
African Journal of Biochemistry Research (AJBR) provides rapid publication (monthly) of articles in all areas of Biochemistry such as Nutritional biochemistry, Analytical biochemistry, Clinical Biochemistry, Human and Plant Genetics, Molecular and Cell Biology, Enzymology, Toxicology, Plant Biochemistry, Biochemistry Education etc. The Journal welcomes the submission of manuscripts that meet the general criteria of significance and scientific excellence. Papers will be published shortly after acceptance. All articles are peer-reviewed.

Contact Us

Editorial Office: ajbr@academicjournals.org

Help Desk: helpdesk@academicjournals.org

Website: http://www.academicjournals.org/journal/AJBR

Submit manuscript online http://ms.academicjournals.me/
Editor

Prof. Johnson Lin
School of Biochemistry, Genetics, Microbiology and Plant Pathology
University of KwaZulu-Natal (Westville)
Private Bag X 54001, Durban
Republic of South Africa

Associate Editors

Gregory Lloyd Blatch
Dept Biochemistry Microbiology & Biotechnology
Rhodes University Grahamstown 6140
South Africa

Dr. Serap Yalin
Mersin University,
Faculty of Pharmacy,
Department of Biochemistry,
YenisehirKampusu,
Mezitli 33161
Mersin/Turkey

Dr. Om Prakash Gupta
Directorate of Wheat Research (ICAR)
Post Box-158, A
grasainMarg, Karnal-132001, Haryana, India
<table>
<thead>
<tr>
<th>Dr. Suraini Abd-Aziz</th>
<th>Universiti Putra Malaysia</th>
<th>Malaysia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr. Mustafa Numan Bucak</td>
<td>Lalahan Livestock Central Research Institute Lalahan</td>
<td>Ankara, Turkey</td>
</tr>
<tr>
<td>Alparslan Kadir Devrim</td>
<td>Department of Biochemistry</td>
<td>Faculty of Veterinary Medicine</td>
</tr>
<tr>
<td>Vasudev R. Thakkar</td>
<td>Sardar Patel University</td>
<td>Brd School of Biosciences</td>
</tr>
<tr>
<td>Prof. Emmanuel Anosike</td>
<td>Department of Biochemistry</td>
<td>University of Port Harcourt</td>
</tr>
<tr>
<td>Dr. Usama Beshay</td>
<td>New Bourg El-Arab City, Research Area</td>
<td>Alexandria 21934</td>
</tr>
<tr>
<td>Dr. Rama Perumal Samy</td>
<td>Department of Anatomy</td>
<td>Yong Loo Lin School of Medicine</td>
</tr>
<tr>
<td>Dr. Shin-ichi ONO</td>
<td>Laboratory of Clinical Pharmacy</td>
<td>College of Pharmacy, Nihon University</td>
</tr>
<tr>
<td>Prof. Lawal Bilbis</td>
<td>Biochemistry Department</td>
<td>Usmanu Danfodiyo University Sokoto</td>
</tr>
<tr>
<td>Dr. Adriana G. Chicco</td>
<td>Department of Biochemistry</td>
<td>University of Litoral, Santa Fe</td>
</tr>
</tbody>
</table>

| Prof. Zia-Ur Rahman | Department of Physiology and Pharmacology | University of Agriculture | Faisalabad | Pakistan |
| Dr. Oluwole Ariyo | Allen University | USA |
| Prof. Francisco Torrens | Institut Universitari de Ciència Molecular | Universitat de València | Spain |
| Prof. Belkhodja Moulay | University of Senia Oran | Algeria |
| Dr. Hossam M Ashour | Department of Microbiology and Immunology | Faculty of Pharmacy, Cairo University | Egypt |
| Dr. Fidelis Occlu | Biotechnology and Nuclear Agriculture Research Institute/GAEC | Ghana |
| Ass. Prof. Alfonso Baldi | Dept. Biochemistry, Sect. Pathology | Second University of Naples, Italy |
| Dr. Anandh Babu Pon Velayutham | Department of Human Nutrition | Foods and Exercise 253 Wallace Hall Virginia Tech | Blacksburg VA 24061 | USA |
| Dr. Tapan K. Chaudhuri | Department of Biochemical Engineering and Biotechnology | Indian Institute of Technology Delhi, HauzKhas | New Delhi-110016, India |
| Dr. Rong Zhang | Shenyang Pharmaceutical University | China |
Ass. Prof. Tzong-Jih Cheng  
Department of Bio-Industrial Mechatronics  
National Taiwan University  
Taiwan

Dr. Zuyong Xia  
Department of Radiology,  
1201 Welch Rd, Room P089, Stanford, CA 94301  
USA

Dr. Pratap Kumar Das  
Indian Institute of Chemical Biology  
India

Dr. Vasudeo Pandharinath Zambare  
Advanced Enzyme Technologies Ltd  
India

Dr. A M Mujumdar  
Agharkar Research Institute  
India

Prof. Christine Clayton  
ZMBH  
ImNeuenheimer Feld 282  
69120 Heidelberg  
Germany

Prof. Rekik Boul baba  
ESA Mateur  
Département des sciences et techniques de productions animales  
Tanzania

Dr. Farhad Mirzaei  
National Dairy Research Institute, NDRI  
Karnal  
India

Dr. ROUABHI Rachid  
Biology Department  
Tebessa University.  
Algeria

Prof. Vaclav Vetvicka  
University of Louisville  
USA

Dr. Ramesh Putheti, Ph.D  
Research scientist  
Actavis Pharmaceuticals  
10065 red run blvd, owings mills Blvd, Maryland USA 21030  
USA

Prof. Dr. Mustafa NAZIROGLU  
Head of Department of Biophysics  
Medical (TIP) Faculty, SuleymanDemirel University  
Cunur, TR-32260 Isparta  
TURKEY

Dr. José Luis Arias Mediano  
GrupoInvestigaciónFarmaciaPráctica (CTS-205)  
Dept. Farmacia y TecnologíaFarmacéutica  
Facultad de Farmacia  
Campus Universitario de Cartuja, s/n Universidad de Granada  
18071 Granada.

Ahmed Malki, PhD  
Lecturer of Biochemistry and Molecular Biology  
Biochemistry Department  
Faculty Of Science  
Alexandria University  
Alexandria,  
Egypt

Dr. Alireza Seidavi (PhD)  
Assistant Professor of Animal and Poultry Nutrition,  
Department of Animal Science,  
College of Agriculture,  
Islamic Azad University, Rasht Branch,  
Rasht, Iran

Amani S. Awaad  
Professor of pharmacognosy, Chemistry Department  
Faculty of Sciences, King Saud University  
Riyadh. KSA. P. O. Box 22452, Riyadh 11495.  
Saudi Arabia

Dr. Abdel-TawabMossa  
Environmental Toxicology Research Unit (ETRU),  
Pesticide Chemistry Department,  
National Research Centre,  
Dokki,  
Egypt
Dr. Amal A. Mohamed  
*Plant Biochemistry Department,  
Agriculture Division - National Research Center,  
31-El-Tahrir St.,  
Dokki,  
Cairo – Egypt*

Dr. Anabella Gaspar  
*Department of Biochemistry,  
University of Pretoria,  
South Africa*

Dr. Anna Janecka  
*Department of Biomolecular Chemistry,  
Medical University of Lodz,  
Mazowiecka 6/8,  
92-215 Lodz,  
Poland*

Dr. Caser Abdel  
*Horticulture Department,  
Dohuk University,  
Iraq*

Dr. David Sheehan  
*Dept Biochemistry,  
University College Cork,  
Ireland*

Dr. Dayananda Chandrappa  
*Center for Bioenergy,  
Department of Life and Physical Sciences,  
Cooperative Research,  
Lincoln University,  
Jefferson City,  
USA*

Dr. Elsayed Abdelaal  
*Special Graduate Faculty,  
University of Guelph,  
Ontario,  
Canada*

Dr. Etienne Marbaix  
*CELL Unit,  
de Duve Institute,  
UCL-75.41, 75 avenue Hippocrate,  
B-1200 Bruxelles,  
Belgium*

Dr. Gary L. Firestone  
*Department of Molecular and Cell Biology,  
University of California,  
Berkeley,  
CA, 94720,  
USA*

Dr. Henryk Zielinski  
*Institute of Animal Reproduction and Food Research,  
Polish Academy of Sciences,  
Poland*

Dr. Irshad A. Nawchoo  
*Department of Botany,  
University of Kashmir,  
India*

Dr. Luchai Butkhup  
*Department of Biotechnology,  
Faculty of Technology,  
Mahasarakham University,  
Mahasarakham 44000,  
Thailand*

Dr. Luminita Vladescu  
*Department of Analytical Chemistry,  
Faculty of Chemistry,  
University of Bucharest,  
Romania*

Dr. Mira Debnath  
*School of Biochemical Engineering,  
Institute of Technology - Banaras Hindu University,  
Varanasi,  
India*

Dr. Nilesh S. Panchal  
*Department of Biosciences,  
Saurashtra University,  
Rajkot-360005,  
Gujarat,  
India*

Dr. Rayappa A. Balikai  
*University of Agricultural Sciences,  
Dharwad,  
Karnataka- 580 005,  
India*
Dr. Saad Tayyab
Institute of Biological Sciences, University of Malaya, 50603 Kuala Lumpur, Malaysia

Dr. Shijun Fu
Institute of Health Sciences, Shanghai Institutes for Biological Sciences, Chinese Academy of Sciences and Shanghai Jiao Tong University School of Medicine, Shanghai, P. R. China

Dr. Shiming Zhang
Weis Center for Research, Geisinger Clinic, Danville, Pennsylvania, USA

Dr. Thomas Efferth
Department of Pharmaceutical Biology, Institute of Pharmacy and Biochemistry, University of Mainz, Heidelberg, 55128 Mainz, Germany
ARTICLE

Effects of Xylopia aethiopica fruit extract on isolated rabbit ileum
Full Length Research Paper

Effects of *Xylopia aethiopica* fruit extract on isolated rabbit ileum

Okwari O.O¹, Obembe A.O², Jeje S.O¹*, Honesty E.E² and Osim E.E²

¹Department of Physiology, Cross River University of Technology, Okuku Campus, Nigeria.
²Department of Physiology, University of Calabar, Calabar, Nigeria.

Received 6 May, 2014; Accepted 29 March, 2016

In this study, pharmacological reactivity of rabbit ileum to crude extract of fruits of *Xylopia aethiopica* in the presence of other agonist and antagonist agents was evaluated. The contractility of the isolated rabbit ileum was recorded using kymograph. The effects of the crude extract of *X. aethiopica* on rabbit ileum were independently determined using a dose range of $10^{-8}$ to $10^{-4}$ mg/ml. However, to determine the effects of the extract on rabbit ileum in the presence of other agonist and antagonist a constant dose of $10^{-4}$ mg/ml of the extract was used. The result showed that the crude extract of *X. aethiopica*, nifedipine only and serotonin only produced a significant ($p<0.001$) dose dependent relaxation of the ileum muscle. Addition of the extract to nifedipine shifted the graph to the right. Administration of CaCl$_2$ alone produce a dose dependent contraction of the rabbit ileum with negative correlation coefficient ($p<0.001$). Co-administration of CaCl$_2$ with the extract shifted the CaCl$_2$ response curve to the left. Addition of extract to serotonin caused a significant ($p<0.01$) decreased in the relaxation of the rabbit ileum. In conclusion, this study suggests that *X. aethiopica* has smooth muscle relaxant effects on rabbit ileum and as such may reduce gastrointestinal motility.

Key word: *Xylopia aethiopica*, smooth muscle, Ileum, motility, agonist.

INTRODUCTION

*Xylopia aethiopica*, has both nutritional and medicinal uses. It is a member of the custard apple family, Annonaceae, and is used as a spice in various traditional dishes of Western and Central Africa (Choumessi et al., 2012). It is one of the plants species man has discovered in the search for food and health care (Okwari et al., 2014).

Phytochemical analysis shows that the plant contain alkaloid (Ekong and Ogan, 1968), proteins, carbohydrate, lipids, crude fibers in various concentrations, some minerals such as calcium, potassium and iodine (Berminas et al., 1999).

*X. aethiopica* has been applied in ethnomedicine in the treatment of cough, bronchitis, dysentery and female sterilization. It is believed to aid uterine contraction and is applied as an abortifacient agent (Iwu, 1993). Some of its investigated uses include antibacterial and antiseptic properties (Okwari et al., 2014).
Nnwafor and Kalio (2006) reported that aqueous extract of *X. aethiopica* caused a significant reduction in the gestation period, number of litters lost after seven days and weight of litters. In line with this, Ebong and Shode (2000) reported that the aqueous and petroleum ether extract of *X. aethiopica* possesses potent spasmylytic properties on the smooth muscles of the rat uterus. However, contrary to this claim, the study on the effect of aqueous and methanol extract of the fruits of the plant on gastrointestinal motility shows that, it has a smooth muscle relaxant effects in the gastrointestinal tract (Ebong et al., 1995). The contradiction in this report may be due to differences in the receptor activated by the extract of the plant in the uterine muscle and gastrointestinal tract. Hence, this study aims at evaluating the effect of aqueous extract of fruit of *X. aethiopica* on the motility of the rabbit intestine in the presence of other agonist and antagonist agents.

**METHODOLOGY**

**Chemicals used**

The chemical and drugs used for this study were obtained from sigma (United Kingdom) and prepared freshly by dissolving in distilled water.

**Preparation of plant extract**

Dried fruit of *X. aethiopica* were bought from Watt market in Calabar Cross River State. It was authenticated at Department of Botany University of Calabar. It was then grounded to a coarse powder using an engine grinder. The ground *X. aethiopica* was then subsequently weighed and 100 g of dried ground fruit was dissolved in 500 ml of deionized water (Ebong and Shode, 2000). The solution was left for 24 h before filtration with Whatman filter paper Number 1. The filtrate was then dried in an oven at about 40°C.

**Preparation of isolated tissue**

The animal for this study was fasted for 24 h prior to the beginning of the study to ensure complete emptying of the small intestine. The rabbit was then killed by cervical dislocation to ensure that gastrointestinal tract (GIT) reflexes were not inhibited. A midline incision was made on the abdomen along the *linea alba* to expose the small intestine. As soon as possible, a piece of the proximal ileum free from the mesentery near the duodenum was removed as it shows greater spontaneous activity as compared to the distal ileum. This part was then immersed in ice-cold saline and cut into small segments of about 3 to 5 cm long. The tissues were continually aerated with the aid of an aerator.

**Experimental procedure**

With the aid of threaded suture needle, a piece of thread was attached to each end of the tissue segment. At one end, the thread was made into a small loop and attached to the hook in the organ bath. The other piece of thread was attached to the writing lever of the kymograph with plasticine. The tissue was bathed with tyrode solution (the solution composed of NaCl: 0.8%, KCl: 0.02%, NaHCO₃: 0.01%, NaHPO₄: 0.005%, CaCl₂: 0.02%, Glucose: 0.1%, Deionized water to make up 100 ml) and allowed to equilibrate for about 20 to 30 min. The bathing solution was flushed out at intervals of 10 min. The kymograph drum was set to a rotating velocity of 0.01 revolution/s with a speed of 0.1×0.5 mm/s. After equilibration period, the basal equilibrium response was obtained after which graded doses of the extract was added to the tissue and its result obtained. The tissue was flushed 3 to 4 times before the addition of other drugs. Each drug effect was considered alone using their graded doses and thereafter with 10⁻⁴ mg/ml of extract. The procedure was repeated five times using new ileal strips from different rabbit. The temperature of the organ bath was maintained at 37°C.

**Statistical analysis**

Results were expressed as Mean ± Standard Error of Mean (SEM). In all cases, the comparison of the different sets of data was done by using the unpaired student t-test. P-value of <0.05 was considered statistical significant. Correlation and regression analysis was done to show association.

**RESULTS**

The plant extract independently elicited dose-dependent relaxation of the rabbit ileum (correlation coefficient = 0.9990). The lowest concentration of the extract (10⁻⁴ mg/ml) produce 8.90±0.19% decrease in contraction of the smooth muscle. While the highest dose (1 mg/ml) produce 44.51±0.95% relaxation of the rabbit ileum (Figure 1). Nifedipine and serotonin also independently produce relaxation of the rabbit ileum (Figures 2 and 4). The correlation coefficient between dose and response was found to be significant at p<0.01 for both nifedipine and serotonin. Introduction of CaCl₂ alone evoked contraction of the smooth muscle in a dose dependent manner (p<0.01). The response of the smooth muscle to graded doses of nifedipine and CaCl₂ has a negative correlation coefficient (-0.9660 and -0.9766, respectively). Addition of 10⁻⁴ mg/ml of the extract to nifedipine increased the relaxation of the smooth muscle with maximal response obtained at a dose of 10⁻⁴ mg (Figure 2). Co-administration of CaCl₂ with the 10⁻⁴ mg/ml of extract reduced the contractile response of the smooth muscle (Figure 3). Serotonin administration alone produces dose dependent increase in relaxation of the rabbit ileum. Addition of extract (10⁻⁴ mg/ml) to serotonin caused a significant decrease in the relaxation of the rabbit ileum (Figure 4).

**DISCUSSION**

The results obtained from this study showed that the extract of *X. aethiopica* produced a dose dependent relaxation of the rabbit ileum. This is in line with the report of Ebong et al. (1995), who reported that the aqueous and methanol extracts of the fruit of *X. aethiopica* has a
smooth muscle relaxant effect on gastrointestinal smooth muscle. The lowest concentration of the extract produced a decrease in contraction, but at high concentration, the extract produce strong relaxation. The smooth muscle relaxant effects of the extract may be due to the presence of alkaloids in the extract, since alkaloids have been previously implicated in the relaxation of smooth muscle (da Silva et al., 1999). Administration of nifedipine, a non-competitive calcium channel blocker produced relaxation of the rabbit ileum. As the concentration of nifedipine increased, the relaxation of the rabbit ileum decreased dose dependently. Addition of extract to graded doses of nifedipine increases the relaxation of smooth muscle of ileum. This may suggest that the extract and nifedipine are both acting through different receptor.

Administration of CaCl₂ produces contraction of the smooth muscle. This contractile response is reduced with increase concentration of CaCl₂. Addition of extract to graded doses of CaCl₂ further reduced the contractile response of the smooth muscle of ileum. It may be
inferred here that the extract potentiated the relaxant effect on the smooth muscle in the presence of CaCl$_2$. This may also indicate that both are acting independently to exert their effects.

Serotonin alone produced a dose dependent increase in relaxation of the rabbit ileum. Simultaneous administration of serotonin and extract produced a dose dependent decrease in relaxation of the rabbit ileum rather than the expected increase in relaxation by two significant relaxants. This may suggest that the two substances may be using the same pathway and competing for receptor sites. Different types of serotonin receptors are expressed on different gastrointestinal cells, enteric nerves, smooth muscle and interstitial cells of cajal (Wouters et al., 2007). Expression and function of these receptors differ, some of them mediate relaxation, others only inhibition and activation of smooth muscle. This diversity makes it difficult to establish the clear
function of serotonin in the gastrointestinal system (Wouters et al., 2007). It is therefore possible that the extract of *X. aethiopica* employed this difference in serotonin receptor action to exert contractile effects in some smooth muscle such as uterus (Nwafor and Kalio, 2006), while exerting smooth muscle relaxant effects on rabbit ileum.

In conclusion, *X. aethiopica* has a smooth muscle relaxant effect on rabbit ileum and as such may reduce gastrointestinal motility.

**Conflicts of interest**

The authors have not declared any conflict of interest.

**ACKNOWLEDGEMENT**

The author acknowledged the technical staffs of Department of Physiology, University of Calabar.

**REFERENCES**


