

CURRICULUM VITAE

PERSONAL DATA

NAME : **Julius Wanjohi Mwangi E.B.S.**

DATE OF BIRTH : 26/2/1953, Kirinyaga County

NATIONALITY : Kenyan

MARITAL STATUS : Married

ADDRESS : Department of Pharmacology and Pharmacognosy,
School of Pharmacy,
College of Health Sciences,
University of Nairobi,
P.O. Box 19676 00202
NAIROBI.

Tel. +254722825966
E-mail julius.mwangi@uonbi.ac.ke , mupal02@yahoo.com,

LANGUAGES : English, Kiswahili and Kikuyu.

PRESENT POSITION : **Professor of Pharmacognosy and Director, Intellectual Property (UoN)**

QUALIFICATIONS : Ph.D. (Pharmacy) – University of Nairobi, 1990.
MSc. (Pharmacy) – University of Nairobi, 1983.
B.Pharm. – University of Nairobi, 1979.
EAACE - Kangaru School, 3 Principals, 1974
EASC - Nyeri High School, Division 1, 1972
Registered Pharmacist, 1980.

INAUGURAL LECTURE: 14th March 2012, Title: HERBAL MEDICINES: DO THEY REALLY WORK?

UNIVERSITY TEACHING EXPERIENCE

June 2001-to date	Professor of Pharmacognosy
1995 – June 2001	Associate Professor (Pharmacognosy)
1991 – 1995	Senior Lecturer
1984 – 1991	Lecturer
1982 – 1984	Tutorial Fellow
1980 – 1981 June	Graduate Assistant

PhD and Masters Supervision - completed

1995	Ph.D. P.K. Gathumbi, Toxicity of <i>Prunus africana</i> and its effects on the prostate gland in rats
2007	MSc. L. Gathu, Kenyatta University - Antimicrobial Activity Medicinal Plants in Kenya.
2007	M. Pharm. , P. M. Njogu – Antimicrobial activity and Phytochemical Investigation of <i>Girardinia diversifolia</i> .
2008	M. Pharm., Mutai Peggoty - Antimicrobial activity and Phytochemical Investigation of <i>Rhus natalensis</i> .
2009	PhD. K.O. Abuga, - A study of the antimalarial constituents of <i>Cassia abbreviata</i> and <i>Strychnos henningsii</i> .
2011	MSc. J.M.- Onyancha Phytochemical and biological activity of <i>Hypericum keniense</i> Scheinf (Hypericaceae).
2011	MSc. B.B Maina. – A comparison of Phytochemical and hypoglycaemic properties of <i>Marsdenia sylvestris</i> (Retz) from different geographical regions of Kenya.
2011	MSc. Shaban W. Sifuma- <i>Vitex doniana</i> (Verbenaceae): Evaluation of pharmacological basis of its use in traditional medicine
2013	PhD.B. Amugune. “Antimicrobial and phytochemistry of some Kenyan plants”
2013	PhD. Ndwigah – Isolation and characterization of active components of <i>Hydnora abyssinica</i> and <i>Dombeya torrida</i>
2014	MSc M.H. Kwena, “ Determination of the antiviral activities of selected Kenyan medicinal plants against the hepatitis B virus.

2014 MSc M.J. Maitha, “ Determination of Withaferin A content in root stems and leaves of *Withania somnifera* in Kenyan Plants”.

2014 Ph.D. N. Mungai, “Antimalarial activity of Annonaceae family found in Kenya”.

Continuing

2014 PhD. T. M. Kahiga. Evaluation of anti-ulcer activity and safety of Mupal: A herbal product used for the management of peptic and duodenal ulcers in Kenya.

2016 MSc. Sarah Mwangi. Method development for evaluation of *Artemesia annua* extract.

Areas of research, specialization and interest

The following are my major areas of research, specialization and interests:

1. Traditional Herbal and other Alternative /Complementary medicines – quality control/assurance, **safety, efficacy, toxicity**, usage, current trends, national policy, legal status, **cultivation**, formulation **production, distribution**, and **commercialization**.
2. **The essential oils** – composition, activities and possible **commercialization** as medicines.
3. Medicinal and poisonous plants – Phytochemistry , **bioprospecting**, Pharmacology.
4. **Intellectual Property** and all aspects associated with the same.

Other University experience

1. Drafted “Regulations and Syllabus for the degree of Master of Science in Pharmacognosy and Complementary Medicine”
2. Drafted the O-draft National Curriculum and Syllabus for Pharmacy and Poisons Board for Bachelor of Pharmacy.
3. Have been in development of many Regulations and Syllabi in our University.
4. **External examiner** (undergraduate & masters students), Muhimbili University of Health and Allied Sciences, Makerere University, University of Ghana 1992 -2008
5. **External assessor** for University of Zimbabwe, Nigeria, Ghana and the above-named universities for promotion purposes, 1992 to date
6. Taught as a **Visiting Lecturer** in Catholic University of Health and Allied Sciences (Bugando, Mwanza) 2013

ADMINISTRATIVE EXPERIENCE

University

1. **Director , Intellectual Property** 2007 to date.
2. **Chairman** – Department of Pharmacology and Pharmacognosy, School of Pharmacy – 1995 – 2004. (9 years).
3. Acted as **Dean, School of Pharmacy since 1995 at various times.**
4. Member – University of Nairobi Interim **Management Board** for Science Technology and Innovation Park.
5. Member – **Research and Development Advisory Board** of the University of Nairobi
6. Member of Committee for Intellectual Property Policy **Review** (UoN), 2013
7. **Chairman** – University Management Board Committee on **award Scheme for innovation and Creativity**
8. Member of **Senate (Over 15 yrs)**
9. Member of **Dean’s Committee (over 6 yrs)**
10. Member of **College of Health Sciences Academic Board (Over 15 yrs)**
11. Member of School of Pharmacy **Postgraduate** Committee 1990s to date.
12. Coordinator for **collaboration** between University of Nairobi and **Tianjin University of Traditional Chinese Medicine, China** 2009-2011
13. **Negotiates** in favor of University of Nairobi a number of **MoUs, Research Collaboration Agreements, Contracts, Training Agreements and Technology Transfer Agreements**
14. **Linked University students with** international universities for their postgraduate studies.

Government

1. Board Member **Pharmacy and Poisons Board (PPB)**, 2005 to 2011
2. Member of **Finance & Human resource** Committee in PPB, **2005 -2011**
3. **Chairman** – Training and Assessment Pharmacy and Poisons Board Committee- 2005 – 2011- **RESPONSIBLE FOR INSPECTION and accreditation of Colleges and Universities offering Diploma and Degree courses respectively and Board Examinations**

4. **Chairman** – Committee for **implementation of recommendations** of the **Efficiency monitoring Unit (EMU)** for Pharmacy and Poisons Board. Appointed by PS- Ministry of Medical Services – 2011
5. Member of directors **Copyright Board of Kenya, 2009 to 2012.**
6. Member of **Finance** Committee at Copyright Board of Kenya, **2009 to 2012.**
7. Member of **Board of Directors** of KIPI (from **2003 to 2006**).
8. Expert for Ministry of Agriculture Committee on **Plant Genetic Resources** (2008 – to date)
9. **Chairman** – Technical Committee of Drug Registration (Vet) of the Pharmacy and Poisons Board from Jan to Oct 2005.
10. Technical Committee on Dietary Foods. **Kenya Bureau of Standards** 2006.
11. Member of **KEMRI'S** Traditional Medicine and Drug Development Committee.
12. Member of **BIO-EARN Program Advisory Committee** representing Kenya (others Uganda, Tanzania, Ethiopia)

Governance

1. Trained in **Corporate Governance** for Directors by Centre for Corporate Governance and Commonwealth Association for Corporate Governance, 2006. Serena Hotel, Mombasa
2. **Corporate Governance** workshop for PPB board members by Department of State Corporations 12th -13th October ,2009
3. **Strategic Leadership and Change Management** workshop for Directors of State Corporations . KIA, 4th to 5th February 2011
4. **Performance** Contracting and **Strategic** Plans.

RECOGNITION

1. **ELDER OF THE ORDER OF THE BURNING SPEAR (E.B.S)** – 12/12/2011
2. Appreciation award by **THE STATE LAW OFFICE** in appreciation of my **Commitment and work** towards the Development of Laws for the protection of Traditional Knowledge in Kenya from March 2006 to July 2009. 26th Feb 2010
3. Selected for inclusion in “**WHO’S WHO in the World**” from **2003 to date** , Marquis WHO’S WHO. USA

4. Included in **WHO IS WHO** in the World of Science, 2002 vol. 19. Marquis WHO'S WHO. USA
5. Included in **WHO IS WHO in science and engineering** 9th Edition 2006 – 2007 Marquis WHO'S WHO. USA
6. Nominated as an **INTERNATIONAL SCIENTIST OF THE YEAR** 2003 and 2007, by The International Biographical Centre of Cambridge, England.
7. Selected and listed as one of the founding members of the IBC's **LEADING SCIENTISTS** of the WORLD 2005. The International Biographical Centre, England.
8. Listed as one of the IBC **OUTSTANDING SCIENTISTS OF THE 21st CENTURY** , 2007 and **OUTSTANDING SCIENTISTS WORLDWIDE**, 2007. The International Biographical Centre, England.
9. Listed as one of the IBC **TOP 100 SCIENTISTS 2007, 2009**. The International Biographical Centre, England.
10. Listed as an International Honorary Advisor to “The **Open International University** for Alternative Medicine” Calcutta, India.
11. Staff University of Nairobi **merit award in recognition of outstanding** contribution to the university's mission 16th October 2001.
12. School of Pharmacy award for **excellent and consistent service** – UON Silver Jubilee celebrations (1997)
13. UoN, Results of Staff Performance Appraisal, 2014/2015 , **Outstanding**.

INTELLECTUAL PROPERTY EXPERIENCE

1. **Director, Intellectual Property (UoN)**, March 2007 to date.
2. Admitted as a **PATENT AGENT** by Kenya Industrial Property Institute on 21st February 2012
3. Provided **0-draft** of University of Nairobi intellectual property policy guidelines and establishment of a technology transfer office in the University of Nairobi 2000.
4. **Chairman**-University of Nairobi Task Force on **University Intellectual Property Policy and establishment of Technology Transfer Office** (2002).
5. Member, Board of Management of **Kenya Industrial Property Institute (KIPI)** 2003-2006.
6. Member, Board of Management of **Kenya Copyright Board**, 2009 to 2012

7. Member, Task Force on “**Protection of Traditional Knowledge, Genetic Resources and Folklore**” constituted by Attorney General, 2006.
8. Member, Task force to review and draw up the final **Material Transfer Agreement** between the Government of Kenya (represented by Ministry of Environment & Natural Resources) and Royal Botanic Gardens, Kew (Britain) 12th-13th July and 2nd -4th Aug 2000.
9. Task force to review and draw up a **Collaborative Agreement** between the University of Nairobi, International Aids Vaccine Initiative (IAVI) New York and Medical Research Centre (Britain) on HIV/AIDS vaccine research 2000-2001. Signed on 24th August 2001.
10. Trained on **Patent Drafting (WIPO/ARIPO), Harare, 3rd to 14th September 2007**
11. **Biodiversity and Law** Training organized by GBDI/ICIPE 26th July – 15th Aug 1999. Nairobi
12. Seminar on **Intellectual Property for Universities**. Eldoret, Kenya, 3rd – 6th September 2002.
13. **African Regional Intellectual Property Organization (ARIPO)**. 28th Session. 22-26th Nov. 2004 Mombasa.
14. **World Intellectual Property Office (WIPO)** National Seminar on the Patent Cooperation Treaty (PCT) 16 –17 Nov. 99.
15. **Bioprospecting** Seminar. 1998, ICIPE 4th – 6th August, Nairobi.
16. Teaching **Biodiversity and Law** (MSc in Pharmacognosy and Complementary Medicine , UoN).
17. Trained on **Patent** Search strategies and techniques. WIPO, KIPI and Ministry of Industrialization. 26th to 28th October 2011
18. Nominated to represent University of Nairobi on **Bio-innovate Intellectual Property Management Committee** in Bioscience Innovation Policy Consortium for East Africa

INTELLECTUAL PROPERTY PROTECTION, KENYA INDUSTRIAL PROPERTY INSTITUTE (KIPI)

1. **ANOPEL**[®] - protects from mosquito bites
2. **MUPAL**[®] - for hyperacidity, stomach and duodenal ulcers.
3. **PROSGEM**[®] - for treatment of benign prostate hyperplasia (BPH).
4. **NATURUB**[®] - for colds, flu and muscular pains

5. Registration ,Protection and commercialization of UoN **Intellectual Property assets (Patents, trademarks, copyrights)**

OTHER CERTIFICATES

1. Certificate for Directors on **Corporate governance**. 2003
- 2.
3. Certificates of recognition in appreciation of outstanding support towards **Pharmaceutical Society of Kenya**.
4. Certificate of Achievement for completing a course on **Intellectual Property Rights**, 8th June 2001.
5. Certificate for successfully completing a course on **Biodiversity and Law**, 15th 1999.
6. Certificate for completing a course on **bioassays**,1993
7. Certificate of merit in recognition of outstanding work on **Evaluation of effects of plant extract on trypanosomes**. 2003
8. Certificate of attendance of studies in Tianjin University of **Traditional Chinese Medicine** on Development and Research of New Botanic Medicine, Plant Chemistry and Traditional Chinese Medicine Preparation and Analysis 3rd September-4th October 2005.
9. Certificate for completion of **Patent Drafting Workshop** (WIPO/ARIPO), Harare, September, 3rd to 14th 2007
10. Certification of participation in the **International Conference on Bioethics**. UESCO Regional Centre for Documentation and Research on Bioethics. 12th -14th August, 2008.
11. Certificate of successfully completing WIPO Workshop on **Patent Search Strategies and Techniques**. WIPO, Min of Industrialization & KIPi, 26th – 28 Oct 2011, Nairobi
12. Certificate of admission as a **patent agent**- 21st February 2012

RESEARCH ACTIVITIES

1. Investigating phytochemical and pharmacological/biological and formulation characteristics of Traditional Herbal Medicines (Mitishamba).
2. Investigation of plants in Kenya containing essential oils, biological activities and bioprospecting of essential oils.
3. Formulation of locally available plants/extracts/isolated compounds as medicines for human, veterinary animals or insecticide.
4. Phytochemical and biological/pharmacological investigation of plants used in traditional medicine for treatment of East Coast Fever caused by *Theileria parva*.

5. Co-investigator – UNDP-GEF funded project “Community-Based Commercial production of Essential oils for Manufacture of Aromatherapeutic Products: A Pilot Project”, ICIPE-Uon (\$ 45,000)
6. Co-investigator – Evaluation of Kenyan plants for their anthelmintic and antitrypanosome (ILRI) effects in veterinary medicine – African Research Foundation funded, 2001 – 2003. (about \$ 20,000)
7. Co- investigator - *In vitro* testing of Kenyan medicinal plants for anthelmintic activity – International Foudation for Science (IFS), Sweden, 2000-2001. (\$ 11,000).
8. Co-investigator –Evaluation of extracts from selected plants in Kenya for anthelmintic activity – Rockefeller Foundation, Faculty of Pharmacy, 2000 -2003. (\$ 32,000)
9. Co-investigator –Phytomedicine in Kenya with Ant-East Coast Fever activity – Rockefeller Foundation, (\$ 34,000) 2002
10. Scientific advisor- Evaluation of Kenyan plants for their antimalarial activity-WHO funded (PI, Dr. H.A. Oketch-Rabah), Faculty of Pharmacy. (\$80,000). 2000
11. Program Advisory Committee in BIO-EARN - Managing about \$ 8 million 2006
12. Co-investigator-The use of *Plumeria rubra* in treatment of *Herpes simplex* and *Varicella zoster* infections-(PI, Dr. P.K. Wanyoike),

RESEARCH AND EXTENSION

1. In Shinyalu, Kakamega County, by Mulilu farmers Association, “Community-Based Commercial production of Essential oils for Manufacture of Aromatherapeutic Products: A Pilot Project”, which resulted in **NATURUB®**

CONFERENCES, SEMINARS, WORKSHOPS AND TRAINING

1. Pharmacy and Poisons **Board Strategic Planning** Workshop (2006).
2. National Quality Control Laboratory (NQCL) **Strategic Planning** Workshop. 2005, 7th -10th August.
3. School of Pharmacy **Strategic Planning** Workshop. 2005, 17th 20th July, Machakos.
4. Trained in Corporate **Governance for** Directors by Centre for Corporate Governance and Commonwealth Association for Corporate Governance, 2006. Serena Hotel, Mombasa
5. Attended **Corporate Governance** workshop for PPB board members by Department of State Corporations 12th -13th October, 2009
6. Strategies for development of essential oils of **economic potential value** from plants by National Council of Sciences and Technology – 22nd August 1984.

7. University of Nairobi Institute of Tropical Infectious Diseases (UNITID). **Curriculum Development**. 2005, 11th -13th April, Bogoria.
8. Attendance of Studies in **Tianjin University of Traditional Chinese Medicine** on various aspects of Traditional Plant medicine in China 7th Sept. 2005 to 3rd Nov. 2005.
9. National symposium on **intellectual property education**, training and research, 31st May to 1st June 2007, Dar es Salaam.
10. Workshop to Strengthen Capacity of **Kenyan for CBD Implementation**- In Preparation for Access & Benefit Sharing Negotiations, 16-17th July 2007, UNESCO, Nairobi.
11. University of **Nairobi Research Policy** workshop 9-11th August 2007, Naivasha
12. WIPO/ARIPO **Patent Drafting** Training/Workshop 3-14th September 2007, Harare, Zambia.
13. BIO-EARN **Program Advisory Committee** meeting 17th-19th 2009, Addis Ababa, Ethiopia.

REPORTS, BOOKS, BOOK REVIEWS, AND OTHER WORKS

1. With others, have drafted a book, “**Medicinal Plants of Kenya**”
2. Report on “**Medical Herbs of Kenya**” stamp issue of 1987.
3. A book review on “**PLANTS OF DHOFAR**” Southern Region of Oman, **Traditional Economic and medical Uses**” by Anthony G. Milles and Miranda Morris. Prepared and published by the Adviser for Conservation of the Environment, Diwan of Royal Court Sultanate of Oman, 1988 p. 361 OSBN 07157-2.
4. Compiled a booklet “***Prunus africana* and benign prostate hyperplasia (prostate enlargement- old man’s disease)**” for Starehe Boys School Library.
5. Reviewed a manuscript for University Press on Medicinal plants.

OTHER ACTIVITIES, INTERESTS AND CONSULTANCIES

1. **Consultant** to World Agroforestry Centre (ICRAF) 1st Feb to 15th March 2007
2. **Consultant** on Pharmacognosy in general and herbal and other traditional/ complementary medicines
3. **Consultant**, AMREF- Pharmacology therapeutics 3rd Edition 2014

4. **Reviewer for scientific journals** BioChemPhysics, Discovery and Innovations, East and Central African Journal of Pharmaceutical Sciences, East African Medical Journal, Molecules, Journal of Essential Oil-Bearing Plants.
5. **Editor**, East and Central Africa J. of Pharmaceutical Sciences;
6. Bioprospecting of plants with useful medicinal/biological activities and **product oriented** research and community-based projects.

CONFERENCE, SYMPOSIA, WORKSHOP AND SEMINAR PRESENTATIONS

a) Papers on intellectual property

1. **J.W. Mwangi** *et al* (2001). A Pharmacy Profession Perspective on Traditional Medicines. Kenya Industrial Property Office Week- A National Sensitization Seminars on Intellectual Property Rights (IPRs) 5th-8th June Nairobi.
2. **J.W. Mwangi**, G. N. Thoithi, I.O. Kibwage (2003). Conservation of Herbal Medicine and Benefit Sharing. Stakeholders Workshop on Sustainable, Safe and Effective Use of Medicinal Plants in East Africa, 24th – 27th, Arusha, Kenya.
3. **J.W. Mwangi** (2004). Sustainable Bioprospecting: Issues of Access and Benefit Sharing for Local Communities. 12th November, National Museums of Kenya, Nairobi.
4. **J.W. Mwangi**, G. N. Thoithi, I.O. Kibwage (2003). Herbal Medicine in Kenya: Conservation of Medicinal Plants and Intellectual Property. 2nd National Congress on Quality Improvement in Health Care, Medical Research and Traditional Medicine. 24th – 28th Nov. KCCT, Nairobi, Kenya.
5. **J.W. Mwangi**, I.O. Kibwage and G. N. Thoithi (2005). Intellectual Property Rights and Pharmaceutical Industry. Pharmaceutical Society of Kenya Annual Symposium 29th April to 2nd May, Mombasa.
6. **J.W. Mwangi** (2005). Importance of institutional intellectual property policies in technology transfer with special reference to disclosure. A workshop on the Implementation of Institutional Intellectual Property Policy in the BIO-EARN Network Partners. 18th to 19th, October Nairobi.
7. **J.W. Mwangi** (2005). Intellectual property policy and partnerships in product development in biotechnology. A workshop on the Implementation of Institutional Intellectual Property Policy in the BIO-EARN Network Partners. 8th to 9th November, Nairobi.
8. **J.W. Mwangi** (2006). Role of Intellectual Property Beyond MODULE II. Workshop on “BEYOND MODULE II” for College of Health Sciences . University of Nairobi, 23rd to 24th June. Nairobi.

9. **J.W. Mwangi** (2006). Access and Intellectual Property. BIO-EARN Workshop on Intellectual Property (IP) Management and Opportunities for Product Development Program, 30th October to 1st November 2006, Nairobi.
10. **J.W. Mwangi** (2006). Issues of Access and Benefit Sharing. East African Regional Programme and Research Network for Biotechnology, Biosafety and Biotechnology Policy Development (BIO-EARN) Newsletter 2nd Issue.
11. **J.W. Mwangi, Nelly N. Mungai** (2007). Protection of traditional knowledge, genetic resources and folklore. Pharmaceutical Society of Kenya Annual Symposium 1-3rd June, Mombasa.
12. **J.W. Mwangi** (2007). Literature on traditional knowledge. Task Force Workshop on Traditional Knowledge, Genetic Resources and Folklore, September 27-28th, Nairobi
13. **J.W. Mwangi** (2008). Intellectual property and the pharmacist. Pharmaceutical society of Kenya annual symposium, 31st May – 2nd June, 2008, Mombasa, Kenya.
14. **J.W. Mwangi** (2008). Traditional medicine and medicinal plants as intellectual property assets in research and development. Traditional Knowledge and Development Workshop, KIPI& IEA, 17th June, Nairobi.
15. **J.W. Mwangi** (2008). Traditional medicine and traditional knowledge – intellectual property rights, access and benefit sharing. 6th African Traditional Day Workshop, 26th August, KEMRI, Nairobi
16. **J.W. Mwangi** and Muthoka S.M. 2013. Protection of intellectual property assets and commercialization. Research and Advisory Board Workshop July 17th -18th. Maazoni, Kenya
17. **J.W. Mwangi** and Muthoka S.M. 2013. Intellectual Property. Sensitization on Intellectual Property Rights workshops to University Management Board, Directors/Deans and IP champions. June 5-6 & June 16-17th. Nairobi.
18. **J.W. Mwangi** and Muthoka S.M. 2013. Role of Patent information in Research. Technology and Innovation Support Centre Training Workshop, September 6-7th Machakos.

b) Papers Presented on medicinal plants

1. **J.W. Mwangi, I. Addae-Mensah, G. Muriuki, R.M. Munavu and W. Lwande** (1990). (Bonn-Bacans) Antimicrobial activity of *Lippia grandifolia* and *L. javanica*. Biology and Chemistry of active natural substances. Int. Joint Symposium. Bonn July 17-22nd 1990 Thiemi. George Thieme Verlag Stuttgart, New York p.100.
2. I. Addae-Mensah, H. Achenbach, G.N. Thoithi and **J.W. Mwangi** (1991). A new triterpenoid ester from *Croton megalocarpus*. 39 annual Congress on Medicinal plants Research. Searbrucken 3-7th Sept. 1991. George Thieme Verlag Stuttgart, New York p.66.

3. K. Njunge and **J.W. Mwangi** (1992). Effect of *Croton sylvaticus* on central nervous system. 13th Medical Scientific Conference of KEMRI/KETRI Feb. 3-7th p.69. Nairobi.
4. K.A Sinei and **J. W. Mwangi** (1993). Effect of *Adenia globosa* on rat uterus. 5th NAPRECA International Symposium, Antananarivo, Madagascar (13-23rd Sept.).
5. **J.W. Mwangi**, T. Tonaka, G. Nonaka, P. Malii, L. Gathu (1993). Tannins of *Ximenia americana* var. *caffra* (Sond.) Andler. A plant used in traditional medicine in Kenya. 14th Medical Scientific Conference of KEMRI/KETRI Feb. 1-5th p. 27.
6. P.K. Gathumbi, G.M. Mugeru, S.M. Njiro and **J.W. Mwangi** (1992). Toxicity of chloroform extract on *Prunus africana* Hook. (*Pygeum africanum*) stem bark in rats – Haematological, biochemistry and pathological changes. Sixth International Congress on Toxicology. Sweden
7. K.A. Sinei, **J.W. Mwangi**, K.J Achola (1994). Potentiation of oxytocin activity of *Adenia globosa* tuber extract by oxytocin and prostaglandin F_{2α}. 15th African Health Sciences congress 7-11th Feb. KEMRI, Nairobi p. 28.
8. P.K. Gathumbi, G.M. Mugeru, S.M. Njiro and **J.W. Mwangi** (1993). Toxicity of a Chloroform extract of *Prunus africana* (*Pygeum africanum*) in rats. Biochemical changes. IFS Scientific Workshop for East African Grantees (Animal production), Kampala.
9. P.K. Gathumbi, **J.W. Mwangi**, S.M. Njiro and G.M. Mugeru (1995). Acute toxicity of water extract of *Prunus africana* rats. Proceedings of VII International Congress of Toxicity Seattle, Washington USA July 2-6.
10. P.K. Gathumbi, G.M. Mugeru, **J.W. Mwangi** and S.M. Njiro (1993). Pathology of a chloroform extract of *Prunus africana* Hook stem bark in rats-biochemical changes. Proceedings of IFS/SIPATH seminar on Animal Diseases of GIT and liver. Addis Ababa, Ethiopia Sept. 20-25.
11. **J.W. Mwangi** (2001). Exploitation of Essential Oils in Kenya. 1st National Workshop on Medicinal, Aromatic, and Underutilized Plant Species in Kenya. 29th October, Naivasha.
12. P.K. Gathumbi, R. Pelle, J. Wando, G. Thoithi, **J.W. Mwangi**, I.O. Kibwage and D.M. Maingi (2001). A baseline Study on Plants used to treat animal Trypanosomiasis in Kenya: A Community Based Approach. 1st National Workshop on Medicinal, Aromatic, and Underutilized Plant Species in Kenya. 29th October, Naivasha.
13. P.K. Gathumbi, **J. W. Mwangi** et al (2003). Evaluation of Effects of Plant Extracts on Trypanosomes. KARI Headquarters, Nairobi, Kenya. 2nd –4th December.
14. **J.W. Mwangi** (2010). East Africa Endowments for Natural-Based Health Products: Untapped Economic Opportunities. Gibex Training Workshop 15th March, Nairobi
15. J.W. Mwangi (2010). Kenyan Products from Nature. 18th Institute of Primate Research International Biomedical Conference, 6th -8th July 2010, KIE, Nairobi

c) Papers Presented on traditional/complementary medicine

1. **J. W. Mwangi** *et al.* (1984). Traditional Medicine: Its relevance to primary health care and its economic importance. Africa Medical Research Foundation (AMREF).
2. **J.W. Mwangi**, H. A. Oketch-Rabah, I.O. Kibwage, G.N. Thoithi (2000). Traditional Herbal Medicine in Kenya. International Conference on Medicinal Plants, Traditional Medicines and Local Communities in Africa: Challenges and Opportunities. ICRAF 16th – 19th May. Nairobi
3. **J.W. Mwangi** *et al* (2000). Pharmacy and Alternative Medicines. Pharmaceutical Society of Kenya National Symposium from 1st-3rd June, Mombasa.
4. **J.W. Mwangi**, I. O. Kibwage and G. N. Thoithi (2001). Ministry of Health and Traditional medicine. Paper presented at the First National Congress on Quality Improvement in Health Care, Medical Research and Traditional Medicine. – Quality Health Care to All Kenyans, 19th –23rd Nov. Nairobi.
5. **J.W. Mwangi**, G.N. Thoithi and I.O. Kibwage (2002). Traditional medicine practice-current and future trends in Kenya. Media and Traditional Medicine. 18th January, Nairobi.
6. **J.W. Mwangi**, I. O. Kibwage and G. N. Thoithi (2002). Evidence based complementary medicines. Pharmaceutical Society of Kenya Annual Symposium from 30th May-2nd June, Mombasa.
7. **J.W. Mwangi**, I. O. Kibwage and G. N. Thoithi (2002). Alternative therapies: Do they really work? Pharmaceutical Society of Kenya National Symposium from 30th May-2nd June, Mombasa.
8. G.N. Thoithi, K.O. Abuga, **J.W. Mwangi**, and I.O. Kibwage (2002). Quality Control of Herbal Medicines. Pharmaceutical Society of Kenya National Symposium from 30th May-2nd June, Mombasa.
9. **J.W. Mwangi**, G. N. Thoithi, I.O. Kibwage (2003). Traditional Medicine in Kenya . Second National Congress on Quality Improvement in Health Care, Second National Congress on Quality Improvement in Health Care, Medical Research and Traditional Medicine. 24th – 28th Nov. KCCT, Nairobi, Kenya.
10. Quality Control/Assurance of Traditional Medicines. Ibid.
11. **J.W. Mwangi** (2004). An overview of research activities in traditional medicine. Inter – Sectoral Workshop on Traditional Medicine Development. 15th - 17th , Nairobi.
12. **J.W. Mwangi**, N.N. Mungai, G.N. Thoithi, I.O. Kibwage (2006). Traditional herbal medicinal plants. Kenya Academy of Sciences Conference. 26th – 30th June.
13. **J.W. Mwangi** (2008). A Kenyan overview of research and training in traditional medicine. South to South Cooperation Workshop 28th July, NMK, Nairobi.

14. **J.W. Mwangi** (2008). Overview of traditional medicine and medicinal plants in Kenya. 5th International Congress of the African Association of Physiological Sciences 28th -30th July, Nairobi.
15. **J.W. Mwangi** (2008). Experiences in herbal medicine practice. International Conference on Bioethics, 12th -14th August, Egerton University, Njoro
16. **J.W. Mwangi, G.N. Thoithi, I.O. Kibwage** (2011). Traditional Medicine in Kenya. International Forum on the Development of Traditional Chinese Medicine. Tianjin. China. 21st-23rd September
17. **J.W. Mwangi** (2012). Traditional medicine and intellectual property. Africa Traditional Medicine Day, 31st August, Kerugoya – to be presented.
18. Sinei K.A., **Mwangi J.W.**, Munenge R.W., Mwaura A.M. (2012). Contactile action of *Adenia globosa* Engl on mammalian smooth muscle. Abstract No. 31. The 1st national Science, Technology and Innovation week. 7th-11th May. KICC, Kenya.
19. **J.W. Mwangi** (2012). Endangered and threatened species in Kenya. Society of Economic Botany –Kenya Chapter. 25th October, Kenyatta University, Kenya.
20. **J.W. Mwangi** (2014). Traditional herbal medicine and Kenya Vision 2030. 4th KASA Conference 5th -7 Feb (KEMRI)
21. **J. W. Mwangi (2015)**. Traditional and complementary medicine in patient centered health care and integrative medicine. Patient Centered Care: Training and Delivery of Universal Healthcare Conference, Kenyatta University Nairobi, Kenya, 29th Sept.– 2nd Oct.
22. **J.W. Mwangi** (2016). Traditional and complementary medicine in cancer management, 6th KEMRI Annual Research Health Conference, 9th -11 Feb, Nairobi, Kenya

PUBLICATIONS

i) Thesis

1. **PhD, Title: J.W. Mwangi** (1990). Pharmacognostical and Biological studies of Kenyan *Lippia* species, with special reference to their essential oils. Ph.D. thesis – University of Nairobi.
2. **Msc (Pharmacognosy), Title: J.W. Mwangi** (1982). Study of the Essential oil of *Eucalyptus citriodora* cultivated in Kenya. MSc. Thesis 1982, University of Nairobi.

ii Books and Book Chapters

3. **J.W. Mwangi**, (1995) The potential for commercialization of 3 *Lippia* species as sources of essential oils for perfumery and medicinal purposes. In “Valorisation de la Biomasse vegetale par les produits Naturels” Ed. Garneau Fx and Collins G.J. Centre De Recherches Pour le Development International Ottawa, Dakar, Nairobi, New Delhi, Singapore, p. 206-216.
4. **J.W. Mwangi**, G.N. Thoithi, I.O. Kibwage (2009). Essential oil bearing plants in Kenya: Chemistry, bioactivity and applications in “African natural plant products: New discoveries and challenges in chemistry and quality”. Eds H.R. Juliani, J.E. Simons, C-T H. American Chemical Society Symposium Series Vol 1020 pp. 495-525
5. Njau E., Adome R., Carter J. **Mwangi J.** (2014). PHARMACOLOGY and THERAPEUTICS 3rd Ed. Vol. III . Amref Health Africa Headquarters, Nairobi

iii) Publications in peer review journals

6. C.K. Maitai, A.N. Guantai and **J.W. Mwangi** (1981). Self-medication in management of minor health problem in Kenya. E.A. Medical J. **58**: 593-600.
7. **J.W. Mwangi**, C.K. Maitai, and Talalaj (1982). Essential oil content of *Eucalyptus citriodora* (Hooker) growing in Kenya. Kenya J. Sci. Tech. **3**: 55-56.
8. **J.W. Mwangi**, A.N. Guantai and Gichuru Muriuki (1985) *Eucalyptus citriodora* – Essential oil content and chemical varieties of Kenya. E. Africa Agric. For. J. **46**: 89-96.
9. **J.W. Mwangi**, A.N Guantai and Gichuru Muriuki and A.K. Kuria (1986). Essential oil of *Plectranthus marrubioides* Benth. Kenya J. Scie. (A) **7** : (1): 63-66.
10. A.N. Guantai, **J.W. Mwangi** and K.A.M. Kuria (1987). Effects of active constituents of *Catha edulis*. Neuropharmacology **26** (5): 401-405.
11. **J.W. Mwangi**, G. Muriuki, I. Addae-Mensah, R.M. Munavu, W. Lwande, A.A., Craveiro and J.W Alencar (1989). Essential oil of *Lippia wilmsii* H.H.W Pearson Rev. Latinoamer. Quim **20-23**: 143-144.
12. **J.W. Mwangi**, G. Muriuki, A.N. Guantai and W. Lwande (1988). Volatile constituents of *Ocimum fischeri* Guerke. Kenya J. Sci. B:**9**: 119-121.
13. **J.W. Mwangi**, I. Addae-Mensah, R.M Munavu and W. Lwande (1990). Essential oils of *Lippia ukambensis* chemotypes and *Lippia somalensis* in Kenya. Journal Essential Oil Research **3** (6): 413-417.
14. **J.W. Mwangi**, I. Addae-Mensah, R.M Munavu and W. Lwande (1991). Essential oil of Kenyan *Lippia* species. Part III: Flavour and Fragrance Journal **6** (3): 221-224.

15. **J.W. Mwangi**, I. Addae-Mensah, G. Muriuki, R.M Munavu and W. Lwande (1992). Essential oils of Kenyan *Lippia* species. Part IV: Maize weevil (*Sitophilus zeamais*) and larvicidal activity. International Journal of Pharmacognosy **30** (1): 9-16.
16. I. Addae-Mensah, Hans Achenbach, G.N. Thoithi, R. Waibel and **J.W. Mwangi** (1992). Epoxychiromodine and other novel constituents of *Croton megalocarpus*. Phytochemistry **31**: 2055-2058.
17. **J.W. Mwangi**, W. Lwande and A. Hassanali (1993). Composition of Essential oils of *Plectranthus tenuiflorus* (Vatke) Agnew. Flavour and Fragrance J.**8**: 51-52.
18. W. Lwande, A. Hassanali, O.B. Wanyama, S. Ngola and **J.W. Mwangi** (1993). Constituents of the essential oil of *Helichrysum odoratissimum*. J. Ess. Oil Research **5**: 93-95.
19. **J.W. Mwangi**, W. Alwande and A.Hassanali (1994). Composition of the Essential oil of *Ocimum keniense* Ayobangira. Flavour and Fragrance J. **9**: 75-76.
20. **J.W. Mwangi**, E.N.Njonge, R.W. Munavu, I. Addae-Mensah and W. Lwande (1994). Antimicrobial activity of essential oils of *Lippia* in Kenya. Discovery and Innovation **6** (1): 58-62.
21. **J.W. Mwangi**, T. Tonaka, G. Nonaka, P. Mali and L. Gathu (1994). Polyphenols of *Ximenia americana* var *caffra*. Fitoterapia. **LXV**: 185.
22. **J.W. Mwangi**, K.J Achola, R Laurent, W. Lwande and A. Hassanali (1994) Essential oil constituents of *Heteromorpha trifoliata*. Flavour and Fragrance J.**9**: 241-243.
23. **J.W. Mwangi**, K.J Achola, W. Lwande and A. Hassanali, R Laurent (1994). Volatile constituents of *Tarconanthus camphoratus*. J. Essential Oil Research. **6**: 183-185.
24. **J.W. Mwangi**, K.J. Achola, R. Laurent, W. Lwande and A. Hassanali (1994). Chemical composition of Essential oil of *Blumea brevipes*. Flavour and Fragrance J.**9**: 233-235.
25. K.A. Sinei, **J.W. Mwangi**, K.J. Achola, A.M. Mwaura and R.W. Munenge (1994). Potential of uterine stimulatory action of *Adenia globosa* Engl. by oxytocin *in vitro*. African J. of Health Sciences. **I** (4): 191-3.
26. **J.W. Mwangi**, K.J. Achola, R. Laurent, W. Lwande and A. Hassanali (1995). Essential oil constituents of *Sphaeranthus cyathuloides*. J. Essential Oil Research. **7**: 177-178.
27. **J.W. Mwangi**, K. J. Achola, K.A. Sinei, W. Lwande and R. Laurent (1995). Essential oil constituents of *Artemisia afra* Willd. J. Essential Oil Research. **7**: 97-99.
28. K.J. Achola, R.W Munenge and **J.W Mwangi** (1995). Pharmacological activities of *Gardenia jovis-tonantis*. International Journal of Pharmacognosy **33**: (3) 250-252.
29. K.A. Sinei and **J.W. Mwangi** (1995). Effect of tuber of *Adenia globosa* Engl. On isolated rat uterus preparation. International Journal of Pharmacognosy. **33**: 346-7

30. K.J. Achola, **J.W. Mwangi** and R. Munenge (1995). Pharmacological activity of *Oxalis corniculata*. International Journal of Pharmacognosy **33**: (3) 247-249.
31. K.J. Achola, **J.W. Mwangi** and R.W. Munenge (1996). Pharmacological activities of *Vernonia glabra*. International Journal of Pharmacognosy. **34**: (2) 141-144.
32. Malele Rainalds S, Mainen J. Moshi, **J.W. Mwangi**, K.J. Achola and R.W. Munenge (1997). Pharmacological properties of extracts from stem bark of *Syzygium guineense* on the ileum and heart laboratory rodents. African J. of Health Sciences **4**: (1) 43-45.
33. K.J. Achola, **J.W. Mwangi**, K.A Sinei, R.W. Munenge and A.M. Mwaura (1997). Pharmacological activities of *Gutenbergia cordifolia*. International Journal of Pharmacognosy **35**: 60-62.
34. **J.W. Mwangi**, K.J. Achola, W. Lwande and A. Hassanali (1998). Aromatic plants of Kenya: Volatile constituents of leaf oils of *Sphaeranthus suaveolens* (Forsk) D.C. and *S. bullatus* Mattf. East and Central Afri. J. Pharm. Scie. **1**: (1) 24-26.
35. **J.W. Mwangi**, G.N. Thoithi, I. Addae-Mensah, H. Achenbach, W. Lwande and A. Hassanali (1998). Aromatic plants of Kenya III: Volatile and some non-volatile constituents of *Croton sylvaticus*. East and Central Afri. J. Pharm. Scie. ,**1**: (2) 41-3.
36. **J.W. Mwangi** and H.A.Okech-Rabah (1998). Traditional Herbal Medicine in Kenya. The Pharmaceutical J. Kenya **9**:22-24.
37. **J. W. Mwangi**. (1999). Essential oils. East and Central Afri. J. Pharm. Scie.**1**: (1) 2-4.
38. **J.W. Mwangi**, C.N. Thoithi, I. Addae-Mensah, H. Achenbach, W. Lwande and H. Hassanali (1999). Aromatic plants of Kenya IV: Volatile and some non-volatile constituents of *Synadenium compactum* N.E. Br. var. *compactum*. East and Central Afri. J. Pharm. Scie. **2**: (1) 5-7.
39. **J.W. Mwangi**, C.N. Thoithi, Ivan Addae-Mensah, H. Achenbach, W. Lwande and H. Hassanali.(1999) Aromatic plants of Kenya II: Volatile constituents of leaf oil of *Psiadia punculata* Vatke. Int. J. BioChemiPhysics **8** (1,2) 32-33.
40. **J.W. Mwangi**, W. Masengo, G.N. Thoithi and I.O. Kibwage (1999). Screening of Kenyan medicine plants using the brine shrimp lethality test. The East and Central Africa J. Pharm. Scie. **2**: (3) 63-71.
41. **J.W. Mwangi**, H.A. Oketch-Rabah, I.O. Kibwage and G.N. Thoithi (2000). Pharmacy and alternative medicine. Pharmaceutical J. Kenya **11**:25-28.
42. K. Njung'e, Gichuru Muriuki, **J.W. Mwangi** and K.A.M Kuria (2002). Analgesia and antipyretic effects of *Myrica salicifolia* (Myricaceae).Phytotherapy Res. **16**: S73-S74.
43. H. A. Oketch-Rabah, **J.W. Mwangi**, J. Lisgarten and E.K. Mberu (2000). A new antiplasmodial coumarin from *Toddalia asiatica* roots. Fitoterapia **71**: 636-640.

44. **J.W. Mwangi** (2000). MUPAL[®] - A herbal medicine for treatment of stomach and duodenal ulcers. *Pharmaceutical J. Kenya* **11**: (30) 35-38.
45. **J.W. Mwangi**, G.N. Thoithi, H.R. Juliani (Jr.) and J.A. Zygadlo (2001). Composition of the essential oil of *Microglossa pyrrhopappa* var. *pyrrhopappa*. *J. Essent. Oil Research* **13**: 229-230.
46. P.K. Gathumbi, **J.W. Mwangi**, S.M. Njiro and G.M. Mugeru (2000). Biochemical and hematological changes in rats administered an aqueous extract of *Prunus africana* stem-bark at various dosage levels. *Onderstepoort J. Vet. Research* **67**: 123-128.
47. P. K. Gathumbi, **J.W. Mwangi**, G.M. Mugeru and S.M. Njiro (2000). Toxicity of chloroform extract of *Prunus africana* stem bark in rats: Biochemical and haematological changes. *Pharmaceutical Biology* **38**: (4)1-5
48. P.K. Gathumbi, **J.W. Mwangi**, G.M. Mugeru and S.M. Njiro (2001). Toxicity of chloroform extract of *Prunus africana* stem-bark in rats: Gross and histopathological lesions. *Phytotherapy Research* **15**: 1-4.
46. **J.W. Mwangi**, P.K. Gathumbi, I.O. Kibwage, G.N. Thoithi and H.A. Rabah (2001). Alternative medicines and prostate enlargement-*Prunus africana* emphasis. *Pharmaceutical J. Kenya*. **12** (1) 26-30.
47. **J.W. Mwangi**, G.N. Thoithi, I.O. Kibwage, J. A. Zygadlo, M.L. Lopez, M.M. Olivia, M.S. Demo and L. Chalchat (2001). Constituents of essential oil of *Cymbopogon afronardus* Staff. *The East and Central Africa J. Pharm. Sci.* **4**: 43-47.
48. F.A. Okalebo, H.A. Rabah, A.N. Guantai, C.K. Maitai, I.O. Kibwage, **J.W. Mwangi** and W. Masengo (2002) The antimalarial and antimicrobial and Brine shrimp toxicity of *Clematis brachiata* extract. *The East and Central Africa J. Pharm. Sci.* **5**: 15-18.
49. G.N. Thoithi, N. Maingi, D. Karume, P.K. Gathuma, **J.W. Mwangi** and I.O. Kibwage. (2002). Anthelmintic and other pharmacological activities of the root bark extracts of *Albizia anthelmintica* Brongn. *The East and Central Africa J. Pharm. Sci.* **5**: (3) 60-66.
50. R. M. Malele, C.K. Mutayabarwa, **J.W. Mwangi**, G.N. Thoithi, A.G. Lopez, E.I. Lucini and J. A. Zygadlo (2003). Antimicrobial activity and composition of *Hyptis suaveolens* (L.) Poit. essential oil from Tanzania, *J. Essential Oil Research* **15** 438 - 440.
51. **J.W. Mwangi**, G.N. Thoithi, I.O. Kibwage, (2005). Essential oil of *Rynchosia minima* D.C. from Kenya: Composition and antibacterial properties. *J. Essent. Oil Res.* **17**: 230-231
52. M.M. Oliva, M.S. Demo, R.S. Malele, C.K. Mutayabarwa, **J.W. Mwangi**, G.N. Thoithi, I.O. Kibwage, S.M. Faillaci, R.L. Scrivanti, A.G. Lopez and J.A. Zygadlo (2003). Essential oil of *Brachylaena hutchinsii* Hutch from Tanzania: Antimicrobial Activity and composition. *The East Cent. Afri. J. Pharm. Sci.* **6**: (3) 61-63.
53. **J.W. Mwangi** (2004). Integration of herbal medicine in national health care in developing countries. *East Afri. Medical J.* **81** (10) 487-498.

- 54 S.N. Ndwiga, G.N. Thoithi, **J.W. Mwangi** and I.O. Kibwage (2005). Constituents of the stem bark of *Dombeya rotundifolia* Hochst . East Cent. Afri. J. Pharm. Sci. **8**: (2) 40-62.
- 55 **J.W. Mwangi**, N.N. Mungai, G.N. Thoithi, I.O. Kibwage, (2005). Traditional Herbal Medicine in National Healthcare in Kenya. East Cent. Afri. J. Pharm. Sci. **8**: (2) 22-6.
- 56 I.O. Kibwage, **J.W. Mwangi**, G.N. Thoithi (2005). Quality Control of Herbal Medicines. East Cent. Afri. J. Pharm. Sci. **8**: (2) 27-30.
- 57 R.S. Malele, **J.W. Mwangi**, G.N. Thoithi, I.O. Kibwage, M.L. López, M.P. Zonino, A.G. López and J.A. Zygadro (2007). Essential oil of *Cymbopogon winterianus* Jowitt from Tanzania: Composition and Antimicrobial Activity. J. Essent. Oil-Bearing Plants (Jeobp) **10** (1) 83-87.
- 58 Ongarora D.S.B., Thoithi G.N., Kamau F.N., Abuga K.O., **Mwangi J.W.** and Kibwage I.O. (2009). Triterpenoids from the stem bark of *Blighia unijugata* Bak. (Sapindaceae).Ethiopian Pharmaceutical J. **24**: 71-74.
- 59 Dambolena J.S., Zunino M.P., Lopez A.G., Rubistein H.R., Zygadlo J.A., **Mwangi J.W.**, Thoithi N.G., Kibwage I.O., Mwalukumbi J.M., Kariuki S.T.(2010). Essential oils of *Ocimum basilicum* L and *Ocimum gratissimum* L from Kenya and their inhibitory effects on growth and fumonisin production by *Fusarium verticillioides*. Innovative Food Science and emerging Technologies **11**(2) 410-414
- 60 Njogu P.N., Thoithi G.N., **Mwangi J.W.**, Kamau F.N., Kibwage I.O., Kariuki S.T., Yenesew A., MugoH.N. and Mwalukumbi J.M.. (2011). Phytochemical and antimicrobial investigation of *Girardinia diversifolia* (Link) Friis (Urticaceae). East Cent. Afri. J. Pharm. Sci. **14**: 89-94.
- 61 Jande M., Kongola G. and **Mwangi J.W.** (2012). Drug prescribing pattern in two hospitals in Mwanza, Northwest Tanzania. East Cent. Afri. J. Pharm. Sci. **15**: 27-30.
- 62 Jande M., Kongola G., Liwa A., Justin-Temu M., **Mwangi J.W.** (2013). Community awareness of adverse effects of nonsteroidal antiinflammatory drugs in Ilala municipality, Dar es Salaam. East Cent. Afri. J. Pharm. Sci. **16**:81-85
- 63 Amugune B.K.,Thoithi G.N., **Mwangi J.W.**, Omosa L.K.,Kibwage I.O. (2013). Antimicrobial activity and bioactive constituents of *Alectra sessilifolia* (Vahl) Kuntze methanol extract. East Cent. Afri. J. Pharm. Sci. **16**:61-68
- 64 Ogaji I. J., Kahiga T. M., Gachuno O.W. and Mwangi J. W. (2016).Development of Pharmacy Education in Kenya Universities to date. Afr. J. Pharm. Pharmacol.**10** (18) 386-393