanding resistance and virulence in the cereal-*Striga* interaction for targeted breeding of durable defence. Lead PI, Prof. Julie Scholes, University of Sheffield (March 2012 - March 2016). Other Co-PIs, Dr. Steven Runo, Kenyatta University, Dr. Jonne Rodenburg, African Rice Center (AfricaRice), Dr. Jenipher Bisikwa, Makerere University, Dr. Mathias Lorieux, Int Centre for Tropical Agriculture, Prof. Roger Butlin, University of Sheffield, Prof. Mark Blaxter, University of Edinburgh and Dr. Santie De Villiers, International Centre for Research in Tropical Agriculture (GBP 1 million).

4. CAPACITATE East Africa – EU- ACP S & T Project FED/2009/218788. KU Team member. Other partners are; Ms. Mary Mwangi, Dr. Fadhiya Khamis and Dr. Alice Muchugi. International Partners are Masinde Muliro University of Science and Technology, Uganda Martyrs University (Uganda) and Bangor university (Wales).

## 3. Publications

1. **Runo S., Macharia, S., Alakonya, A., Machuka, J., Sinha, N, Scholes, J.D.** *Striga* parasitizes transgenic hairy roots of *Zea mays* and provides a tool for studying plant-plant Interactions. **Plant Methods. 2012**; In Press.

2. **Runo S.** Engineering host derived resistance against plant parasites through RNA interference - Challenges and opportunities. **Bioengineered Bugs. 2011**;2(4):1-6.

3. **Runo S**, Alakonya, A., Machuka, J., Sinha, N. RNA interference as a resistance mechanism against crop parasites in Africa: a 'Trojan horse' approach. *Pest Manag Sci.* **2011**;67:129–36.
4. David-Schwartz R, **Runo S**, Townsley B, Machuka J, Sinha N. Long-distance transport of mRNA via parenchyma cells and phloem across the host–parasite junction in *Cuscuta*. *New Phytol.* **2008**;179:1 133–1 41.
5. **Runo MS**, Muluvi, G.M., Odee, D.W. Analysis of genetic structure of *Melia volkensii* (Gurke.) populations using random amplified polymorphic DNA. *African Journal of Biotechnology.* **2004**;3:421-5.
6. Adam O.R., Matheka M.J., **Runo S.R.**, Ali A.M., Kuria A., Masiga C., Mugoya C., Machuka J. Effects of auxin and source of explants on callus induction of tropical maize. *Biotechnology* **2012**: In press.
7. Bedada LT, Seth MS, **Runo SM**, Tefera W, Machuka J. Regenerability of Elite Tropical Maize (*Zea mays* L.) Inbred Lines Using Immature Embryo Explants. *African Journal of Biotechnology.* **2012**;In Press.
4. Bedada LT, Seth MS, **Runo SM**, Tefera W, Machuka J. Plant Regeneration of Ethiopian Tropical Maize (*Zea mays* L.) Genotypes. *Biotechnology.* **2011**;10(6 ):506-13.
5. 8. Alakonya, A., Koenig, D., Kumar, R., Kimura, S., Townsley, B., **Runo, S.**, Garces, H., Kang, J., Machuka, J., Sinha, N. "Interspecific RNAi of STM disrupts *Cuscuta pentagona* plant parasitism. *Plant Cell* 2011;under review.
8. Alakonya AE, **Runo, S.M.**, Keonig, D., Monda, E., Machuka, J., Sinha, N. Lack of GFP Trafficking from Transgenic *Nicotiana benthamiana* to Parasitizing *Cuscuta pentagona*. *Global Journal of Biotechnology & Biochemistry* **2010**;5 (4):237-42.

## 6. Consultancy and community service

1. 12<sup>th</sup> December 2011 – 30<sup>th</sup> January 2012: Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA). Consultancy for training and capacity building of AGROBIO Program sub grantees and stakeholders including staff through a regional and or international trainings and or exposure visits on critical innovative areas.
2. 1<sup>st</sup> – 5<sup>th</sup> March 2010: Kenya Plant Health Inspectorate Services (KEPHIS) as a resource person/facilitator. GMO Detection, Risk Assessment and Handling course. Training for KEPHIS scientists and technicians.
3. 1st September 2009- 12th September 2009: Africa Harvest Biotech Foundation International- Development of a Field Trial Compliance document.
4. 11<sup>th</sup> September 2009; Moi University on the launch of the department of Biotechnology and Biosafety – Facilitator and a panelist in a round table discussion on 'GMOs and Biosafety'
5. 18<sup>th</sup> – 20<sup>th</sup> March 2009; ISAAA Risk Communication Training Course held at Kenyatta University – Facilitator

## 7. Affiliation to Professional Bodies

1. April 2007- present; Editorial Assistant- Journal of Tropical Microbiology and Biotechnology
2. Executive committee member – Kenya Society of Microbiology (KSM)

### 8. Supervision of postgraduate students (if any)

#### PhD supervision – all ongoing

1. Leta Tulu Bedada **Reg. No. 184F/12347/2009**– 3<sup>rd</sup> Year PhD. Thesis title ‘Enhancing drought tolerance in maize (*Zea mays* L.) through genetic transformation with *ISOPENTYL TRANSFERASE (IPT)* gene’.
2. Rasha Adam Omer Abdalla **Reg. No 184/12345/2009** – 3<sup>rd</sup> Year PhD. Thesis title ‘Cloning and characterization of *ANNEXIN*-like genes for use in enhancement of drought stress tolerance in maize’.
3. Catherine Muui **Reg. No. A99/13325/09**– 3<sup>rd</sup> Year PhD. Thesis title Characterization of sorghum varieties from Eastern Kenya.
4. Daniel Sakyi Agyirifo **Reg. No. I84F/24679/2011** – 1<sup>st</sup> Year PhD. Thesis title. Metagenomic analysis of Ghanaian cocoa beans fermentation and flavour formation in cocoa and chocolate

#### Master of Science supervision – completed

1. Geoffrey Mugambi Meru **Reg. No. I56/11242/2008** – **M.Sc. graduate (2010)**. Thesis title: ‘Genotyping BC3F2 populations of four Ethiopian sorghum varieties for Stay Green QTLs introgression through Marker assisted selection with SSRs’.
2. Newton Otieno Oteko **Reg. No. I56/10106/2008** – **M.Sc. defended thesis successfully (March, 2012)**. Thesis title: Effect of HIV and malaria chemo-prophylaxis on multiplicity of *Plasmodium falciparum* infections in pregnant women in Western Kenya.
3. Redemtor Awuor Ojwang **Reg. No. I56/12252/09** – **M.Sc. defended thesis successfully (April, 2012)**. **Thesis title:** Lipid profile and levels of omega-3 and omega- 6 fatty acids present in jack fruit (*Artocarpus heterophyllus*) lam. (Moraceae) and variation in different areas and treatments.
4. Josephine N. Wokabi **Reg. No. 156/6516/03** – **M.Sc. defended thesis successfully (April, 2012)**. Thesis title: Optimization of in vitro micropropagation protocol for cocoyam [*Colocasia esculenta* (L) Schott] and [*Xanthosoma sagittifolium* (L) schott] cultivars grown in Kenya
5. John Muturi Mwangi **Reg. No. I56/10669/07** – **M.Sc. defended thesis successfully (May, 2012)**. Thesis title: Molecular characterization and sequence variation in the rDNA region of root-knot nematode (*Meloidogyne spp.*) in indigenous leafy vegetables.
6. Jacinta Muthini Kavuluko **Reg. No. I56/10270/2007** – **M.Sc. defended thesis successfully (May, 2012)**. Molecular characterization and genetic variation of root-knot nematode (*Meloidogyne spp.*) in selected legume production areas of Mbeere district.

#### Master of Science supervision – ongoing

1. Cecilia Njoki Ngugi **Reg. No. 156/12255/09 – 2<sup>nd</sup> Year M.Sc. (Thesis submitted for examination)**. Entomopathogenic nematodes *Heteroharbditis indica* and *Steinernema karii* as control agents of legume pod borer *Maruca vitrata syn testulalis* in cow pea
2. Erick Kuria Kimani **Reg. No. I56/10663/2007 – 2<sup>nd</sup> Year M.Sc. (Thesis submitted for examination)**. Thesis title ‘Development of drought tolerant maize using *C-REPEAT BINDING FACTOR 1 (CBF 1)* gene through *Agrobacterium* mediated gene transfer’.
3. Mercy Wairimu Macharia **Reg. No. I56/12254/2009 – 2<sup>nd</sup> Year M.Sc.** Thesis title ‘Population structuring and diversity of East African taro [*Colocasia esculenta* (L.) Schott]’.
4. Celestine Khayeli Dweni **Reg. No. I56/12253/2009 – 2<sup>nd</sup> Year M.S.c.** Thesis title: Protein-protein interactions associated with *Trypanosoma brucei* Splicing Factor SF3a60.
5. Alex Ngetich Kibet **Reg. No. I56/10659/2007 – 2<sup>nd</sup> Year M.Sc.** thesis title: Low cost micropropagation of elite varieties of taro (*Colocasia esculenta spp.*) in Eastern Kenya
6. Solomon Maina **Reg. No. 156/20567/10 – 2<sup>nd</sup> Year M.Sc.** Thesis title: Molecular characterization of genetic diversity of Begomoviruses infecting sweetpotato in Kenya.
7. Adam Juma Okinyi **Reg. No. I56/10103/2008 – 2<sup>nd</sup> Year M.Sc.** Thesis title: Determination of phytoplasma host range among wild grasses in Western Kenya for phytoplasma disease management.
8. Carolyin Mukiri Kamboba **Reg. No. I56/CE/14404/2009 – 2<sup>nd</sup> Year M.Sc.** Thesis title: Differential resistance response of sorghum cultivars against *Striga hermonthica* land races.
9. Wilson Kamau Gichina **Reg. No. I56/CE/11871/2008 –** Thesis title: Genetic diversity of pumpkins grown in Central and Eastern Kenya.
10. Sarah Naulikha Kituyi **Reg. No. I56/20979/2010 –** Thesis title: Parasite load by microscopy, antigen detection and Reverse Transcriptase –quantitative PCR in children with malaria

#### **Bachelor of Science (undergraduate) supervision**

1. Dinah Nyambura Mwangi – **B.Sc. graduate (2009)**. Dissertation title; ‘Perceptions and Characterization of Genetically Modified Organisms (GMOs) in Food Stuffs in Kenya’.
2. Sarah Wanjiku Macharia – **B.Sc. graduate (2010)**. Dissertation title; ‘Production of transgenic hairy roots of *Zea mays* L. through *Agrobacterium rhizogenes* transformation
3. Dorothy Isiaho – **B.Sc. Final Year**. Dissertation title: Diversity of Kenyan Dodders using ribosoma RNA.

#### **12. Administrative positions held to date**

Chairman Departmental Board of Undergraduate Studies (BUS)