ONLINE JOURNAL OF ANIMAL AND FEED RESEARCH

An International Peer-Reviewed Journal which Publishes in Electronic Format

Volume 5, Issue 6, November 2015

ISSN 2228-7701

Online Journal of Animal and Feed Research

An international peer-reviewed journal which publishes in electronic format (online)

Online J. Anim. Feed Res., 5 (6): November 25, 2015

Behzad Shokati
PhD student, Department of Agronomy and Plant Breeding, Faculty of Agriculture, University of Maragheh, IRAN (Email: behzad_sh1987@yahoo.com)
Agriculture: Environment, Nutritive value and utilization of feeds
Ekrem LAÇİN
PhD, Professor, Dept. Animal Science and Production, Facult. Vet. Med., Atatürk University, TURKEY (Email: ekremlacin@hotmail.com)
Nutrition - Non-Ruminants
Fazul Nabi Shar
PhD, Lecturer, Faculty of Veterinary & Animal Sciences, Lasbela University of Agriculture Water & Marine Sciences, Uthal Balochistan, Pakistan (Email: fazulnabishar@yahoo.com)
Clinical Veterinary Medicine, Poultry & Animal Husbandry
Fikret Çelebi
PhD, Prof., Dep. Physiology, Facult. Vet. Med., Atatürk University, Erzurum, TURKEY (Website; Email: fncelebi@atauni.edu.tr)
Physiology and Functional Biology of Systems
Firew Tegegn
Bahir Dar University, ETHIOPIA (Email: firewtegegne@yahoo.co.uk)
Animal Nutritionist
Ferdaus Mohd. Altaf Hossain
DVM, Sylhet Agricultural University, Bangladesh; not shah Jalal University of Science & Technology, BANGLADESH (Email: ferdaus.dps@sau.ac.bd)
Microbiology, Immunology, Poultry Science, and Public Health
Hamid Mohammadzadeh
PhD, Assistant Prof., Department of Animal Science, Faculty of Agriculture, University of Tabriz, IRAN (Email: hamidmhz@ag.iut.ac.ir)
Nutrition - Ruminants
Hazim Jabbar Al-Daraji
PhD, Professor, University of Baghdad, College of Agriculture, Abu-Ghraib, Baghdad, IRAQ (Email: prof.hazimaldaraji@yahoo.com)
Avian Reproduction and Physiology
John Cassius Moreki
PhD, Department of Animal Science and Production, Botswana College of Agriculture, Gaborone, BOTSWANA (Email: jcmoreki@gmail.com)
Nutrition - Non-Ruminants, Breeders, Livestock management
Manish Kumar
Prof. Dr., Society of Education (SOE), INDIA (Email: manishzoology06@gmail.com)
Pharmacology, Ethnomedicine
Megiste Taye
PhD, Seoul National University, SOUTH KOREA (Email: mengistietaye@yahoo.com)
Comparative genomics and bioinformatics
Mohammed Yousuf Kurtu
Associate Prof., Animal Sciences Department, Haramaya University, Dire-Dawa, ETHIOPIA (Email: mkurtu2002@yahoo.com)
Animal Science, Nutrition
Muhammad Saeed
PhD candidate, Northwest A&F University, Yangling, 712100, CHINA (Email: muhammad.saeed@nwsuaf.edu.cn)
Nutrition - Ruminants
Naser Maheri Sis
PhD, Assistant Prof., Dept. Anim. Sci., I.A.U.-Shabestar, IRAN (Website; Emails: maherisis@iaushab.ac.ir; nama1349@gmail.com)
Nutrition - Ruminants, Nutritive Value, Utilization of Feeds
Nilüfer SABUNCUOĞLU ÇOBAN
PhD, Professor, Department of Animal Science and Production, Faculty of Veterinary Medicine, Atatürk University, TURKEY (Website; Email: ncoban@atauni.edu.tr)
Animal Hygiene, Physiology, Animal Welfare
Ömer ÇOBAN
PhD, Professor, Department of Animal Science and Production, Atatürk University, TURKEY (Website; ocoban@atauni.edu.tr)
Nutrition - Ruminants
Paola Roncada
PhD, Associate Professor, Veterinary Pharmacology and Toxicology, University of Bologna, ITALY (Email: paola.roncada@unibo.it)
Pharmacokinetics
Raga Mohamed Elzaki Ali
PhD, Assistant Prof., Department of Rural Economics and Development,University of Gezira, SUDAN (Email: ragaelzaki@yahoo.co.uk)
Animal-feed interactions, Nutritive value
Saeid Chekani Azar
PhD, Dept. Anim. Sci., Facult. Vet. Med., Atatürk University, TURKEY (Emails: saeid.azar@atauni.edu.tr; schekani@gmail.com)
Physiology, Product Quality, Human Health and Well-Being,
Shahin Eghbal-Saeid
PhD, Assiociate Prof., Dep. Anim. Sci., I.A.U., Khorasgan (Isfahan), IRAN (Email: shahin.eghbal@khuisf.ac.ir)
Animal Genetics and Breeding
Shahin Hassanpour
Dept. Physiology, Facult. Vet. Med., I.A.U., Shabestar, IRAN (Email: shahin.hassanpour@yahoo.com)
Physiology and Functional Biology of Systems

Join OJAFR Team

As an international journal we are always striving to add diversity to our editorial board and operations staff. Applicants who have previous experience relevant to the position may be considered for more senior positions (Section Editor, SE) within OJAFR. All other members must begin as Deputy Section Editors (DSE) before progressing on to more senior roles. Editor and editorial board members do not receive any remuneration. These positions are voluntary.

If you are currently an undergraduate, M.Sc. or Ph.D. student at university and interested in working for OJAFR, please fill out the application form below. Once your filled application form is submitted, the board will review your credentials and notify you within a week of an opportunity to membership in editorial board.

If you are Ph.D., assistant, associate editors, distinguished professor, scholars or publisher of a reputed university, please rank the mentioned positions in order of your preference. Please send us a copy of your resume (CV) or your Live DNA or briefly discuss any leadership positions and other experiences you have had that are relevant to applied Animal and Feed Researches or publications. This includes courses you have taken, editing, publishing, web design, layout design, and event planning.

If you would like to represent the OJAFR at your university, join our volunteer staff today! OJAFR representatives assist students at their university to submit their work to the OJAFR. You can also, registered as a member of OJAFR for subsequent contacts by email and or invitation for a honorary reviewing articles.

Download OJAFR Application Form

Archive

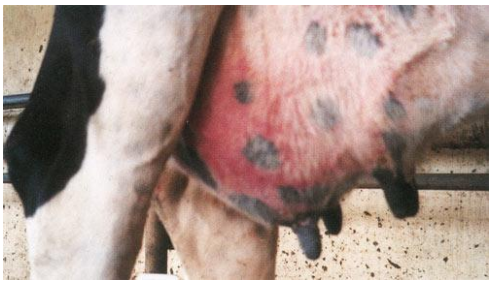
Volume 5 (6); November 25, 2015

Research Paper

Update on bovine mastitis etiological, clinical and treatment aspects in Khartoum state, Sudan.

Mohammed Salih R.R.

Online J. Anim. Feed Res., 5(6): 153-159, 2015; pii: S222877011500025-5



Abstract

This study was conducted in certain area at Khartoum State determine the causative agent of bovine mastitis and the susceptibility of different isolates to different antibiotics use for treatment of bovine mastitis. The total number of dairy cows, which were examined in 34 investigated farms, equals 500. The result as follows: 55% acute mastitis, 44% chronic mastitis and 1% gangrenous mastitis. The isolated genera were as follows: 74% *Bacillus* spp., 24% *Staphylococcus* spp., 1% *Corynebacterium* spp. and 1% *Klebsiella* spp. The isolated species were as follows: 31% *Bacillus coagulans*, 11% *B. cereus*, 9% *B. subtilis*, 9% *B. licheniformis*, 4% *B. circulans*, 2% *B. lentus*, 3% *B. mycoides*, 3% *B. amyloliquefaciens*, 2% *B. megaterium*, 16% *Staphylococcus aureus*, 8% *Staphylococcus hyicus*, 1% *Corynebacterium* spp. and 1% *Klebsiella* spp. Lastly, the sensitivity test was applied using different antibiotics were as follows: Hundred percent of isolates were sensitive for Chloramphenicol and Ciprofloxacin, 91.6% for Gentamycin and Piperacillin/ Tazobactam, 83.3% for Pefloxacin and Tetracycline, 75% for Amikacin and Ofloxacin, 66.6% for Ceftizoxime, 33.3% for Co-Trimoxazole and Cefotaxime and 16.6% for Ampicillin/ Sulbactam. This study was depended at routine works at microbiological laboratory.

Keywords: Bovine Mastitis, Etiology, Clinical, Treatment, Khartoum, Sudan

PDF XML DOAJ

Research Paper

Effect of Different Stocking Densities on Survival Rates of Nile Tilapia Fingerlings Transported in Plastic Bags.

Adam Ibrahim AM, Yagoub Adam HM., Musa Ahmed A.M, Mirghani Yousif F.

Online J. Anim. Feed Res., 5(6): 160-164, 2015; pii: S222877011500026-5

Abstract

Fish farmers in Sudan obtain their seed stocks mainly not from their farms and as such rely heavily on good packing conditions covering sometimes 8–12 hours transportation time to maximize fish survival and quality the study here required main objective to identified the optimum loading for the success during transporting. closed oxygenated plastic bag which was carried three densities for each one with tow replicate for every treatment for the lower loading is 75 fingerlings /l the medium is, 100 fingerlings and last density is the larger one 140 fingerlings the duration factors was 10 hours, 11 hours and 18 hours. The fingerlings was sex reversed, their size is (5g ± 0.5). The collecting data analyze used SPSS computer software version-16.0. Analysis result shown the factor of density in the tow treatments (75 fingerlings + 100 fingerlings) was the best according to the survivor rate depending to type of the periods parameter. 10 hour=94% and 11 hours = 92% and here was N.S otherwise the comparative between those and the density 140 was high significant. Variation between loading and durations is NS at P<0.05, so the conclusions is found the optimum loading during transporting period was 100/l/18 (hundred fish per litter in 18 hours period) according to analysis details.

Keywords: Transport, Survival Rates, Fingerlings, Nile Tilapia, Plastic Bags.

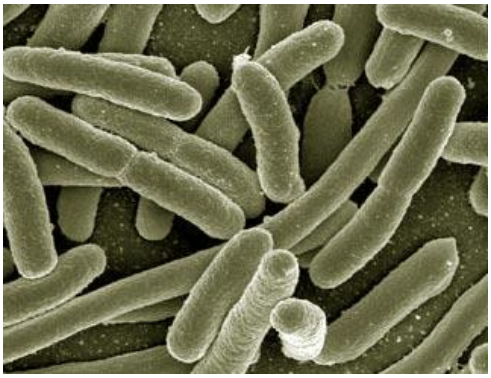
PDF XML DOAJ

Research Paper

Isolation of *Klebsiella* Spp. from Gangrenous Mastitis in Cattle in Khartoum State, Sudan.

Mohammed Salih R.R, Mohamed Ahmed F.A.

Online J. Anim. Feed Res., 5(6): 165-168, 2015; pii: S222877011500027-5



Abstract

This study was conducted in Khartoum State to determine the causative agent of gangrenous mastitis in bovine. Hundred dairy cows were examined after collected aseptically from 41 cows suffering from mastitis. All these cows were examined by visual inspection and palpation of mammary gland and supra-mammary lymph nodes. The milk samples were examined bacteriologically. The result was as follows: 55% acute

mastitis, 44% chronic mastitis and 1% gangrenous mastitis. The isolated genera were as follows: 74% *Bacillus* spp., 24% *Staphylococcus* spp., 1% *Corynebacterium* spp. and 1% *Klebsiella* spp. The isolation of *Klebsiella* spp. from gangrenous mastitis in Frisian cow is considered as the first of its type in Sudan.

Keywords: Bovine, Gangrenous, Mastitis, Klebsiella, Khartoum, Sudan.

PDF XML DOAJ

Review

Review virulence nature of *Escherichia coli* in neonatal swine.

Paul N.

Online J. Anim. Feed Res., 5(6): 169-174, 2015; pii: S222877011500028-5

Abstract

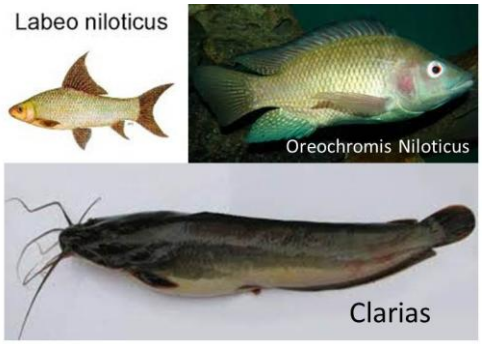
Piglet disease due to Enterotoxigenic *Escherichia coli* (ETEC) are classical and associated typically with severe watery diarrhea within the first two weeks of life and occasionally some days after weaning in pigs. *E.coli* is a well-known and diverse organism though normally harmless commensal, but when it acquires mobile genetic elements becomes a highly pathogenic organism capable of causing a range of diseases. ETEC adhere to the small intestinal microvilli without inducing morphological lesions and produce enterotoxins acting locally on enterocytes. This leads to hyper-secretions and reduced absorption of electrolytes. The virulence attributes of ETEC are adhesions and toxins and the successful management of the disease is dependent on good understanding of these virulence factors. In pigs ETEC, the commonest adhesions are the fimbriae on the surface K88, K99, 987p, F18ab and F18ac. The enterotoxine of pigs ETEC are further classified into heat-labile (LT) and heat-stable (ST). Other subdivisions of enterotoxin *E. coli* are LT, STb, STa, Stx2e. The adhesive fimbriae and enterotoxins of piglet ETEC can be evaluated using plasmids. Polymerase chain reaction (PCR) is a specific test and had been used for virulence gene detection of ETEC. In this reviews, we focus on current opinions and knowledge of the various pathogenic pathways that *E.coli* uses to cause disease in piglet.

Keywords: ETEC, Fimbria, Toxins, Piglets, Virulence

PDF XML DOAJ

Research Paper

Comparative study of the body weight characteristics and effect of drying on chemical composition of three Nile fish species (*Oreochromis Niloticus, Labeo Niloticus and Clarias Spp.*).



Yagoub Adam H.M., Musa Ahmed AM, Adam Ibrahim A.M., Mirghani Yousif F.

Online J. Anim. Feed Res., 5(6): 175-180, 2015; pii: S222877011500029-5

Abstract

This study was carried out to compare the body weights of three different Nile fish species (Oreochromis niloticus, Labeo niloticus and Clarias spp.), and the impact of direct sun drying on their chemical composition.36 samples were collected (12 samples/ species). Averages of total length, standard length (cm) and gross body weight (gm) were determined and the findings were as follows: 36.5, 29.75 and 930 for Oreochromis niloticus, 49, 39.5 and 1210 for Labeo niloticus and 49, 45 and 977.5 for Clarias spp. It was noticed that clarias spp. has the highest edible meat percentage 46.75% followed by Labeo niloticus 38.82% and Oreochromis niloticus 33.39%, and there were significant differences ($P < 0.05$) among the three species. Chemical analysis for the samples was done to determine (protein, fat, ash and moisture contents). The results of protein contents examined were 62%, 61.5% and 61.5% for Oreochromis niloticus, Labeo niloticus and Clarias spp. respectively. Fat contents were 7.41%, 8.27% and 7.32% for Oreochromis niloticus, Labeo niloticus and Clarias spp. respectively. Moisture contents were 6.7%, 7.5% and 7.5% for Oreochromis niloticus, Labeo niloticus and Clarias spp. respectively. Ash contents were 5.90%, 6.05% and 6.85% for Oreochromis niloticus, Labeo niloticus and Clarias spp. respectively.

PDF XML DOAJ

Research Paper

Effect of dietary Hyacinth beans (*Lablab purpureus*) and enzyme additives on performance of broilers.

Ragab HI, Abdel-Atti KhA, Babiker MS, Elawad SM.

Online J. Anim. Feed Res., 5(6): 181-188, 2015; pii: S222877011500030-5

Abstract

The study was conducted to assess the effect of Hyacinth beans on the performance of broilers, for a period of 47 day feeding trial. In addition to basal control (A), another treatment diets were formulated to have Hyacinth beans at 15% (B, C) without or with enzyme additives and 20% (D, E) without or with enzyme additives. A total of 150 unsexed Ross 308 chicks were randomly distributed to 5 dietary treatments, with 5 replicates (6 birds per rep) Feed and water were offered *ad- libitum*. Results illustrated that, feed intake ($P \leq 0.01$), weight gain ($P \leq 0.01$), FCR ($P \leq 0.05$), PER ($P \leq 0.01$) and dressing percentages ($P \leq 0.01$) were negatively affected by Hyacinth beans inclusion levels (15%, 20%). Neither the processing method practiced for Hyacinth beans nor the enzyme additives were able to improve the performance of broilers better than or comparable to that of basal control broiler diet. The results as well revealed that, treatment diets of 15% Hyacinth beans displayed better

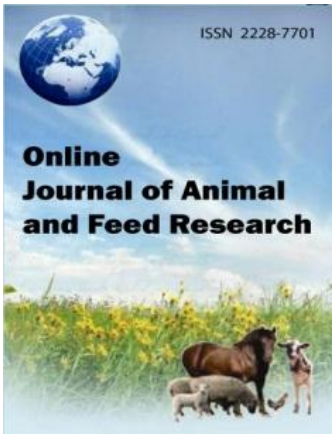
performance than 20% level for all of the parameters measured including the dressing percentages and internal organs relative weight.

Keywords: Hyacinth Beans, Processing, Broilers Performance

PDF XML DOAJ

Archive

Online Journal of Animal and Feed Research



ISSN: 2228-7701

Frequency: Bimonthly

Current Issue: 2015, Vol: 5, Issue: 6 (November)

Publisher: SCIENCELINE

Online Journal of Animal and Feed Research is an internationalpeer-reviewed journal, publishes the full text of original scientific researches, reviews, and case reports in all fields of animal and feed sciences, bimonthly and freely on the ınternet ...view full aims and scope

www.jwpr.science-line.com

» OJAFR indexed/covered by NLM/PubMed, CABI, CAS, AGRICOLA, DOAJ, Ulrich's™, GALE, ICV 2015 = 71.65), Worldcat, EZB, TOCs ...details

» Open access full-text articles is available beginning with Volume 1, Issue 1.

» Full texts and XML articles are available in ISC-RICeST and DOAJ.

» This journal is in compliance with Budapest Open Access Initiative and International Committee of Medical Journal Editors' Recommendations.

» We are member of WAME

» High visibility of articles over the internet.

Editorial Offices:
Atatürk University, Erzurum 25100, Turkey
University of Manitoba, Winnipeg, Manitoba R3T 2N2, Canada
University of Maragheh, East Azerbaijan, Maragheh 55136, Iran
Homepage: www.science-line.com
Phone: +98 914 420 7713 (Iran); +90 538 770 8824 (Turkey); +1 204 8982464 (Canada)
Emails:
administrator@science-line.com
saeid.azar@atauni.edu.tr

Online Journal of Animal and Feed Research

Volume 5, Issue 6: 160–164 ; Nov 25, 2015

ISSN 2228-7701

EFFECT OF DIFFERENT STOCKING DENSITIES ON SURVIVAL RATES OF NILE TILAPIA FINGERLINGS TRANSPORTED IN PLASTIC BAGS

Abdelwahab.M. Adam Ibrahim[1*], Hassan M. Yagoub Adam[1*], Ahmed Mohamed Musa Ahmed[2], and Fathi mirghani Yousif[3]

*[1]*Ministry of Agriculture, Animal Resources and Irrigation, Khartoum State, Sudan*
[2] Alneilain University, Department of Fisheries, Khartoum, Sudan
[3] Ministry of Animal Resources and Fisheries and Range Land, Khartoum, Sudan

*Email: hassanwildlif@gmail.com

ABSTRACT: Fish farmers in Sudan obtain their seed stocks mainly not from their farms and as such rely heavily on good packing conditions covering sometimes 8–12 hours transportation time to maximize fish survival and quality the study here required main objective to identified the optimum loading for the success during transporting. closed oxygenated plastic bag which was carried three densities for each one with tow replicate for every treatment for the lower loading is 75 fingerlings /l the medium is, 100 fingerlings and last density is the larger one 140 fingerlings the duration factors was 10 hours, 11 hours and 18 hours. The fingerlings was sex reversed, their size is (5g ± 0.5). The collecting data analyze used SPSS computer software version- 16.0. Analysis result shown the factor of density in the tow treatments (75 fingerlings + 100 fingerlings) was the best according to the survivor rate depending to type of the periods parameter. 10 hour=94% and 11 hours = 92% and here was N.S otherwise the comparative between those and the density 140 was high significant. Variation between loading and durations is NS at P<0.05, so the conclusions is found the optimum loading during transporting period was 100/l/18 (hundred fish per litter in 18 hours period) according to analysis details.

Keywords: Transport, Survival Rates, Fingerlings, Nile Tilapia, Plastic Bags.

ORIGINAL ARTICLE
pii: S2228770115000026-5
Received 01 Sep. 2015
Accepted 15 Nov. 2015

INTRODUCTION

According to international food policy research institute prediction the global fish consumption will increase to 127.8 million tons in 2020. Seventy seven percent of this amount will be consumed by developing countries while the developed countries will consume the rest. In the coming 20 years the mean global fish consumption per capita will increase by 0.4%, but the rate for China and India will be higher at 1.3% and 0.9% respectively. The rate for Latin America and Southeast Asia will be 0.4% and 0.5% respectively while the rate for other countries will be low or even negative FAO (2012).

Aquaculture is now recognized as a viable and profitable enterprise. Worldwide fish supply can be controlled more effectively when fish are cultured under managed conditions like domestic livestock FAO (2012). Aquaculture production has been expanding rapidly in recent decades especially in developing countries due to growing demand for high quality protein from aquatic sources. This expansion has contributed in some instances to local food security World Fish Center (2012).

Sudan`s fisheries resources depend mainly on the White Nile, the Blue Nile, the main River Nile and their tributaries and huge number of small water bodies of fresh water including reservoirs, lakes, small ponds, canals, irrigation canals. The estimated annual sustainable potential is (100,000~110,000 (mL/t/y) while actual annual production is 50,000m./t/y. and the annual consumption rate per individual is about (1.5 kg/p/y). Many fish species were studied and tested for aquaculture in Sudan. Tilapia was found to be the most appropriate one for the following reasons. It grows well at high densities, it is resistant to diseases and it has simple hatchery technology. The contribution of fisheries to the Sudan economy is presently marginal and is mostly obtained by capture fish landings. The magnitude and trend of fish resource utilization and the level of development of the fisheries sector is handicapped by as number of problems and constraints. Some of the reasons are that, no attention has been paid to the development the fisheries sector and aquaculture is only playing a marginal role, despite the availability of its basic prerequisites FAO (2012).

To cite this paper: Adam Ibrahim AM, Yagoub Adam HM., Musa Ahmed A.M, Mirghani Yousif F. 2015. Effect of Different Stocking Densities on Survival Rates of Nile Tilapia Fingerlings Transported in Plastic Bags. *Online J. Anim. Feed Res.*, 5(6): 160-164.
Scienceline/Journal homepages: http://www.science-line.com/index/; http://www.ojafr.ir

Transporting fish is very important part of fish culture. Fry and fingerlings must be transported from hatchery to pond for stocking and brood fish are sometimes transported in to the hatchery to spawn. It may even be necessary to transport live harvested fish to transport market for sale. A fish farmer must be very familiar with the principles, techniques and practices of fish transportation so as to minimize fish death resulting from transportation I.C.A. (1990).

Fish are generally transported in containers such as cans of different sizes, pots of ceramic or metal, wooden or metal buckets, vats, barrels, plastic bags, Styrofoam boxes, bottles, jugs etc. Generally, almost any clean, water proof container may be used. Certain containers like wood and Styrofoam are good heat insulators while metal or plastic containers are poor insulators and may have to be wrapped with wet towels or packed with ice to keep temperatures down (ICA, 1990). Once fish have been placed in transport containers they should be brought to their destination by the quickest possible means. That will provide relatively smooth and direct route which may be made by foot, animal cart, bicycle, boat, vehicle etc.

MATERIAL AND METHODS

Small digital balance 0.00-20.00 g (electronic scales, produced by AND Company), Different types of thermometers (produced by Big Learning Company), Oxygen cylinders from liquid air Company. Cartons size 100 cm x 50 cm x 80 cm. Scope nets size 30 cm diameter. One metal barrel filled water on truck. One Plastic container. One Truck or open Box car Hilux. Treatment and handling tools (light source, gloves, boxes) .Safety and protection tools. Two note books. Ninety Plastic bags. One cell phone Stop watch. One five liters Plastic container.

The experimental design comprises one thousand and ninety fingerlings divided among 18 plastic bags. Two variables were used in the experiment and these were the loading and the transporting period. Three different loadings were used and these were 140, 100 and 75 fish per liter. The transporting periods were set at 10, 11 and 18 hours. Two replicas were made of each of these variables. Fish feeding ceased 24 hours prior to the time of their transportation. The fish were placed in bags in which water constitutes one quarter and the three remaining quarters contain oxygen. After adding oxygen the bag is sealed shut with a rubber band then agitated by pure oxygen of liquid air 99% they fish were then transported from Khartoum north to Barber in the River Nile state which is located 324 kilometers north. The average air temperature during the journey was 24 C while the average water temperature was 18 ºC. Wet clothes placed over the bags will keep them cool, and immediately upon arrival the rates of mortality and survival were determined.

Statistical analysis

The statistical analysis of the data was conducted using SPSS statistical package Ver.16

RESULTS AND DISCUSSION

Measurements and Readings

The number of dead fish were recorded after 10 hours were 39 dead fish in loading 140 per litter while were 21dead fish in loading 100 per litter and only 8 dead fish were sorted from this group . The total of mortality in the short period was 68 dead fish, the number of dead fish were recorded after 11 hours were 46 dead fish in loading 140 per litter while were 23 dead fish in loading 100 per litter and only 9 dead fish were sorted from this group . The total of mortality in the medium period was 78 dead fish. The number of dead fish were recorded after 18 hours were 55 dead fish in loading 140 per litter while were 30 dead fish in loading 100 per litter and only 18 dead fish were sorted from this group . The total of mortality in the long period was 103 dead fish.

Table 1- The mortality loading 140/liter according to different duration in experiment.

Density	Duration	Mortality	Mortality Rate	Survivor%
140	10	17	12.14%	87.86%
140	10	22	15.70%	84.30%
140	11	24	17.14%	82.86%
140	11	22	15.70%	80.70%
140	18	27	19.30%	80.70%
140	18	28	20%	80%

To cite this paper: Adam Ibrahim AM, Yagoub Adam HM., Musa Ahmed A.M, Mirghani Yousif F. 2015. Effect of Different Stocking Densities on Survival Rates of Nile Tilapia Fingerlings Transported in Plastic Bags. *Online J. Anim. Feed Res.*, 5(6): 160-164.
Scienceline/Journal homepages: http://www.science-line.com/index/; http://www.ojafr.ir

Table 2 - The Mortality loading 100/liter According To Different Duration in Experiment

Density	Duration	Mortality	mortality rate	Survival %
100	10	10	10%	90%
100	10	11	11%	89%
100	11	11	11%	89%
100	11	12	12%	88%
100	18	16	16%	84%
100	18	14	14.00%	86%

Table 3 - The Mortality loading 75/liter According To Different Duration In Experiment

Density	Duration	Mortality	Mortality Rate	Survival %
75	10	2	2.70%	97.30%
75	10	6	8%	92%
75	11	3	4%	96%
75	11	6	8%	92%
75	18	9	12%	88%
75	18	9	12%	88%

Table 4 - Show the stocking densities throughout different periods of time

Factors		Parameters		
		Transport duration	Mortality	Survival Number
Packing density	140 fingerlings	10 hours	19.50±3.54	120.50±3.54
		11 hours	23±1.41	117±1.41
		18 hours	27.50±0.71	112.50±0.71
	100 fingerlings	10 hours	10.50±0.71	89.50±0.71
		11 hours	11.50±0.71	88.50±0.71
		18 hours	15±1.41	85±1.41
	75 fingerlings	10 hours	4±2.83	71±2.83
		11 hours	4.50±2.12	70.50±2.12
		18 hours	9±0	66±0
Main effect				
Packing density		140 fingerlings	23.33a	116.67a
		100 fingerlings	12.33b	87.67b
		75 fingerlings	5.83c	69.17c
Standard error			0.75	0.75
Significant			**	**
Transport duration		10 hours	11.33a	93.67a
		11 hours	13.00b	92a
		18 hours	17.17a	87.83b
Standard error		–	0.75	0.75
Significant		–	**	**
Significant		NS	NS	NS

N=2; Different superscript letters in the same column means significant difference at P<0.05; **: significant difference at P<0.05; NS: No significant difference

First factor is 10 hours transporting period

The density in this period was found to be 140/l and the mean mortality equals 19.50±3.54 which constitutes 13.92 per cent:

Second density in this period 100/l mean of mortality equals 10.50±0.71 as percentage equals 11%.

Last density capacity in this period was 75/l the mean of mortality equals 4±2.83 fish and as percentage equals 5.35%.

To cite this paper Adam Ibrahim AM, Yagoub Adam HM., Musa Ahmed A.M, Mirghani Yousif F. 2015. Effect of Different Stocking Densities on Survival Rates of Nile Tilapia Fingerlings Transported in Plastic Bags. *Online J. Anim. Feed Res.*, 5(6): 160-164.
Scienceline/Journal homepages: http://www.science-line.com/index/; http://www.ojafr.ir

Second factor is 11 hours transporting period

- First density in this period was 140 /l the mean of mortality = 23±1.41 and as percentage equals16.42%.
- Second density in this period 100 /l mean of mortality = 11.50±0.71 as percentage equal = 12%.
- Last density capacity in this period was 75/l the mean of mortality = 4.50±2.12 fish.as percentage equal 6%.
- Third factor is 18 hours trip period.
- First density in this period was 140 /l the mean of mortality = 27.50±0.71 as percentage equal 19.65%.
- Second density in this period 100 /l mean of mortality = 15±1.41 as percentage equal = 15%
- Last density capacity in this period was 75/l the mean of mortality = 9±0 fish. as percentage equal 24%
- The results of the statistical analysis comparing the survival rates indicated that the mean survival rate is not significantly different between the two densities of 100 fingerlings per liter and 75 fingerlings per liter. They were found to be 93.67% and 92.0% respectively while the survival rate at 140 /l was found to be 87.3% which is significantly different at $P < 0.05$.

DISCUSSION

Fish farmers in Sudan obtain their seed stocks mainly not from their farms and as such rely heavily on good packing conditions covering sometimes 8–12 hours transportation time to maximize fish survival and quality. The transportation of live fish involves the transfer of large numbers (or biomass) of fish in a small volume of water. The Sudan climatic conditions are characterized by high temperatures during most of the months of the year. As a result the oxygen consumption is higher in transporting fish which necessitates the use the closed plastic bags in which oxygen supply is controlled. NAPFRE (2011) recommended that the water in the plastic bags should frequently be replaced with fresher supply so that adequate oxygen is provided and the fish waste excretions were disposed of. These recommendations should be followed specially during long transporting periods and higher temperatures. In this study though the water holing the fish in the plastic bags had not been changed, the survival rate of the fish was generally high. This could be attributed to the average low temperatures which were 18 and 24 for water and air respectively. The highest stocking density of 140 /l showed a lower survival rate equals to 87 %. However, the survival rate is not significantly different $P>0.05$ between the densities of 75/l and 100 /l which they were 92% and 93% respectively. In this study it was found that the density of 100/L produced the highest loading in the transporting time with lowest risk. In different research and studies recommendations were in the same range of 90-120 fingerlings size (5.03 cm) (NAPFRE, 2011).

The results of this thesis indicated that the range of loading of fingerlings in Sudan varies between 75 and 100 fingerlings/liter. This showed a higher survival rate and it was more successful than 140 fingerlings /l. Fish stress was not observed in my lowest loading of 75 fingerlings per litter. Monica *et al.* (2011) observed that signs of stress were exhibited within four hours for Piau (*Leporinus friderici*) during transporting but the difference could be attributed to the specific differences and Water temperature which increased throughout the transportation (from 20.8±0.34 to 24.2±0.12 °C; $P<0.0001$). In this study the maximum and minimum water temperatures were 19°C and to 17°C respectively. In future we shall need only to explore the other factors affecting fingerlings transport like economical, the distance travelled and the type of transporting.

CONCLUSION

Provision of fingerlings constitutes the basis of fish culture in Sudan. The results of data analysis showed that density and transporting periods are the most important factors that affect the existence and the survival of the fingerlings.

At a fixed transporting time there was no significant difference in the survival rate between the stocking densities of 75 and 100 fingerlings per liter. However, the stocking density of140 fingerlings per liter showed significantly lower survival rate. So to implement the optimum densities in transporting fingerlings the stocking density of 75-100 fingerlings per liter per 18 hours should be used. In cases when the distance or the time spent in transporting is be less than 10 hours we can increase the stocking density to 140 fingerlings per liter of water. But only 100 grams/liter/18 hours can be recommended as an optimum stocking density which can be used to transport Tilapia fingerlings in Sudan.

REFERENCES

FAO, 2012. Fisheries, Aquaculture, 272, 698 -706; report NO.968; ISSN 2070-6987.

To cite this paper: Adam Ibrahim AM, Yagoub Adam HM., Musa Ahmed A.M, Mirghani Yousif F. 2015. Effect of Different Stocking Densities on Survival Rates of Nile Tilapia Fingerlings Transported in Plastic Bags. *Online J. Anim. Feed Res.*, 5(6): 160-164.
Scienceline/Journal homepages: http://www.science-line.com/index/; http://www.ojafr.ir

International Center For Aquaculture (I C A, 1990) .Transporting Fish Water Harvesting and Aquaculture For Rural Development), Auburn University. GT 119P. International Food Policy Research Institute (IFPRI) www.ifpri.org.

Martins, E.G., Hinch, S.G., Patterson, D.A., Hague, M.J., Cooke, S.J., Miller, K.M .,Lapointe, M.F., English, K.K., Farrell, A.P., 2011. Effects of river temperature and climate warming on stock-specific survival of adult migrating Fraser River sock-eye salmon (Oncorhynchusnerka). Global Change Biology 17, 99–114.

Monica Serral; Carla Patrícia Bejo Wolkersl; Márcio Aquio Hoshiball; Elisabeth Criscuolo Urbinatil, 2011., Physiological responses of piau (Leporinusfriderici), Bloch to transportation., Rio Grande do Sul, Brasil.

National Agricultural Extension and Research Liaison Services 2001, Transporting fish for culture, Ahmadu Bello University, Zaria, Extension Bulletin No151., Fisheries Series No 6.,pp 21 .

NAPFRE, 2011, Malaysia, Penang, aquaculture report.

Atlantic salmon Aquaculture stocked with seawater, 272, 698 - 706. FAO, fisheries, 2012; report NO.968; ISSN 2070-6987.

World Fish center, 2012, Malaysia, Penang, aquaculture report.

To cite this paper Adam Ibrahim AM, Yagoub Adam HM., Musa Ahmed A.M, Mirghani Yousif F. 2015. Effect of Different Stocking Densities on Survival Rates of Nile Tilapia Fingerlings Transported in Plastic Bags. *Online J. Anim. Feed Res*., 5(6): 160-164.
Scienceline/Journal homepages: http://www.science-line.com/index/; http://www.ojafr.ir

Online Journal of Animal and Feed Research

Volume 5, Issue 6: 165-168 ; Nov 25, 2015 ISSN 2228-7701

ISOLATION OF *Klebsiella* Spp. FROM GANGRENOUS MASTITIS IN CATTLE IN KHARTOUM STATE, SUDAN

Reem Rabie MOHAMMED SALIH*[1] and Fawzi Ali MOHAMED AHMED[2]

[1]*Department of Clinical Medicine, Faculty of Veterinary Medicine, University of Khartoum, P.O. Box 32, Khartoum North, Sudan*
[2]*D Epartment of Fisheries and Wildlife Science, College of Animal Production for Science And Technology, Sudan University for Science and Technology, P.O.Box204, Khartoum North, Sudan*
*Email: reemat7@yahoo.com

ABSTRACT: This study was conducted in Khartoum State to determine the causative agent of gangrenous mastitis in bovine. Hundred dairy cows were examined after collected aseptically from 41 cows suffering from mastitis. All these cows were examined by visual inspection and palpation of mammary gland and supra-mammary lymph nodes. The milk samples were examined bacteriologically. The result was as follows: 55% acute mastitis, 44% chronic mastitis and 1% gangrenous mastitis. The isolated genera were as follows: 74% *Bacillus* spp., 24% *Staphylococcus* spp., 1% *Corynebacterium* spp. and 1% *Klebsiella* spp. The isolation of *Klebsiella* spp. from gangrenous mastitis in Frisian cow is considered as the first of its type in Sudan.

Keywords: Bovine, Gangrenous, Mastitis, Klebsiella, Khartoum, Sudan.

ORIGINAL ARTICLE
pii: S222877011500027-5
Received 08 Jul. 2015
Accepted 17 Jul. 2015

INTRODUCTION

Bovine mastitis, defined as "inflammation of the mammary gland" is the most economically important disease in dairy milk production worldwide (Bradley, 2002; Gruet et al., 2001). This disease can have an infectious or noninfectious etiology, and the infectious pathogen is the most important ones that frequently due to infection by one and/or the other pathogens, such as bacteria, viruses, mycoplasma, yeasts and algae (Chaneton et al., 2008; Malinowski et al., 2006; Osumi et al., 2008; Watts 1988; Wellenberg et al., 2002). Fortunately the vast majority of mastitis is of bacterial origin and just a few species of bacteria account for most cases, such as *E. coli*, *S. aureus*, *Str. uberis*, *Str. dysgalactiae* and *Str. agalactiae* (Aarestrup et al., 1995; Annemüller et al., 1999; Aouay et al., 2008). The main causative agent of gangrenous mastitis in cattle is *Staphylococcus aureus, this was reported by* dairy farmers of Ontario 1995 (2011).

Rate of coliform infection is higher during the dry period than during lactation; and dry cow therapy (treating cows with antibiotics at the end of lactating period) has been shown to have no effect on reducing the coliform infection rate (Smith et al., 1985). An outbreak of coliform mastitis is described in a dairy herd from the State of Rio de Janeiro, Brazil. During a four-month period 14 fatal cases of *Klebsiella pneumoniae*-related mastitis were observed in a herd of 104 lactating cows (Arq, 2001). Contaminated cow´s surrounding is the cause of *Klebsiella* spp. mastitis. Unlike contagious forms of mastitis which spread from cow-to-cow during milking, *Klebsiella* come from environmental sources, such as manure and organic material/bedding (recycled manure, wood shavings, etc.) (Arq, 2001).

Klebsiella bacteria can enter the teat canal both during and between milking. Dirty udders, especially when wet, have enormous bacterial populations. High rainfall, hot and humid weather, and moist environments can trigger heavy bacterial growth and increase incidence of mastitis caused by Klebsiella. The clinical signs of infected cow with mastitis caused by Klebsiella are: Fever, swollen/warm quarter (usually only 1 quarter affected), abnormal milk, decreased appetite, depression, diarrhea, and standing away from other herd-mates are common clinical signs of Coli Mastitis (Christina et al., 2011). *Klebsiella* spp. are most numerous in sawdust bedding as reported by Bramley and Neave (1975), Fairchild et al. (1982) who both reported *Klebsiella* spp. Outbreaks when cows were bedded using fresh sawdust.

The main objective of this study was to investigate the causative agents of bovine mastitis with special reference of mastitis caused by *Klebsiella* spp.

To cite this paper: Mohammed Salih R.R, Mohamed Ahmed F.A. 2015. Isolation of *Klebsiella* Spp. from Gangrenous Mastitis in Cattle in Khartoum State, Sudan. *Online J. Anim. Feed Res*., 5(6): 165-168.
Scienceline/Journal homepages: http://www.science-line.com/index/; http://www.ojafr.ir

MATERIAL AND METHODS

The samples were subjected to pH detection by using an indicator paper (manufactured by Kruse Company in Denmark). This test was applied by adding one drop of milk on yellow spot, in a few seconds the colour should change. The milk samples were collected aseptically from individual cows from infected quarters and then were subjected to bacteriological analysis by culturing on Blood agar and MacConkey´s agar. Isolation and identification was carried out according to the method of Barrow and Feltham (2003). The disc of different antibiotics was used for sensitivity test on the isolates according to Barrow and Feltham (2003).

RESULTS

Among the Hundred examined cows we find one was infected with gangrenous mastitis. Examination of the mammary gland produced a yellowish secretion in the left hind quarter, and the consistency of the secretion in the other quarters was normal in the infected cattle with gangrenous mastitis. The clinical signs observed in the cow affected by gangrenous mastitis were increase in body temperature, sloughed the mammary gland from the body and the oozing of purulent secretions. The pH indicator paper revealed change in colour from yellow to green. Table 1 shows the percentage of *Klebsiella* spp. and other isolates from various type of mastitis, there were *Bacillus* spp. (74%), *Staphylococcus* spp. (24%), *Klebsiella* spp 1% and *corynebacterium* spp. (1%). The various type of mastitis diagnosed were acute mastitis 55%, chronic mastitis 44% and 1% for gangrenous mastitis showed Figure 1. Table 2 shows the results of the antibiotic sensitivity test. *Klebsiella* was found equally sensitive to all antibiotics tested.

Table 1 - The percentage of isolated bacteria from milk samples

Bacteria	Percentage %
Bacillus spp.	74
Staphylococcus spp.	24
Klebsiella spp.	1
Corynebacterium spp.	1

Table 2 - The effectiveness of different antibiotics against Klebsiella spp

Klebsiella spp.	The effectiveness of different antibiotics against *Klebsiella* spp. and name of antibiotic											
	AS 20mcg	BA 25mcg	CF 30mcg	TZP 100/10mcg	CH 30mcg	CP 5mcg	CI 30mcg	TE 30mcg	OF 5mcg	GM 10mcg	AK 30mcg	PF 5mcg
Results	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++

AS: Ampicillin/Sulbactam; CI: Ceftizoxime; BA: Co-Trimoxazole; TE: Tetracycline; CF: Cefotaxime; OF: Ofloxacin; TZP: Piperacillin/ Tazobactam; GM: Gentamycin; CH: Chloramphenicol; AK: Amikacin; CP: Ciprofloxacin; PF: Pefloxacin; (+++): Higly sensitive.

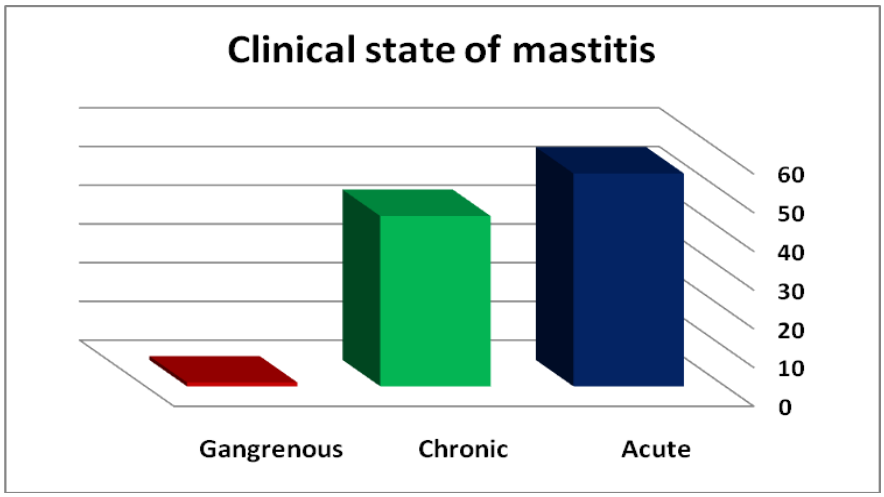


Figure 1 - The percentage of types of mastitis

To cite this paper: Mohammed Salih R.R, Mohamed Ahmed F.A. 2015. Isolation of *Klebsiella* Spp. from Gangrenous Mastitis in Cattle in Khartoum State, Sudan. *Online J. Anim. Feed Res.*, 5(6): 165-168.
Scienceline/Journal homepages: http://www.science-line.com/index/; http://www.ojafr.ir

DISCUSSION

In the literature dealing with gangrenous mastitis, there is considerable discussion concerning the relative importance of various bacteria in the pathogenesis of the condition (Minett 1937; Schalm, 1944). The environmental mastitis becomes more prevalent in a herd, the probability increases in early-lactation. The greatest number of cases in the first 21 days after calving, before breeding starts. Coliforms are found in soil, water and manure and they also inhabit the intestinal tract of cows (Eberhart et al., 1979; Fairchild et al., 1982). *Klebsiella pneumoniae* and *Escherichia coli* are the most common species associated with mastitis (International Dairy Federation, 1999) in dairy cattle. However, a significant number of cases were recorded until 70 days after calving. Then, as lactation progressed, the numbers became much more sporadic. With increased environmental mastitis in the summer, the occurrence of such cases in some cows close to breeding is likely (Perrin et al., 2007).

Isolation of *Klebsiella* spp. in this study is in accord with Cullor (1992), who found that 20% of bovine mastitic cases, in Nordic countries caused by coliform of which about 85% were *E. coli* and the rest were *Klebsiella* spp., and other *Enterobacteria* were isolated. This is in agreement with Mc Donald et al. (1970); Ibrahim and Habiballa (1978). To the best of knowledge gangrenous mastitis caused by *Klebsiella spp* is considered as the first report in Sudan.

CONCLOUSION

Regardless of this result should be make an experimental infection with *Klebsiella* spp. to confirm that bacteria can cause gangrenous mastitis and use PCR to detect what strain of these bacteria or the toxin can cause gangrenous mastitis.

REFERENCES

Aarestrup FM, Wegener HC and Rosdahl VT (1995). Evaluation of phenotypic and genotypic methods for epidemiological typing of *Staphylococcus aureus* isolates from bovine mastitis in Denmark. Vet. Microbiol, 45: 139 -150.

Annemüller C, Lämmler C and Zschöck M (1999). Genotyping of *Staphylococcus aureus* isolated from bovine mastitis. Vet. Microbiol, 69: 217-224.

Anonymous (2012). Health and Welfare. Copyright©2012 Ahdb all Rights Reserved.

Aouay A, Coppée F, Cloet S, Cuvelier P, Belayew A, Lagneau PE and Mullender C (2008). Molecular characterization of Prototheca strains isolated from bovine mastitis. J. Med. Mycol, 18: 224-227.

Arg B (2001). An outbreak of acute bovine mastitis caused by *Klebsiella pneumonia* in a dairy herd. Med. Vet. Zootec, 53.

Bradley A (2002). Bovine mastitis: an evolving disease. Vet. J, 164: 116 -128.

Bramley A J and Neave FK (1975). Studies on the control of coliform mastitis in causes, prevalence, prevention. J. Dairy Sci, 68: 1531-1553.

Barrow GI and Feltham RKA (2003). Cowan and Steel's manual for identification of medical bacteria. 3rd (ed) Cambridge press.

Chaneton L, Tirant L., Maito J, Chaves J, Bussmann LE (2008). Relationship between milk lactoferrin and etiological agent in the mastitic bovine mammary gland. J. Dairy Sci, 91: 1865-1873. Deliv. Rev. 50, 245-259.

Christina S, Petersson W, Isis M, John C (2011). Klebsiella spp.: A Practical Summary for Controlling Mastitis. Maryland Regional College of Veterinary Medicine.

Cullor J (1992). Tests for identifying antibiotic residues in milk; How well do they work? Vet. Med, 87:, 1235-1241.

Dairy Farmers of Ontario (1995, 2011). Mastitis pathogens. Proudly serving Ontario´s milk producers.

Eberhart RJ, Natzke RP, Newbould FHS, Nonnecke B and Thompson PD (1979). Coliform mastitis – a review. J. Dairy Sci, 62: 1 - 22.

Fairchild TP, McArthur BJH, Moore J and Hylton WE (1982). Coliform counts 16 in various bedding material. J. Dairy Sci, 65: 1029-1035.

Gruet P, Maincent P, Berthelot X, Kaltsatos V (2001). Bovine mastitis and intramammary drug delivery: review and perspectives. Adv. Drug.

To cite this paper: Mohammed Salih R.R, Mohamed Ahmed F.A. 2015. Isolation of *Klebsiella* Spp. from Gangrenous Mastitis in Cattle in Khartoum State, Sudan. *Online J. Anim. Feed Res*., 5(6): 165-168.
Scienceline/Journal homepages: http://www.science-line.com/index/; http://www.ojafr.ir

Ibrahim AE and Habiballa N (1978). Persistent mastitis in dairy herd of a breeding center. Sud. J. Vet. Sci. Anim. Husb. 19: Pp, 96.

International Dairy Federation (1999). Suggested interpretation of mastitis terminology. International Dairy Federation. 338, 3-26.

Malinowski, E., Lassa, H., Kłlossowska, A., Smulski, S., Markiewicz, H and Kaczmarowski, M (2006). Etiological agents of dairy cows' mastitis in western part of Poland. Pol. J. Vet. Sci, 9: 191-194.

McDonald JS and Anderson JA (1981). Antibiotic sensitivity of Staphylococci isolated from infected bovine mammary glands. Cornell. Vet, 71(4): 391-396.

Minett FC (1937). Studies on bovine mastitis XII. mastitis due to staphylococci. J. Comp. Path. Therap. 50: Pp, 101.

Osumi T, Kishimoto Y, Kano R, Maruyama H, Onozaki M, Makimura K, Ito T, Matsubara K and Hasegawa A (2008). Prototheca zopfii genotypes isolated from cow barns and bovine mastitis in Japan. Vet. Microbiol, 131: 419-423.

Perrin I R W, Bostelmann I and Sheldon M (2007). Reduced conception rates associated bovine mastitis during a "window of opportunity". Veterinary Record, 161: 61-62.

Schalm O W (1944). Gangrenous mastitis in dairy cows. Vet. Med, 39: Pp, 279.

Smith KL, Todhunter DA and Schoenberger PS (1985). Environmental mastitis: causes, prevalence, prevention. J. Dairy Sci, 68: 1531-1553.

Watts JL (1988). Etiological agents of bovine mastitis. Vet. Microbiol, 16: 41-66.

Wellenberg G J, van der Poel WH and Van Oirschot JT (2002). Viral infections and bovine mastitis. Vet. Microbiol, 88: 27-45.

To cite this paper: Mohammed Salih R.R, Mohamed Ahmed F.A. 2015. Isolation of *Klebsiella* Spp. from Gangrenous Mastitis in Cattle in Khartoum State, Sudan. *Online J. Anim. Feed Res*., 5(6): 165-168.
Scienceline/Journal homepages: http://www.science-line.com/index/; http://www.ojafr.ir

Online Journal of Animal and Feed Research

Volume 5, Issue 6: 169-174; Nov 25, 2015 ISSN 2228-7701

REVIEW VIRULENCE NATURE OF *Escherichia coli* IN NEONATAL SWINE

Nwiyi PAUL

Department of Veterinary Microbiology and Parasitology, College of Veterinary Medicine, Michael Opkara University of Agriculture, Umudike Abia state, Nigeria
*Email: afodiokechukwu@yahoo.com

ABSTRACT: Piglet disease due to Enterotoxigenic *Escherichia coli* (ETEC) are classical and associated typically with severe watery diarrhea within the first two weeks of life and occasionally some days after weaning in pigs. *E.coli* is a well-known and diverse organism though normally harmless commensal, but when it acquires mobile genetic elements becomes a highly pathogenic organism capable of causing a range of diseases. ETEC adhere to the small intestinal microvilli without inducing morphological lesions and produce enterotoxins acting locally on enterocytes. This leads to hyper-secretions and reduced absorption of electrolytes. The virulence attributes of ETEC are adhesions and toxins and the successful management of the disease is dependent on good understanding of these virulence factors. In pigs ETEC, the commonest adhesions are the fimbriae on the surface K88, K99, 987p, F18ab and F18ac. The enterotoxine of pigs ETEC are further classified into heat-labile (LT) and heat-stable (ST). Other subdivisions of enterotoxin *E. coli* are LT, STb, STa, Stx2e. The adhesive fimbriae and enterotoxins of piglet ETEC can be evaluated using plasmids. Polymerase chain reaction (PCR) is a specific test and had been used for virulence gene detection of ETEC. In this reviews, we focus on current opinions and knowledge of the various pathogenic pathways that *E.coli* uses to cause disease in piglet.

Keywords: ETEC, Fimbria, Toxins, Piglets, Virulence

REVIEW
pii: S2228770115O0028-5
Received 08 Nov. 2015
Accepted 17 Nov. 2015

INTRODUCTION

One of the important disease of swine herds around the world is neonatal Colibacillosis (Blickwede and Schwarz 2004; Hart et al., 2004). The ability of adhesion of Enterotoxigenic *Escherichia coli* to intestinal epithelial cell is mainly due to the production of thin (3-7nm) proteinaceous surface appendages (fimbriae or pili), which can be morphologically, biologically and antigenically different on various strains. Some of them morphologically resemble the common fimbriae (type 1 fimbriae) of *E.coli* (Duguid et al., 1955). The ability of the fimbriae to agglutinate red blood cells of different species was recognized early (Elsinghorst and Weitz, 1994) and has been used. Neonatal and post-weaning diarrhea has been associated with different types of *Esherichria coli* pathotypes among which are enterotoxigenic *Escherichia coli* (ETEC) and attaching or enteropathogenic *E. coli* (AEEC). The disease called edema is caused by a Shiga toxin – producing *E. coli* (STEC). There is a high mortality rates in piglets as a result of these disease (Choi et al., 2002, Hariharan et al., 2004). The enterotoxigenic *E. coli* makes use of the fimbriae (F4, F5, F6, F18 and F41) to adhere to the small intestine and produce enterotoxins (STa, STb, and LT) that interact with enterocytes causing water and electrolyte hypersecretion and impairing nutrient absorption (Bertschinger and Fainbrother, 1999; Amezcua et al., 2002). A very important factor or marker of ETEC virulence from swine is hemolysins (Docic and Bilkei, 2003). The contamination of piglets occurs via contact with environment or from the sow and this has resulted in disease producing a very high mortality rate in the first 24 hours of life. The piglet susceptibility is associated with several factors such as presence of intestinal *E. coli* fimbrial receptors, stress, very poor hygiene and low quantity of ingested colostrums (Bertschinger and Fairbrother, 1999). In Nigeria the case of neonatal piglet diarrhea is alarming and this inform the essence of this review. The study takes a look at important characteristics features that occurs in piglet due to ETEC and these include: fimbriae adhesions, enterotoxins, virulence spread determinants, age-related ETEC strain susceptibility as well as its lineage to ETEC, common receptor in piglet enterocytes and diagnostic methods.

Fimbriae Adhesins

The piglet ETEC isolates are known to produce about five different adhesins, all of which are fimbriae also called pili among which are K88, (F4), K99 (F5), 987P(F6), (F7) and F18 (Wilson and Francis, 1986; Casey et al.,1992). Fimbrial ahesins K88 and F18 occur in several antigenic forms. The K88 fimbrial variants are K88ab, K88ac and K88ad. In a country like United States of America, the only form of K88 found is K88ac (Westerman et

To cite this paper: Paul N. 2015. Review virulence nature of *Escherichia coli* in neonatal swine. *Online J. Anim. Feed Res*., 5(6): 169-174.
Scienceline/Journal homepages: http://www.science-line.com/index/; http://www.ojafr.ir

al., 1988). The variants of F18 include F18ab and F18ac. The strains that express F18ab maybe more commonly associated with edema disease than strains expressing F18ac. The F41 type of adhesion was commonly and often found in association with K99, but has significance in naturally occurring disease. The Fimbrial adhesions are known to be involve in target of specific receptors on piglet intestinal brush border epithelial cells (enterocytes), enabling the bacteria to colonize the cell surface and also excrete toxins whose action includes production of watery stool in the piglet. The exposure of these receptors to the luminal surface is responsible for the susceptibility of piglets to ETEC. The exposure of piglets to clinical infection of ETEC is limited to animal genetics and age (Francis et al., 1998; Imberechts et al., 1997).

Enterotoxins

The ETEC strain that causes diarrhea piglets produces toxins. The toxins are of five different pathotypes namely; heat labile enterotoxin (LT), heat stable enterotoxin type A (STa); heat stable enterotoxin type B (STb); Shiga toxin type 2e (Stx2e), and enteroaggregative *E.coli* heat stable enterotoxin 1 (EASTI). Choi et al. (2001) enterotoxin Stx2e, also known as edema disease factor is responsible for lesions that are associated with edema disease in piglets. When these toxins are absorbed into the blood stream, they cause destruction of endothelial cells resulting in hemorrhage, blood dot, necrosis and edema in important organs among which is the brain (Clugston et al., 1974). The importance of entero-aggregative *E. coli* heat stable enterotoxin 1 (EAST 1) in piglet diarrheal is yet to be known.

Table 1 - Features of enterotoxigenic *Escherichia Coli* (ETEC) strains in relative with diseased pigs of different ages.

	ETEC	Features		Age group affected	
Serogroup	Fimbrial	Toxins	Hemolysins	Weaned	Neonatal
08	K99	STa	-	No	Yes
09	K99, 987p	STa	-	No	Yes
0101	K99	STa	-	No	Yes
0141	987P	STa	-	No	Yes
0149	K88	LT, STb ± STa	+	Yes	Yes
0157	K88	LT, STb ± STa	+	Yes	Yes
0138	F18ab, F18ac	STa, STb ± St x 2e	+	Yes	No
0139	F18ab	STa, STb ± St x 2e	+	Yes	No
0141	FI8ac	STa, STb ± St x 2e	+	Yes	No
0157	F18ac	STa, STb ± Stx 2e	+	Yes	No

The neonate were affected by enterotoxigenic *E coli*, (08, 09, 0141 and 0149) while the weaned were affected by enterotoxigenic *E.coli* (014, 0139, 0141 and0157); Source: Wilson, R.A and Francis, D.H. (1986); + = Presence, - = absence of hemolysin.

Determinants of Virulence pattern/spread

Virulence determinants are not randomly distributed among the virulent strains, rather they occur in patterns associated with specific serogroups and fumbrial. Table 1 above demonstrates clustering of virulence determinants around serogroup and the ages of pigs that are commonly infected with ETEC of each virulence type. All the strains of ETEC isolated from weaned pigs with diarrhea contain the gene in post-weaning diarrhea and this strongly suggests that ST_b plays an important role in pathogenesis that is not duplicated by other enterotoxins. Furthermore, very few ETEC Strains possess the features of only ST_b genes. Postweaning isolates genes for ST_a- LT or ST_a-LT.

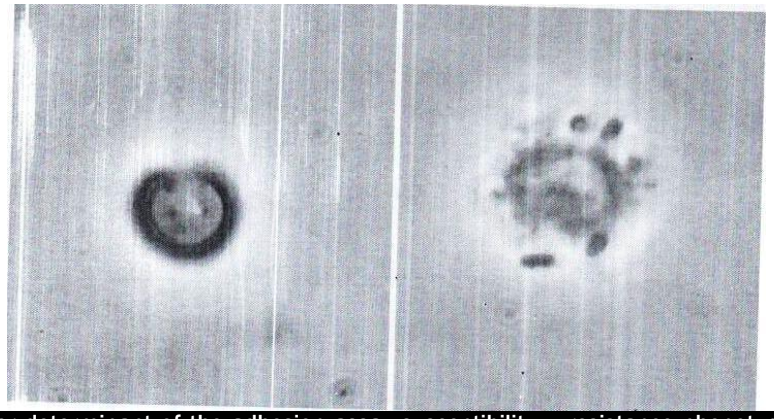


Figure 1 - The brush border determinant of the adhesion assay susceptibility – resistance phenotype of piglet k88+ and f18+ enterotoxigenic *Escherichia coli.* (Bacteria) with F18 (Fimbrial) adhere to brush border residue of pigs of the susceptible phenotype right (x1200) and non for left. Brush borde determinant of the adhesion assay susceptibility –resistant phenotype of pigletK88+ and f18+ enteritoxigenic *Echerichia coli*. (Bacteria) with F18 (Fimbrial) do not adhere to the brush border determinant of the adhesion assay susceptibility-resistant phenotype left (x1200).

To cite this paper: Paul N. 2015. Review virulence nature of *Escherichia coli* in neonatal swine. *Online J. Anim. Feed Res*., 5(6): 169-174.
Scienceline/Journal homepages: http://www.science-line.com/index/; http://www.ojafr.ir

Age associated spread susceptibility to various ETEC strains

It has been shown that a large majority of piglets clinically exposed to ETEC strains revealed 987P and K99 are neonates, even though most pigs may be susceptible to these strains for about one week post birth. As piglets grow into grower stage, the receptors of K99 fimbriae decrease in concentration which is an indication that ETEC susceptibility is a function of expression of receptors (Runnels et al., 1980). The receptors for K88 and F18 also appear to be present in large quantity in adult pigs which is an indication that stop in receptor expression is inconsequential with respect to age related resistance of adult pigs to ETEC expressing these fimbrial related resistance of adult pigs to ETEC expressing these fimbrial (Erickson et al., 1992). There exists a little correlation between the type of enterotoxin produced by ETEC strain and the age at which pigs become resistant. Furthermore, even adult humans are susceptible to traveler's diarrhea caused by ETEC.

This suggests that some adult pigs are not resistant to all types of *E-coli* enterotoxins. The explanation for this occurrence could be that changes in the intestinal brush border glycocalyx associated with aging render the fimbrial receptors less available for bacterial attachments (Erickson *et al.,* 1992). Since receptors for the different fimbrial adhesions are different in size and probably different in presentation from each other, on the surface of the enterocyte, diet and age associated changes in the glycocalyx may mask fimbrial of different receptors at varying animal ages (Grange et al*.,* 1999).

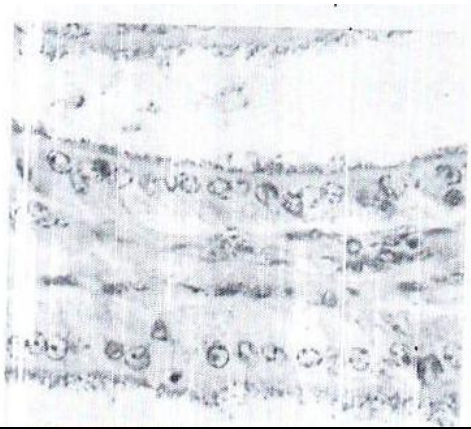


Figure 2 - Hematoxylin-eosin stained histologic section of small intestine from a pig infected with enterotoxigenic *Escherichia coli.* Bacteria form a confluent layer on the epithelial surface. (x400)

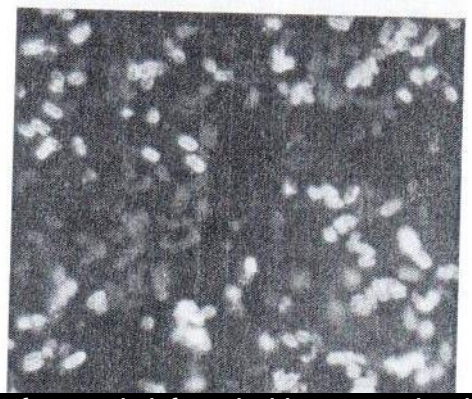


Figure 3 - Intestinal impression smear from a pig infected with enterotoxigenic *Escherichia coli* stained by indirect immunofluorescence with anti-fimbria antibodies and fluorescein-isothiocyanate-conjugated anti-immunoglobulin. Many fluorescing bacteria are present (x1200).

Besides age related resistance of piglets to $K88^+$ and $F18^+$ ETEC strains, there may be lineage-related resistance to infection. In each of the cases, susceptibility is an autosomal dominant trait and the inability of the pigs to express the required receptors on enterocytes is due to resistance. An experiment mounted to demonstrate expression of K88 receptors from four different breeds of pigs showed that there was substantial variation in the prevalence of susceptible pigs among the breeds (Bakar et al., 1997). The prevalence of pigs of the F18 susceptibility phenotype has not been determined, though casual observation suggests that it is considerably higher than that 88 ETEC susceptibility K88 and F18 receptors present on swine erythrocytes. K88ab and K 88ac in swine erythrocyte possess a receptor which has been identified as a mucin-type sialoglycoprotein (MTSG). This molecule often gets attached to the border of the brush surface of erythrocytes (Erickon et al., 1992). Those pigs that show (MTSG) are susceptible to $K88ab^+$ and $K88ac^+$ ETEC and the piglet acceptance to K88 ETEC correlates with the

To cite this paper: Paul N. 2015. Review virulence nature of *Escherichia coli* in neonatal swine. *Online J. Anim. Feed Res*., 5(6): 169-174.
Scienceline/Journal homepages: http://www.science-line.com/index/; http://www.ojafr.ir

expression of (mucin-type sialoglycoprotein (Francis et al., 1998). The brush boarder adherence assay is a test useful for $K88^+$ ETEC susceptibility-resistance phenotypes of pigs as reflected (Figure 1). There is no genetic marker of $K88^+$ ETEC resistance-susceptibility identified. However, the determinant for resistance susceptibility rest on the 13^{th} chromosome (Peelman, 1999). The receptor for F18ab and F18ac is yet to be known, but a genetic marker for loss of expression of receptor had been shown to be closely linked to the marker for swine blood group inhibitor (s) and swine stress syndrome. The marker was mapped to an alpha (1,2) fuicosyltransferase (FUT) gene on the 6^{th} chromosome (Meijerink et al., 1997). Difference exists between resistant and susceptible fuicosyltransferase gene and open reading frames (ORFS) were polymorphism at lease pairs 307 and 857 resulted in substitution of amino acid at position 103 and 286 for (threonine substituted for alanine) and glutamine substituted for arginine). The animals resistant to F18 ETEC are in hologous for threonine at amino acid 103 of the fuicosyltransferase enzyme. The level of FUT enzyme are significantly lower in F15 ETEC resistant animals (Meijerink et al., 2000).

Methods of Diagnosis & Enterotoxigenic *E. coli* (ETEC) Characterization

At necropsy, no obvious sign may be seen in pigs infected with ETEC beside dehydration. Histological evaluation may show bacilli adherent diffusely on the villous surface of the small intestine (figure 2). Large number of Gram negative bacilli is seen in the ileum of clinically infected pigs on making a smear (Francis, 1983) with few organisms present. Enterotoxigenic *E. coli* cultured from infected neonatal pigs may be either hemolytic or non-hemolytic but only hemolytic ETEC colonize weaned pigs (Imberechts et al., 1997) confirmation that E coli isolates are pathogenic strains may be by phenotypic or genotypic analysis. However, for the purpose of this study, genotypic assessment will be considered. Genotypic analysis by multiplier polymerase chain reaction (PCR) identifies genes for virulence factors, among which are fimbriae K88, K99, 987P, F18 and F41 (Figure 4). It also identifies genes for toxins LT, ST_a, ST_b and Stx2e (Casey and Bosworth, 1997). PCR testing eliminates difficulties associated with gene expression under laboratory conditions. However, PCR have its demerits because results obtained are subject to interpretation and superfluous bands may mix with genes of virulence factors. The presence of genes or its fragment evidenced by a band on the agarose gel does not necessarily show that gene is expressed as a functional virulence factor.

Genes contained within bacterial plasmids may easily be spread via a bacterial populations. Many virulence factor genes of ETEC are plasmid borne and the presence of a typical combination of genes in ETEC strain is expected. The fact that extra genes add little if at all any advantage is on the premise of low isolation incidence of each typical combination. Phenotypic analysis is best performed by assessment for production of adhesive fimbriae, either by Enzyme-Linked Immunosorbent Assay (ELISA) or by Indirect Immunofluorescence Assay (IFA) as described (Mullaney et al., 1991). Monoclonal antibodies for each type of fimbria are available for these tests. The ELISA rest requires culture of the organisms from infected tissues. The IFA may be performed either on impression smears or frozen sections of infected intestine or on smears prepared from cultures of the bacteria (Francis, 1983) as described (Figure 3). A potential pitfall in using organisms cultured from infected tissue is that cultured organism may not always express fimbrae. In vitro expression is parta problem with 987P and F18ab fimbriae (Imberechts et al., 1997; Mullaney et al., 1991)

CONCLUSION

Esherichia coli particurlaly enterotoxigenic *E. coli* is responsible for causing severe diarrhea in neonate swine. The virulence nature of *E.coli* is embedded in the fimbriae which produces the toxin and it also posses adhesive property. The virulence form is associated with certain age type of pigs. The toxins STa affects only the neonatal pigs and not the weaned. Only non-haemolytic *E. coli* colonize the neonate pig.

REFERENCES

Amezcua R, Friendship RM and Dewey CE (2002). Presentation of post-weaning *Escherichia coli* diarrhea in southern Ontario, prevalence of hemolytic *E. coli* sero-groups involved, and their antimicrobial resistance patterns. Can. J. Vet. Res. 66: 73-78

Bertshchinger HU and Fairbrother JM (1999). *Escherichia coli* infections.In: Straw BE (Ed) diseases of swine, Ames: Iowa State University, 1: 431-468.

Birnboim HC and Doly J (1979). A rapid alkaline extraction procedure for screening recombining plasmid DNA. Nucleic Acids Res, 7: 1513-1523

Blickwede M and Schwarz S (2004). Molecular analysis of florfenicol-resistant *Eschericha coli* isolates from pigs. Animicrob Chemother., 53: 58-64

Casey TA and Bosworth BT (1997). Diagnosis of *E. coli* in swine using multiplex PCR. 97*th* Gen Meet Amer Soc. Microbiol. Miami, Florida. 1: 116.

Casey TA, Nagy B, and Moon HW (1992). Pathogenicity of porcine enterotoxigenic *Escherichia coli* that do not express K88, K99, F41, or 987P adhesins. Am J Vet Res. 53:1488–1492.

Choi C, Cho WS, Chung HK, Jung T, Kim J and Chae C (2001). Prevalence of the enteroaggregative *Escherichia coli* heat-stable enterotoxin 1 (EAST1) gene in isolates in weaned pigs with diarrhea and/or edema disease. Vet Microbiol. 81: 65–71.

Choi C, Ham HJ and Kwon D (2002). Antimicrobial susceptibility of pathogenic *Escherichia coli* isolated from pigs in Korea. J. Vet. Med. Sci., 64: 71-73

Clugston RE, Nielsen NO and Smith DLT (1974). Experimental edema disease of swine (*E.coli* enterotoxemia). III Pathology and pathogenesis. Can J Comp Med., 38: 34–43.

David HF (2002). Enterotoxigenic *Escherichia coli* infection in pigs and its diagnosis. J. of Swine Health and Product. 10:171-175

Docic M and Bilkei G (2003). Differences in antibiotic resistance in *Escherichia coli,* isolated from East-European swine herds with or without prophylactic use of antibiotics. J. Vet. Med. B. Infect. Dis. Vet. Public Health, 50: 27-30

Duguid JP, Smith IW and Dempster G (1955).Noa-flagellar filamentors appendages (fimbrial) and haemagglutinciting activity in *Escherichia coli* J. Pathol. Bacteriology 53:335-355

Elsinghorst EA and Weitz JA (1994). Epithelial cell invasion and adherence directed by the enterotoxigeric Esherichia coli tib locus is associated with a 104 – kilodalton outer membrane protein. Infect. Immun. 62:3463-3471

Erickson AK, Willgohs JA, McFarland SY, Benfield DA and Francis DH (1992). Identification of two porcine brush border glycoproteins that bind the K88ac adhesin of *Escherichia coli* and correlation of these binding glycoproteins with the adhesive porcine phenotype. Infect Immun. 60: 983–988.

Francis DH, Grange PA, Zeman DH, Baker DR, Sun R and Erickson AK (1998). Expression of mucin-type glycoprotein K88 receptors strongly correlates with piglet susceptibility to K88+ enterotoxigenic *Escherichia coli*, but adhesion of this bacterium to brush borders does not. Infect Immun. 66: 4050–4055.

Francis DH (1983) Use of immunofluorescence, gram staining, histologic examination, and seroagglutination in the diagnosis of porcine colibacillosis. Am J Vet Res. 44: 1884–1888.

Grange PA, Erickson AK, Levery SB and Francis DH (1999). Identification of an intestinal neutral glycosphingolipid as a phenotype-specific receptor for the K88ad fimbrial adhesin of *Escherichia coli.* Infect Immun. 67:165–172

Hariharan H, Coles M and Poole D (2004). Antibiotic resistance among enterotoxigenic *Escherichia coli* from piglets and calves with diarrhea. Can. Vet. J., 45: 605-606.

Hart WS, Heuzenroeder MW and Barton MD (2004). Antimicrobial resistance in Campylobacter spp., Escherichia coli and enterococci associated with pigs in Australlia. J. Vet. Med. B. Infect. Dis Vet. Public Health, 51: 216-221.

Imberechts H, Bertschinger HU, Nagy B, Deprez P and Pohl P (1997). Fimbrial colonization factors F18ab and F18 ac of *Escherichia coli* isolated from pigs with postweaning diarrhea and edema disease. Adv Exper Med Biol. 412:175–183.

Meijerink E, Fries R, Vogeli P, Masabandi J, Eigger G, Stricker C, Neuenschwander S, Bertschinger HU and Stranzinger G (1997). Two alpha (1,2) fucosyltransferase genes on porcine chromosome 6q11 are closely linked to the blood group inhibitor (S) and *Escherichia coli* F18 receptor (ECF18) loci. Mamm Genome. 8:736–741.

Meijerink E, Neuenschwander S, Fries R, Dinter A, Bertschinger HU, Stranzinger G and Vogeli P (2000). A DNA polymorphism influencing alpha (1,2) fucosyltransferase activity of the pig FUT1 enzyme determines susceptibility of small intestinal epithelium to *Escherichia coli* F18 adhesion. Immunogenetics 52:129–136.

Mullaney CD, Francis DH and Willgohs JA (1991). Comparison of seroagglutination, ELISA, and indirect fluorescent antibody staining for the detection of K99, K88, and 987P pilus antigens of *Escherichia coli*. J Vet Diagn Invest. 3:115–118.

Peelman LJ (1999). Genetic investigation of the resistance mechanisms of the pig against diarrhea caused by *E. coli*. Verhandelingen-Koninklijke Academie voor Geneeskunde Belgie. 61:489–515.

Runnels PL, Moon HW and Schneider RA (1980). Development of resistance with host age to adhesion of K99+ *Escherichia coli* to isolated intestinal epithelial cells. Infect. Immun. 28:298–300.

Westerman RB, Mills KW, Phillips RM, Fortner GW and Greenwood JM (1988). Predominance of the ac variant in K88-positive *Escherichia coli* isolates from swine. J. Clin. Microbiol. 26:149–150.

Wilson RA and Francis DH (1986). Fimbriae and enterotoxins associated with *E coli* serogroups isolated from clinical cases of porcine colibacillosis. Am J Vet Res. 47:213–217.

To cite this paper: Paul N. 2015. Review virulence nature of *Escherichia coli* in neonatal swine. *Online J. Anim. Feed Res*., 5(6): 169-174.
Scienceline/Journal homepages: http://www.science-line.com/index/; http://www.ojafr.ir

Online Journal of Animal and Feed Research

Volume 5, Issue 6: 175-180; Nov 25, 2015 ISSN 2228-7701

COMPARATIVE STUDY OF THE BODY WEIGHT CHARACTERISTICS AND EFFECT OF DRYING ON CHEMICAL COMPOSITION OF THREE NILE FISH SPECIES (*Oreochromis Niloticus, Labeo Niloticus* AND *Clarias Spp.*)

Hassan M. YAGOUB ADAM[1]*, Ahmed Mohamed MUSA AHMED[2], Abdelwahab M ADAM IBRAHIM[1], Fathi MIRGHANI YOUSIF[3]

[1] *Ministry of Agriculture, Animal Resources and Irrigation, Khartoum State, Sudan*
[2] *Alneelain University, Faculty of Agricultural Technologyand Fish Sciences, Department of Fish Sciences, Sudan, Khartoum*
[3] *Ministry of Animal Resources and Fisheries and Range Land, Sudan, Khartoum*
*Email: hassanwildlif@gmail.com

ABSTRACT: This study was carried out to compare the body weights of three different Nile fish species (*Oreochromis niloticus, Labeo niloticus and Clarias spp.*), and the impact of direct sun drying on their chemical composition.36 samples were collected (12 samples/ species). Averages of total length, standard length (cm) and gross body weight (gm) were determined and the findings were as follows: 36.5, 29.75 and 930 for *Oreochromis niloticus*, 49, 39.5 and 1210 for *Labeo niloticus* and 49, 45 and 977.5 for *Clarias spp.* It was noticed that *clarias spp.* has the highest edible meat percentage 46.75% followed by *Labeo niloticus* 38.82% and *Oreochromis niloticus* 33.39%, and there were significant differences (P < 0.05) among the three species. Chemical analysis for the samples was done to determine (protein, fat, ash and moisture contents). The results of protein contents examined were 62%, 61.5% and 61.5% for *Oreochromis niloticus, Labeo niloticus* and *Clarias spp.* respectively. Fat contents were 7.41%, 8.27% and 7.32% for *Oreochromis niloticus*, *Labeo niloticus* and *Clarias spp.* respectively. Moisture contents were 6.7%, 7.5% and 7.5% for *Oreochromis niloticus*, *Labeo niloticus* and *Clarias spp.* respectively. Ash contents were 5.90%, 6.05% and 6.85% for *Oreochromis niloticus, Labeo niloticus* and *Clarias spp.* respectively.

Keywords: Body weight, Chemical Composition, Drying, Nile fish's spp.

ORIGINAL ARTICLE
pii: S2228770115000029-5
Received 20 Mar. 2014
Revised 20 Feb. 2015
Accepted 17 Aug. 2015

INTRODUCTION

Fish are the most numerous of vertebrate, with at least 20,000 known species and more than 58% are found in marine environment (Thurman and Webber, 1984). Fish is one of the most important sources of animal protein available in the tropics and has been widely accepted as a good source of protein and other vital nutrients for the maintenance of a healthy body (Andrew, 2001). The less developed countries capture 50% of the world harvest and a large proportion of the catch are consumed internally (FAO, 1985). In many Asian countries over 50% of the animal protein intake comes from fish, while in Africa, the proportion is 17.50% (Williams et al., 1988). In Nigeria, fish constitutes 40% of the animal protein intake (Olatunde, 1998). They have significant role in nutrition, income, employment and foreign exchange earning of the country. Fresh fish is a central point in fish for food utilization. The knowledge of fish composition is essential for its maximum utilization. The nutritional composition of fish varies greatly from one species and individual to another, depending on age, feed intake, sex and sexual changes connected with spawning, the environment and season (Silva and Chamul, 2000).

Processors have direct interest in the proximate composition of fish in order to know the nature of the raw material before chilling, freezing, smoking or canning can be correctly applied (FAO, 2004). In the Sudan fish distributed over an area that amount to 100,000km of fresh water and 760 km of marine, the total sustainable production amount to 114,100 tones/ year and human consumption is estimated at only 1.4kg/ year (Meske, 1985).

Sudan is endowed with diversified surface and underground water resources, and arable lands that are suitable to support a vigorous capture Fishery activities are centered around the River Nile and its tributaries, and the territorial water of Sudan on the Red Sea (FOA, 1999). Fish in the Sudan have is been a major source of protein and energy for many communities especially among the Nilotic tribes of the south and some of Nubian ethnic groups of the far north especially in the lean month of the year. Sudanese people use fish sometimes as the only source of animal protein throughout the year as substitute for meat, particularly in the central Nile valley. Fish is one of the most highly perishable commodities and the public has always required continuous reassurance about its large number of species of widely different sizes and shapes. Because of this variety consumers are often unsure if particular species of product made from them are good to eat. Many countries now have comprehensive system of inspection and control of at least some aspects of fish quality. Thus from several points of view fish quality has become very important in the world. This is because consumers now are more aware of possible food hazards and

To cite this paper: Yagoub Adam H.M., Musa Ahmed AM, Adam Ibrahim A.M., Mirghani Yousif F. 2015. Comparative study of the body weight characteristics and effect of drying on chemical composition of three Nile fish species (*Oreochromis Niloticus, Labeo Niloticus* and *Clarias Spp.*). *Online J. Anim. Feed Res.*, 5(6): 175-180.
Scienceline/Journal homepages: http://www.science-line.com/index/; http://www.ojafr.ir

malpractices which will affect the quality as a result of bad handling and processing. Therefore, consumers individually or collectively become more demand in respect of freshness, naturalness, microbial safety, free from pollutants and protection from damage.

The number of simple drying techniques suitable for small-scale, such as at household or village level as described by Brigih et al. (2004). In recent years the annual world production of dried a fishery product has been 350,000 tones, and the biggest production comes from Asia and Africa (Sigurjon, 2003). Salted fish is consumed in many countries, especially the developing countries where they constitute an important source of low cost dietary protein (Bligh et al, 1988).

The aims of this study were to identify the filleting yield characteristics of three Nile fish species and to compare and determine the effect of drying on chemical composition of the studied fish species.

MATERILAS AND METHODS

Locality:

This study was conducted at Sudan University of Science and Technology, College of Science and Technology of Animal Production, department of Fisheries and Wildlife Science.

Fish samples:

Thirty six fish samples of three fish species, Garmut (African cat fish, *Clarias spp.*), Dabs (*Labeo niloticus*) and Bulti (*Oreochromis niloticus*), purchased from Elmourda fish market, Oumderman, Sudan. The length and total weight of individual samples were taken using Measuring board (100cm) and normal balance (10Kg).

Experimental procedure:

The fish samples were washed thoroughly with tap water and weighed individually and degutted using sharpened and clean knives. The treated samples were washed again to remove all the adhesive material and blood, representing and divided into three groups, each group contained 12 samples, all studied species, Garmut (African cat fish, *Clarias spp.*), Dabs (*Labeo niloticus*) and Bulti (*Oreochromis niloticus*).The Total Length, standard Length, Total Weight and Filleting yield indices were determined using different materials (sharpened, knives, balance and measuring board) and recorded in separate tables. The fillets of studied fish species were Packed in plastic bags, and sent to the Central Veterinary Research Laboratory {Soba} to determine chemical composition parameters (moisture, protein, fat, dry matter and ash). As described by (AOAC, 1984).

Drying Method: Fish species samples (36 fillet samples) were hanged up horizontally from the head on hooks and string, at about 70 cm off the ground level to dry in the open air for 12 days from 28 February – 11 March /2011, then packed into plastic bags, sent for chemical analysis (protein, fat, ash, moisture and dry matter) to the Central Veterinary Research Laboratory {Soba}. As described by (AOAC, 1984).

Chemical Composition: The chemical parameters of the studied fish samples were as follows:

Moisture Determination: The samples were weighed at first (Initial weight), then dried in electric oven at 105 C for 24 – 30 hours to obtain a constant weight. The moisture content was calculated as follow:

$$\text{Moisture\%} = \frac{\text{initial weight} - \text{dry weight} \times 100}{\text{Initial weight}}$$

Crude Protein Determination: The kjeldahl method for estimation of nitrogen was applied. Nitrogen content was converted to protein percentage by multiplying 6.25 as follow:

$$\text{Protein \%} = \frac{((Va - Vb) \times N \times 14 \times 100 \times 6.25)}{1000 \times Wt}$$

Where:

Va = volume of HCL used in titration.

Vb = volume of sodium hydroxide of known normality used in back titration.

0.014 = conversion factor of ammonium sulfate to nitrogen.

6.25 = conversion factor of nitrogen to protein.

Wt = weight of tissues sample.

Fat Determination: Fat content (ether extract) of each sample was determined according to Soxhlet method, using 2gm of fish samples. The extraction continued for 5 hours at 100 C. fat percentage was calculated as follows:

$$\text{Fat \%} = \frac{\text{extracted fat weight x 100}}{\text{Initial weight}}$$

Ash Determination: Ash was determined by heating 1g at 550 C in a muffle furnace until a constant weight was obtained. Ash content percentage was calculated by the following formula:

$$\text{Ash \%} = \frac{\text{Ash weight x 100}}{\text{Sample weight}}$$

The Nitrogen – Free Extracts (NFE) Calculated by subtraction as follows:

%NFE = 100 – (Dry matter (DM)), or % Moisture + % Protein + %Fat + % Ash.

Statistical analysis:

The data of the study present was statistical analyzed using one –way ANOVA and FUCTORIAL procedures (SPSS 17.0 for windows). The significance levels were defiantly at $P< 0.05$, as described by Gomez and Gomez (1984).

To cite this paper: Yagoub Adam H.M., Musa Ahmed AM, Adam Ibrahim A.M., Mirghani Yousif F. 2015. Comparative study of the body weight characteristics and effect of drying on chemical composition of three Nile fish species (*Oreochromis Niloticus, Labeo Niloticus* and *Clarias Spp.*). *Online J. Anim. Feed Res*., 5(6): 175-180.
Scienceline/Journal homepages: http://www.science-line.com/index/; http://www.ojafr.ir

RESULTS

The result in Table 1 Showed the filleting yield indices (head, skeleton, skin and viscera) analysis of three fresh water fish, purchased from El-mourada fish Market.There was a distinctive variation in the mean weight and standard length of investigated fish. The fillet percentage was highest in *Clarias spp.* 46.75% compared to *Oreochromis. Niloticus* which was 30.39%. The highest filleting yield of *Clarias spp.* is due to its small skin (5.5%), skeleton (8.58%) and viscera (6.99%), while the lowest filleting yield of *O. niloticus* is due to large head and skeleton which were 27.16% and 22.84% respectively. The least variable component of carcass was the skeleton which more or less uniform, except for *O. niloticus* and *Labeo niloticus* which recorded a higher percentage skeleton weighed 22.84% and 27.37% respectively.

Table 2 Showed that there were significant differences among filleting yield of three studied fish and Table 3. Showed the effect of direct sun light (open air) on chemical composition of three fish species *O. niloticus*, *Labeo niloticus* and *Clarias spp.* meat, the results show there is significant difference in fat, crude protein, nitrogen free extract and ash among the three different fish species (fresh and dried) at level ($p< 0.01$), al so there is significant different in moisture and dry matter among the three different fish species at level ($P< 0.05$).

Table 1 - Body weight characteristics of three fish species (*O.niloticus*, *L.niloticus* and *Clarias spp.*).

Parameter / Type of fish	*O.nlloticus*	*L.nlloticus*	*C.spp.*	Sig.
Total length/cm	36.5 ± 0.58[a]	49 ± 1.16[b]	49 ± 0.82 [b]	**
Standard length/cm	29.75 ± 0.50[c]	39.5 ± 1.29 [b]	45 ± 0.82 [a]	**
Total weight/gm	930 ± 21.60 [b]	1210 ± 106.15 [a]	977.5 ± 71.82 [b]	**
Head weight/gm	252.5 ± 6.46 [b]	121.25 ± 11.09 [c]	283.75 ± 11.09 [a]	**
Viscera weight/gm	65 ± 5.77 [b]	132.5 ± 34.03 [a]	101.25 ± 13.15 [a]	**
Skin weight/gm	92.5 ± 2.89 [b]	112.5 ± 6.46 [a]	53.57 ± 4.79 [c]	**
Skeleton weight/gm	212.5 ± 19.37 [b]	330 ± 13.54 [a]	83.75 ± 4.79 [c]	**
Fillet weight/gm	282.5 ± 17.09 [c]	470 ± 47.61 [a]	398.75 ± 38.38 [b]	**
Inedible Part%	56.98 ± 1.5[a]	48.28 ± 0.53[b]	45 ± 1.26[b]	**

Sig: Significant; N = 4; **: Significant $P < 0.05$); [ab]Means with different superscripts at the same raw differ significantly by Least Significant Difference (LSD) test at $P < 0.05$.

Table 2 - Comparisons of percent fillet yield of three fish specie (*O.niloticus*, *L.niloticus* and *Clarias spp.*).

Parameter / Type of fish	*O.niloticus*	*L.niloticus*	*C.spp.*	Sig.
Average head % ±SD	14.16 ± 0.67 [b]	10.06 ± 0.93 [c]	29.09 ± 1.16 [a]	**
Average viscera %±SD	10.33 ± 0.6 [a]	10.85 ± 1.97 [a]	6.99 ± 0.5 [b]	**
Average skin %±SD	9.95 ± 0.44 [b]	9.32 ± 0.42 [a]	5.52 ± 0.58 [c]	**
Average skeleton %±SD	32.84 ± 1.85 [b]	27.37 ± 1.51 [a]	8.58 ± 0.41 [c]	**
Average fillet %±SD	33.39 ± 2.05 [c]	38.82 ± 1.29 [a]	46.75 ± 1.32 [b]	**

Sig: Significant; N = 4; **: Significant ($P < 0.01$); [abc]Means with different superscripts at the same raw differ significantly by Least Significant Difference (LSD) test at $P < 0.0$.

DISCUSSION

The results of this study shed a light on body weight characteristics, filleting indices and proximate chemical composition studies (Ether extract, Crude protein, Nitrogen free extract, Ash, Moisture, Dry matter) of three commercial fresh water fishes. *Oreochromis niloticus* possessed large skeleton 32.84% which had an adverse effect on the filleting yield of fish, Also there are some attributes which are responsible for decreasing the filleting yield such as skeleton, skin and viscera. In the case of *Labeo niloticus* which recorded 27.37%, 9.32% and 10.85% respectively.

Clarias spp. had moderate skin and viscera weight which resulted in the high filleting yield (46.75%) among the studied fishes, although the head of the *Clarias spp.* was large in comparison with rest of the its components, this did not affect its filleting yield which was (46.75%) because on the other hand it has a lower skin and skeleton percentage (5.52%) and (8.58%) respectively. The filleting yield results indicated that the body weight composition revealed a significant difference in head; viscera, skin, skeleton and fillets of the three fish (*Oreochromis niloticus, Labeo niloticus,* and *Clarias spp.*). This result is in agreement with Eoy (1991) who studied carcass composition and filleting yield of ten fish species from Kanji Lake. He reported that the weight of whole fish and weights of fillets were significant different to each other ($P<0.01$).

And also the results of Obanu and Ikeme (1988) studies on processing characteristics and yield of some fishes of the River Niger. They mentioned that the fillets, head, viscera and bones were in the range 33.5- 68%, 11-31%, 3.89- 9.8% and 1.32- 15.3% respectively. The results obtained were agreement with Mac (1992) who studied the meat, yield and nutritional value of O*. niloticus* and S. *galilaeous*, and found that the processing characteristics of this species have decreasing order of fillets, head, skeleton, viscera and skin.

To cite this paper: Yagoub Adam H.M., Musa Ahmed AM, Adam Ibrahim A.M., Mirghani Yousif F. 2015. Comparative study of the body weight characteristics and effect of drying on chemical composition of three Nile fish species (*Oreochromis Niloticus, Labeo Niloticus* and *Clarias Spp.*). *Online J. Anim. Feed Res*., 5(6): 175-180.
Scienceline/Journal homepages: http://www.science-line.com/index/; http://www.ojafr.ir

Table 3 - The effect of direct sunlight (open air) on the chemical composition of the three fish species (*Oreochromis niloticus, Labeo niloticus and Clarias spp.*).

Traits	E.E		CP		NFE		Ash		Moisture		DM	
	Untreated	Treated	Untreated	Treated	Untreated	Treated	Untreated	Treated	Untreated	Treated	Untreated	Treated
O .nilotics	7.5±0.2	7.4±0.2	34.4±0.5	62.0±.0.6	29.9±1.3	16.7±0.8	4.6± 0.3	7.2± 0.1	76.3±0.8	6.7±1	23.7±0.8	93.3±1
L .nilotics	8.4±0.3	8.2±0.2	32.2±0.6	61.5±2.7	29.3±1.6	16.9±0.9	4.8±0.2	7.3± 0.2	74.9±0.9	7.1± 0.7	25±0.9	92.9± 0.7
C .lazira	7.3±0.2	7.3 ±0.2	32.3±0.4	61.5±0.7	30.9±0.9	17.8±0.9	5.8± 0.3	7.9± 0.2	76.5± 0.7	7.1± 0.5	23.7± 1	94.5± 0.5
Main effects												
Fish species												
O .nilotics	7.41[b]		48.18[a]		23.34[b]		5.90[c]		41.52[a]		58.48[b]	
L .nilotics	8.27[a]		46.84[b]		23.10[b]		6.05[b]		41.02[b]		58.96[a]	
C .lazira	7.32[b]		46.91[b]		24.38[a]		6.85[a]		40.99[b]		59.11[a]	
Standard error	0.04		0.25		0.23		0.04		0.16		0.17	
Significant	**		**		**		**		*		*	
Treatment												
Untreated	7.71		32.99		30.07		5.06		75.93		24.13	
Treated	7.62		61.63		17.14		7.47		6.43		93.57	
Standard error	0.04		0.2		0.19		0.04		0.13			
Significant	NS		**		**		**		**		**	
Treatment X Fish species												
Significant	NS		*		NS		**		**		**	

[abc] Means with different superscripts at the same raw differ significantly by Least Significant Difference (LSD); N= 4; **: Significant (P < 0.01); *: Significant (P < 0.05); NS: No significant.

To cite this paper: Yagoub Adam H.M., Musa Ahmed AM, Adam Ibrahim A.M., Mirghani Yousif F. 2015. Comparative study of the body weight characteristics and effect of drying on chemical composition of three Nile fish species (*Oreochromis Niloticus, Labeo Niloticus* and *Clarias Spp.*). *Online J. Anim. Feed Res*., 5(6): 175-180.
Scienceline/Journal homepages: http://www.science-line.com/index/; http://www.ojafr.ir

Table 2 shows the average of body weight characteristics for fish under experiment this result is in agreement with the finding of Ali et al. (1992) who studied body characteristics; yield assessment and proximate chemical composition of commercial fish species namely *Lates niloticus*, *O.niloticus*, *Sarotheradeom galilaeous*, *Labeo niloticus* and *Labeo horie*. The results of body characteristics and yield indices revealed clearly percentage decrease in the order of fillets, heads, skeletons, viscera and skin for *tilapia spp.* Compared to order of fillets, skeletons, viscera, head and skin for *Labeo spp.*

Generally the filleting yields of these fish studied were a reflection of their anatomy, species with large head, skin and skeleton, relative to musculature give lower filleting yield, than those with smaller head, skin and skeleton, on the other hand, *O.niloticus* had high inedible parts (head, skeleton and viscera) which recorded (56.98%). And the lowest inedible parts for *Clarias spp.* (48%). These inedible parts are often discarded except for few considerations head and skeleton are used as by product.

The result of chemical composition is in agreement with Clacus and Ward (1996) who reported that flesh from healthy fish contains (70-80% water).The results of this study is in agreement with Babiker and Dirar (1992) studies on the fermented, dried fish in Sudan on three fish species; Dabs (*Labeo spp.*), Bulti (*Tilapia spp.*) and Germut (*Clarias spp.*). They mentioned that the chemical composition results showed that moisture contents were 9%, 7.1% and 7.7% protein content 65%, 58.1% and 55.9%. Fat content 11.3%, 18.2% and 17%, and ash content 18.5%, 22.9% and 12.6% respectively.

CONCLUSION

Recently, the demand of tilapia (*oreochromis niolticus*), Dabs (*Labeo niloticus*) and catfish (*Clarias spp.*) consumption increased continuously because, these fishes are of low price but, high nutrition food. It was noticed that *clarias spp.* has the highest edible meat percentage 46.75% followed by *Labeo niloticus* 38.82% and *Oreochromis niloticus* (33.39%), and there were significant differences ($p < 0.05$) among the three species.

The results of protein contents examined were 62%, 61.5% and 61.5% for *Oreochromis niloticus, Labeo niloticus* and *Clarias spp.* respectively. Fat contents were 7.41%, 8.27% and 7.32% for *Oreochromis niloticus*, *Labeo niloticus* and *Clarias spp.* respectively. Moisture contents were 6.7%, 7.5% and 7.5% for *Oreochromis niloticus*, *Labeo niloticus* and *Clarias spp.* respectively. Ash contents were 5.90%, 6.05% and 6.85% for *Oreochromis niloticus, Labeo niloticus* and *Clarias spp.* respectively.

When comparing protein contents of the three fish species it was found that *Labeo niloticus* and *Clarias spp.* have equal protein contents, but *Oreochromis niloticus* has different percentage. Moreover it was found that *Labeo niloticus* and *Clarias spp.* have equal Moisture contents. Also it was found that the three fish species have different fat contents with the highest level for *Labeo niloticus* followed by *Oreochromis niloticus* and the least level for *Clarias spp.*

REFERENCES

Andrew AE (2001). Fish Processing Technology. University of Ilorin press, Nigeria.pp.7-8.

AOAC (1984). Association of Official Analytical Chemists.Official Method of Analysis of the Association of Official Analytical Chemists, Vols. I & II, Association of Analytical Chemists, Arlington. pp.12-98.

Babiker SA and Dirar HA (1992). Kejeik, Fermented Dried Fish of Sudan, Sudan Journal Agriculture, A Study in Africa Food Nutrition, CAB international.

Bligh EG, Shaw SJ and Woyewoda AD (1988). Effects of Drying and Smoking on lipids of fish. In: fish smoking and Drying, J.R. Burt, Elsevier Applied Science. London, pp. 52 – 41.

Brigih MV, Brigiet BV and Corlin H. (2004). Preservation of fish and Meat, Wageningen, Netherland, pp22 – 43.

Eoy AA (1991). Carcass composition and filleting yield of ten fish species from Kainji Lake FAO Fisheries Report No. 467 supplement FIIU/R467suppl. Accra, Chana, 22-25 Oct.199 1.

FAO (2004). The composition of fish. Available from http:// www.fao.org /wairdoes/ tx 5916e /× 5916co1.htm.pp1-80.

Food and Agric Org (1985). World catch and trade of fisheries and products in 1984. Info fish Marketing Digest. No. 25. Hardy R, Smith, JGM (1976). The storage of Mackerel (*Scomber).*

Food and Agriculture Organization FAO, (1999). World production of fish, Crustaceans and Molluscs by Major fishing Areas. Fisheries Information and Statistics unit (FIDI), Fisheries Department, FAO, Rome.

Gomez KA and Gomez AA (1984). Statistical procedures for agricultural research 2ed, Wiley sons, Inc.

Clacus IJ and Ward AR (1996). Post harvest fisheries development: A guide to handling, preservation, processing, and Quality Chatham Maritime. United Kingom.

Mac JG (1992). Meat, yield and Nutritional Value Determination of Tilapia species (Tilapia nilotica + S. Galilaecous) from Lake Nubia B.Sc. (honor) Dissertation. Department of fisheries, College of Natural Resources and Environmental studies, University of Juba, Sudan.

Meske C (1985). Fish Aquaculture Technology and Federal Research Center for Fisheries, Institute for Costal and Inland Fisheries, Hamburg, Federal Republic of Germany. Edited and translated by Fredrick Vogt. Formally of the polytechnic of Central London, U. K.

Obanu ZA and Ikeme AI (1988). Processing characteristics and yield of some fish's species of the river Niger in Nigeria FAO consultation of fish technology in Africa FIIU/R400 Supp. Pp. (218-221).

To cite this paper: Yagoub Adam H.M., Musa Ahmed AM, Adam Ibrahim A.M., Mirghani Yousif F. 2015. Comparative study of the body weight characteristics and effect of drying on chemical composition of three Nile fish species (*Oreochromis Niloticus, Labeo Niloticus* and *Clarias Spp.*). *Online J. Anim. Feed Res*., 5(6): 175-180.
Scienceline/Journal homepages: http://www.science-line.com/index/; http://www.ojafr.ir

Olatunde AA (1998). Approach to the study of fisheries biology in Nigerian inland water. Proceedings of the International Conference of two decades of research in Lake Kainji, pp. 338-54.
Sigurjon A (2003). The Drying Fish and Utilization of Geothermal Energy. The Iceland Experience, CHG Bulletin. Pp27.
Silva JJ and Chamul RS (2000).Composition of marine and fresh water finfish and shellfish Species and their products. In: RE Martin, EP Carter, EJ Flick and LM Davis (Eds.), Marine and fresh water products handbook, Lancaster, Pennsylvania, U.S.A: Technomic Publishing Company, pp 31-46.
Thurman HV and Webber HH (1984). Marine biology Charles, E. Merrill Publishing C. A. Bell and Howell co. Columbus, Ohio U. S. A.

To cite this paper: Yagoub Adam H.M., Musa Ahmed AM, Adam Ibrahim A.M., Mirghani Yousif F. 2015. Comparative study of the body weight characteristics and effect of drying on chemical composition of three Nile fish species (*Oreochromis Niloticus, Labeo Niloticus* and *Clarias Spp.*). *Online J. Anim. Feed Res*., 5(6): 175-180.
Scienceline/Journal homepages: http://www.science-line.com/index/; http://www.ojafr.ir

Online Journal of Animal and Feed Research

Volume 5, Issue 6: 181-188 ; Nov 25, 2015 ISSN 2228-7701

EFFECT OF DIETARY HYACINTH BEANS (*Lablab purpureus*) AND ENZYME ADDITIVES ON PERFORMANCE OF BROILERS

Husham Ismail RAGAB [1*], Khadiga Abbas ABDEL-ATTI[2], Mutaz Saeed BABIKER[3], and Salah Mohammed ELAWAD[4]

[1]*Department of Poultry Production, Faculty of Animal Production, University of Khartoum, Sudan*
[2]*Department of Animal Nutrition, Faculty of Animal Production, University of Khartoum, Sudan*
[3]*Department of Poultry Production, Faculty of Animal Production, University of Gezira, Sudan*
[4]*Department of Agricultural Economics, Faculty of Agriculture, University of Khartoum, Postal code 13314, Khartoum North, Sudan*
*Email: hushamsd7@gmail.com

ABSTRACT: The study was conducted to assess the effect of Hyacinth beans on the performance of broilers, for a period of 47 day feeding trial. In addition to basal control (A), another treatment diets were formulated to have Hyacinth beans at 15% (B, C) without or with enzyme additives and 20% (D, E) without or with enzyme additives. A total of 150 unsexed Ross 308 chicks were randomly distributed to 5 dietary treatments, with 5 replicates (6 birds per rep) Feed and water were offered *ad- libitum.* Results illustrated that, feed intake ($P \leq 0.01$), weight gain ($P \leq 0.01$), FCR ($P \leq 0.05$), PER ($P \leq 0.01$) and dressing percentages ($P \leq 0.01$) were negatively affected by Hyacinth beans inclusion levels (15%, 20%). Neither the processing method practiced for Hyacinth beans nor the enzyme additives were able to improve the performance of broilers better than or comparable to that of basal control broiler diet. The results as well revealed that, treatment diets of 15% Hyacinth beans displayed better performance than 20% level for all of the parameters measured including the dressing percentages and internal organs relative weight.

Keywords: Hyacinth Beans, Processing, Broilers Performance

ORIGINAL ARTICLE
pii: S222877011500030-5
Received 04 Oct. 2015
Accepted 05 Nov. 2015

INTRODUCTION

The cost of feed concentrates for livestock is increasing The Organization for Economic Co-operation and Development (OECD and FAO, 2010), and the unavailability and scarcity of animal origin protein in adequate quantities, makes the use of protein rich legumes to be essential alternatives in poultry nutrition (Akanji, 2002). Legumes beans could be an important source of proteins for countries having short supplies of animal proteins. However, due to high competition and demands for these sources of protein rich legumes, specially, groundnut cake (GNC) and soybean meal (SBM), unfortunately, conventional sources have become in short supply and oftentimes unavailable. That is, therefore, call for adoption of some new unconventional feed ingredients which have comparable nutrients potential as the conventional ones. Hyacinth beans which is a leguminous plant is not eaten very frequently by human, thus, has the potential to become an important protein source for animals. But legume beans, including Hyacinth beans, may contain many anti-nutritional factors, such as haemagglutinin, trypsin inhibitors, saponins, phytic acids, tannins, alkaloids and polyphenolic compounds that could impart negative effects on digestion and performance (Huisman, 1995; Beric et al., 1997). Different processing facilities as soaking, boiling, roasting, germination and fermentation are commonly practiced to alleviate the negative effects of these anti-nutritional factors (Kperegbeyi and Onwumere, 2007; Ani and Adiegwu, 2005). Further reports showed that, the availability of sulphur amino acids (SAA) was - 18.6% in raw beans and about 40-68% in thermally processed beans (Wu et al., 1996).

Mostly, grain legumes were shown to contain relative concentrations of non-starch polysaccharides (NSP) which are resistant to endogenous enzyme digestion in the alimentary tract (Choct et al., 1996; Choct, 1997). Therefore, enzyme mixture supplements which can digest (NSP) are likely to increase the metabolizable energy and protein values of grain legumes (Hew et al., 1995). The use of supplementary enzymes in lupin diets for poultry has met with varying degrees of success in improving animal performance and nutrient utilization (Brenes et al., 1993a, 2002).

The objective of this work is to investigate the influence of intensively processed two levels of Hyacinth beans and dietary enzyme enhancement on the performance of broilers.

To cite this paper Ragab HI, Abdel-Atti KhA, Babiker MS, Elawad SM. 2015. Effect of dietary Hyacinth beans (*Lablab purpureus*) and enzyme additives on performance of broilers. *Online J. Anim. Feed Res*., 5(6): 181-188.
Scienceline/Journal homepages: http://www.science-line.com/index/; http://www.ojafr.ir

MATERIALS AND METHODS

Site and Housing

The experiment was carried out in the Faculty of Veterinary Medicine University of Khartoum. In an open sided housing system, a twenty-five pens of about 100 cm width and length and 90 cm height, were constructed for the experiment of iron posts and wire netting. Five inch thick layer of dry wood shavings was laid as bedding material.

Experimental birds and Duration

One hundred and fifty unsexed day old chicks (Ross 308) were randomly selected out of 500. Chicks were purchased from Coral Company after having been vaccinated against Marek's disease. Twenty five groups of six chicks each, of approximately comparable weights were randomly distributed to five dietary treatments, hence, each treatment included five replicate, (30 birds per treatment). During the first four days adaptation, chicks were fed *ad libitum* on basal diet. Then the five experimental diets were randomly assigned to the experimental units, where chicks were fed on treatment diets for six weeks (5^{th} - 47^{th} day-old). Chicks were vaccinated against Gumboro at 14, 20, and 26 days old and against Newcastle disease at 7^{th} and 20^{th} day old.

Hyacinth beans processing

Hyacinth beans were firstly cleaned, mixed, submerged in water in 200 liter capacity plastic container for 48 hour with seeds to water ratio of 1/10 (w/v), and then boiled for 30 min. Water change was every 24 h and before boiling process. Thereafter, grains were sun dried for 72 h and milled to particle size of I mm. Hyacinth beans were then analyzed for proximate composition according to the standardized method VDLUFA 4th Ed. (Naumann et al., 2004). It was reported by Osman (2007), that soaking and cooking of presoaked Hyacinth beans has a good potential for improving the nutritional value by the reduction it caused in anti-nutritional factors.

Experimental diets

Five isocaloric and isonitrogenous experimental diets were made ready to meet the requirements of broilers as stated by (NRC, 1994). In addition to basal control diet (A) without Hyacinth beans, four experimental diets were composed to contain (150g/kg) and (200g/kg) of the processed Hyacinth beans, either with or without enzymes additives as follow:

1. Diet (A) Control, neither containing Hyacinth beans nor enzyme.
2. Diet (B) contains 150 g/kg of Hyacinth beans without enzyme.
3. Diet (C) contains 150 g/kg of Hyacinth beans with enzyme.
4. Diet (D) contains 200 g/kg of Hyacinth beans without enzyme.
5. Diet (E): contains 200 g/kg of Hyacinth beans with enzyme.

Dietary ingredients including Hyacinth beans of the Rongai type (brown in color) were purchased from the local market and veterinary centers. The enzyme (BERGAZYM^0 P) which was used as additive, is a multi-enzyme with a high content of pentosanase, contains Endo-1, 4-ß-Xylanase, with 6.000 in EPU/g(= Endo Pentosanase Units), also it has side activities as Cellulase, Alpha-Amylase, Protease and Hemicellulase.

Proximate composition of raw and presoaked boiled Hyacinth beans is illustrated in Table 1, percent composition of dietary ingredients, calculated and determined analysis of the experimental diets according to AOAC (1990) are presented in Table 2. On weekly basis, average feed intake and live body weight for all treatment groups were measured using a digital electronic balance. Then data records were taken for feed intake, weight gain, feed conversion ratio (F.C.R), protein efficiency ratio (P.E.R) and mortality rate. The technical efficiency of Hyacinth beans treatment diets (15 & 20) [(B&C)&(D&E)] % without or with enzyme additives was calculated as percentages of feed consumption and carcasses weight of the control dietary group (A). Samples of birds per treatments (15 birds/ treatment) by ending the experiment were individually weighed and killed by cervical dislocation, and weights of carcasses and some of the internal organs were recorded for computing dressing and relative weights of internal organs.

Table 1 - Proximate Composition of Raw and Processed Hyacinth beans (% DM).

Composition	Raw Hyacinth beans	Soaked and Boiled Hyacinth beans
Dry matter[1,2]	93.30	88.90
Crude protein (CP)[1]	23.40	25.70
Ash[1]	3.73	2.20
Ether extract (EE)[3]	0.92	2.12
Crude fiber (CF)[3]	10.20	11.50
NFE [4]	61.80	58.50

[1]Values are averages of three determinations, [2]DM on fresh basis, [3]Values are averages of two determinations, [4]Values are calculated by difference as following: NFE = 100 – (Moisture+ Ash + CP + EE +CF)

To cite this paper Ragab HI, Abdel-Atti KhA, Babiker MS, Elawad SM. 2015. Effect of dietary Hyacinth beans (*Lablab purpureus*) and enzyme additives on performance of broilers. *Online J. Anim. Feed Res*., 5(6): 181-188.
Scienceline/Journal homepages: http://www.science-line.com/index/; http://www.ojafr.ir

Table 2 - Composition of experimental diets containing processed Hyacinth beans

Ingredient \ Treatments	Hyacinth beans, %				
	0 (A)	15 (B)	15 (C)	20 (D)	20 (E)
	Enzyme (mg/kg)				
	0	0	25	0	25
Sorghum	54.25	52.80	52.80	45.20	45.20
Groundnut cake	23.00	17.21	17.21	17.64	17.64
Sesame cake	5.58	8.00	8.00	7.59	7.59
Hyacinth beans	0	15	15	20	20
Wheat Bran	7.70	0.00	0.00	0.00	0.00
Super concentrate [1]	5	5	5	5	5
Di- calcium	0.70	0.75	0.75	1.48	1.48
Oyster shell	0.26	0.00	0.00	0.22	0.22
Salt	0.20	0.20	0.20	0.20	0.20
Lysine	0.12	0.03	0.03	0.29	0.29
Methionine	0.09	0.01	0.01	0.18	0.18
Vegetable Oil	2.90	0.80	0.80	2.00	2.00
Vit. + Min[2]	0.20	0.20	0.20	0.20	0.20
Calculated analysis					
ME (Kcal/Kg)	3155.23	3153.94	3153.94	3155.50	3155.50
CP%	22.82	22.81	22.81	22.82	22.82
Crude fibre%	5.14	5.27	5.27	5.60	5.60
Ca%	1.05	0.96	0.96	1.19	1.19
Av. Phosphorus%	0.45	0.44	0.44	0.57	0.57
Lysine%	1.23	1.04	1.04	1.28	1.28
Methionine%	0.51	0.41	0.41	0.57	0.57
Meth. + Cystine	0.77	0.63	0.63	0.78	0.78
Determined analysis					
CP%	23.20	23.10	22.60	22.85	23.50
Crude fibre%	5.10	5.20	5.20	5.25	5.25
EE%	4.50	4.00	4.50	3.00	4.50
Ash%	6.25	7.50	7.35	7.00	6.25
NFE%	56.45	56.20	57.20	58.40	57.00

[1]Supplied the following per kg = 40% CP, 2100 kcal ME, 2% C.F, 10% Ca,4% P, 12% lysine and 3 % methionine. [2]Supplied the following per kg of the diet: Vitamin A15000 IU, Vitamin D_3 3000 IU, Vitamin B_1 2 mg, Vitamin B_2 5.5 mg, Vitamin B_{12} 0.01 mg, D- Calcium pantothenate 10 mg, Vitamin E 5 mg, Vitamin K 3 mg, Niacine 25 mg, Ethoxyquin 10 mg, Manganese oxide 32.26 mg, Cobalt sulphate 0.57 mg, Zinc oxide 2.5 mg and Ferro carbonate 40.64 mg.

Experimental Design and Statistical Analysis

The experiment was conducted following completely randomized design. Data were subjected to analysis of variance according to (Steel and Torrie, 1980). Treatment means were separated using Duncan multiple range test (1989).

RESULTS AND DISCUSSION

The Chemical analysis of raw and processed Hyacinth beans revealed a slight increase in crude protein, fiber and fat content due processing, similar to previous finding by Ragab *et al*. (2010, 2012). The two stage processing method used was based on positive findings previously mentioned by Osman (2007) ,who referred to reduction in Trypsin inhibitor activity of Hyacinth beans by 6.3% due soaking and by 66.7% due cooking. And a decline in phytic acid by soaking for 22.19%, and by cooking for 44.85%.

As illustrated in Tables 3 and 4, birds on control groups consumed the highest ($P \leq 0.01$) feed, whereas those on both of 20% Hyacinth beans diets D&E consumed ($P \leq 0.01$) the lowest feed. The group on enzymic 15% Hyacinth beans (C) consumed more feed ($P \leq 0.01$) than those on non-enzymic 15% Hyacinth beans diet (B). As outlined in Table 5, the overall feed consumption of diets B, C, D and E was lowered by about 19.17%, 13.24%, 33.87% and 36.79% as compared to consumption of control group.

This clear reduction in feed consumption due increasingly Hyacinth beans is in harmony with the finding of Abeke (2008) in Pullets and layers when were fed on Hyacinth beans. Dousa et al. (2011) reported similar feed reduction due feeding on increased levels of legume concentrates. Similar feed reduction due feeding on legumes

To cite this paper: Ragab HI, Abdel-Atti KhA, Babiker MS, Elawad SM. 2015. Effect of dietary Hyacinth beans (*Lablab purpureus*) and enzyme additives on performance of broilers. *Online J. Anim. Feed Res*., 5(6): 181-188.
Scienceline/Journal homepages: http://www.science-line.com/index/; http://www.ojafr.ir

beans was previously reported; an example is the high dietary levels of cooked *Mucuna utilis* seed meal as replacement for soya bean meals (Akinmutimi and Okwu, 2006). This reduction was elucidated by the authors to unpalatable residual effect of anti-nutritional factors, which were increasingly accumulated as the dietary level of test feedstuff increased. Furthermore, a reduction in feed consumption was earlier noticed when graded levels (0, 5, 10, 15 and 20) of dietary decorticated *Cajanus. cajan* seeds were fed to broilers (Saeed and khadiga, 2007). Sundu et al. (2008), showed that, a substitution of 10-50% of copra meal (CM) depressed feed intake by about 13% in 30% (CM) diet and by 26% in 50% (CM). Emenalon (2004) remarked a reduction in feed consumption, when graded levels of *Mucuna pruriens* and copra seed meals were fed to broilers as starter. He attributed feed reduction to poisonous residual effect of *Mucuna pruriens*, the bulkiness, and non-starch polysaccharides (NSP) of copra meal. These components are considered to have negative effects on feed intake and digestibility (Naveed *et al.*, 1999).

Table 3 - Overall performance of broilers as affected by the dietary levels of processed Hyacinth beans.

Parameters \ Hyacinth beans %	0	15	15	20	20	SEM
			Enzyme (mg/kg)			
	0(A)	0(B)	25(C)	0(D)	25(E)	
Feed intake (g/bird)	3681.39 [a]	2975.29 [c]	3194.13 [b]	2434.55 [d]	2327.13 [d]	60.35
Live body weight (g/bird)	2108.41 [a]	1567.23 [b]	1611.87 [b]	1162.72 [c]	1037.20 [d]	42.54
Body weight gain (g/bird)	2032.42 [a]	1491.76 [b]	1534.88 [b]	1087.19 [c]	960.80 [d]	42.32
FCR (g feed/g weight gain)	1.81 [c]	2.00 [bc]	2.08 [bc]	2.25 [ab]	2.46 [a]	0.09
PER (g B.Wt gain/g protein consumed)	2.38 [a]	2.17 [b]	2.13 [bc]	1.96 [c]	1.76 [d]	0.06
Mortality (%)	6.80	0.00	3.40	0.00	3.40	2.84

[a, b] Means in the same raw with different superscripts were significantly different; Values are means of 5 replicates, 6 birds each, (n = 30); SEM =standard error of treatment means.

Table 4 - Performance parameters of broilers as affected by dietary levels of processed Hyacinth beans

Item	Live body weight (g)	Feed intake (g)	Body weight gain (g)	FCR (g feed/g weight gain)	PER (g weight gain/g protein consumed)
Hyacinth beans					
15%	1589.55 [a]	3084.71 [a]	1513.32 [a]	2.04 [b]	2.15 [a]
20%	1099.96 [b]	2380.84 [b]	1023.99 [b]	2.36 [a]	1.86 [b]
Enzyme					
No enzyme	1364.97	2704.92	1364.97	2.12	2.06
Enzyme	1324.53	2760.63	1247.84	2.27	1.94
Pooled ± SEM	23.33	23.33	23.16	0.05	0.03
Source of variation			**Probability**		
Hyacinth beans %	0.0001	0.0001	0.0001	0.0001	0.0001
Enzyme	0.399	0.406	0.382	0.176	0.102
H.beans% × enzyme	0.087	0.024	0.086	0.553	0.286

[a, b] Means in the same column with different superscripts were significantly different; Values are means of 5 replicates, 6 birds each, (n = 30); SEM =standard error of treatment means.

The significant increase in overall feed intake of enzymic (15%) Hyacinth bean was noticeable; it was contrary to that of enzymic 20% Hyacinth beans. Enzymes were known to improve the feeding value of feedstuffs, and their action might be affected by many factors, including environment, the amount of enzyme in the reaction and the interactions between enzymes and other substances (Choct, 1996; Kumar et al., 1997).

Control group A achieved the distinguished weight gain ($P \leq 0.01$), whereas, the lowest ($P \leq 0.01$) one was for both of 20% Hyacinth beans groups D&E. Birds on 15% Hyacinth beans diets B&C showed non-significant ($P \geq 0.05$) difference to each other for overall weight gain and final body weight.

The inferiority viewed for weight gain as the dietary level of Hyacinth beans raised, could be attributed to several reasons as; the reduction in feed intake due to residual toxic components affecting palatability (Aletor, 1997). Tannins are known to bind dietary proteins and digestive enzymes into complexes, which are then not

To cite this paper: Ragab HI, Abdel-Atti KhA, Babiker MS, Elawad SM. 2015. Effect of dietary Hyacinth beans (*Lablab purpureus*) and enzyme additives on performance of broilers. *Online J. Anim. Feed Res*., 5(6): 181-188.
Scienceline/Journal homepages: http://www.science-line.com/index/; http://www.ojafr.ir

readily digestible (Melansho et al., 1987). Phytin as well is thought to chelate certain macro and micro minerals; it can form complexes with divalent cations, thereby reducing bioavailability of Ca, Cu, Fe, Mg and Zn (Smith and Annison, 1996). This in turn might distress different metabolism processes due to minerals lack, resulting in a consequential growth depression (Aletor and Fasuyi, 1997).

Cyanide detoxification route, particularly in monogastrics is through Cyanide Thiocyanate sulphur-transferase (Rhodenase pathway) which requires organic sulphur donors in the form of Methionine and Cysteine. This precipitate methionine deficiency in an otherwise balanced diet (Aletor and Fasuyi, 1997); it might be this deficiency which resulted in poor growth rate. One or combined reasons from the above-mentioned ones might have negatively led to the depressing performance of broilers fed on the processed Hyacinth beans diets.

Birds on control diet A demonstrated the best FCR, whereas, birds on 20% Hyacinth beans diet (D&E) exhibited the poorest FCR. The inability of Hyacinth beans treatments to express similar FCR as shown for control group could be attributed to low feed consumption or low digestibility of these diets. It was stated by McDonald et al. (1994), that better utilization of feeds (FCR) depends on its digestibility, which rely mainly on its chemical composition.

Enzyme additives at 20 % Hyacinth beans failed to modify FCR. The effect might be explained on basis of low feed utilization at 20 % level, due to decreased digestibility caused mainly by increased cumulative residual effect of anti-nutritional factors (ANFs), as reported earlier with soybeans by Scott et al. (1976). Concerning overall protein efficiency ratio PER, birds on control diet A, achieved the best PER ($P \leq 0.01$) compared with Hyacinth beans treatment groups B, C, D and E. The lowest PER was recorded for the group on enzymic 20% Hyacinth beans diet E. Low values of PER with increased Hyacinth beans levels could be interpreted, as reported earlier by (Emenalon et al., 2007; Ani and Omeje, 2007). Those authors showed that, toxic components, mainly anti-trypsin and chymotrypsins inhibit protein and energy utilization of birds. They are protease inhibitors, in the efficient utilization of legumes proteins.

There was no significant ($P \geq 0.05$) difference in mortality rate between treatment groups. Similarly as the results with Hyacinth beans obtained by Abeke et al. (2008), which refer to lack of serious health hazards due feeding on treatments, an indication of somewhat appropriate processing of 30 minutes boiling at 100°C to the 48 hour soaked Hyacinth beans.

Table 5 - Technical efficiency of feeding broilers on dietary levels of processed Hyacinth beans

Treatment	Overall feed consumption (g)	Feed consumption technical efficiency (%)	Carcasses weight (g)	Carcasses weight technical efficiency (%)
A(standard)	3681.39 [a]	100 %	1614.86 [a]	100%
B	2975.29 [c]	80.83%	1235.39 [b]	76.50
C	3194.13 [b]	86.76%	1240.42 [b]	76.81
D	2434.55 [d]	66.13%	958.70 [c]	59.37
E	2327.13 [d]	63.21%	857.19 [c]	53.08
SEM	±60.35	–	±40.69	–

[a, b] Means in the same column with different superscripts were significantly different; Values are means of 5 replicates, 6 bids each, (n = 30); SEM =standard error of treatment means.

Table 6 - Effect of dietary levels of processed Hyacinth beans on dressing percentages and internal organs relative weights of broilers.

Hyacinth beans % / Parameters	0	15	15	20	20	
	Enzyme (mg/kg)					
	0	0	25	0	25	
	(A)	(B)	(C)	(D)	(E)	
Dressing %	75.88 [a]	69.47 [b]	70.52 [b]	66.56 [c]	65.78 [c]	0.90
Viscera %	10.19 [c]	13.50 [b]	13.09 [b]	16.32 [a]	16.56 [a]	0.53
Heart %	0.41[c]	0.46[bc]	0.42[c]	0.49 [ab]	0.52[a]	0.02
Liver %	1.97 [b]	2.28 [ab]	2.15 [ab]	2.48 [a]	2.44 [ab]	0.15
Gizzard+ Proventriculus %	3.67 [b]	3.96 [b]	3.92 [b]	4.78 [a]	5.02 [a]	0.22
Pancreas %	0.19 [c]	0.29 [b]	0.29 [b]	0.34 [a]	0.35 [a]	0.02

[a, b] Means in the same raw with different superscripts were significantly different; Values are means of 15 bird samples (n = 15); SEM =standard error of treatment means.

To cite this paper: Ragab HI, Abdel-Atti KhA, Babiker MS, Elawad SM. 2015. Effect of dietary Hyacinth beans (*Lablab purpureus*) and enzyme additives on performance of broilers. *Online J. Anim. Feed Res*., 5(6): 181-188.
Scienceline/Journal homepages: http://www.science-line.com/index/; http://www.ojafr.ir

Table 7 - Effect of dietary levels of processed Hyacinth beans on dressing percentages and internal organs relative weights of broilers.

Item	Dressing (%)	Viscera (%)	Heart (%)	Liver (%)	Gizzard+ Proventriculus (%)	Pancreas (%)
Hyacinth beans						
15%	70.00 [a]	13.30 [b]	0.44 [b]	2.21 [b]	3.94 [b]	0.29 [b]
20%	66.17 [b]	16.44 [a]	0.50 [a]	2.46 [a]	4.90 [a]	0.35 [a]
Enzyme						
No enzyme	68.02	14.91	0.47	2.38	4.37	0.31
Enzyme	68.15	14.83	0.47	2.30	4.47	0.32
Pooled SEM	0.45	0.29	0.01	0.09	0.12	0.01
Source of variation			**Probability**			
Hyacinth beans level	0.0001	0.0001	0.0001	0.157	0.0001	0.0001
Enzyme	0.883	0.887	0.903	0.605	0.665	0.749
H. Beans× enzyme	0.309	0.576	0.083	0.803	0.559	0.714

[a, b] Means in the same column with different superscripts were significantly different; Values are means of 15 birds samples (n = 15); SEM =standard error of treatment means.

Carcasses and non-carcasses components evaluation

Data for dressing percentage and internal visceral organs relatives' weights is illustrated in Tables 6 and 7. Treatment groups on control diet demonstrated the superiority ($P \leq 0.01$) for dressing percentages. Birds on 20% Hyacinth beans diets D&E showed lower ($P \leq 0.01$) dressing compared to those on 15% diets B&C. As outlined in Table 5; carcasses of B, C, D and E groups when compared to control were lessened by 23.5%, 23.19%, 40.63% and 46.92% respectively.

The low dressing percentages of the Hyacinth beans groups is in parallel to their carcasses and live body weights. The high dressing for control group implies that. Hence, dietary Hyacinth beans were negatively affected the dressing percentage. Regarding viscera relative weights, birds on Hyacinth beans, chiefly 20% level, showed higher viscera relative weights compared to control groups. The same pattern of notable increase was applied as well to pancreas. Lower heart relative weight was noticed with control and both of 15% Hyacinth beans (B&C) groups, oppositely, birds on 20% Hyacinth beans exhibited the highest one. The same remark was witnessed before by Abeke (2008) when another cultivar of Hyacinth beans was fed to broilers.

Birds on all Hyacinth beans treatments showed non-significant ($P \geq 0.05$) difference for lower liver relative weights. Birds on both of 20% Hyacinth beans displayed ($P \leq 0.05$) high relative weight for gizzard plus proventriculus. The high relative weights noticed with Hyacinth beans treatment groups for the internal organs as (pancreas, liver and gizzard plus proventriculus) confirm the interpretation of Omeje (1999) for an occurrence of somewhat hypertrophy and increased weights of internal organs. This was due to their increased activity in the production of proteolytic enzymes, to make-up for reduced availability of proteins and energy from Hyacinth beans, because of the presence of anti-nutritional factors. On the other hand, liver action in detoxifying the inherent toxins may lead to their enlargement. As shown in Table 7, Hyacinth beans level is the major factor ($P \leq 0.01$) which negatively affected internal organs relative weights. Yet no noteworthy effects were traced for enzyme additives or its interaction with Hyacinth beans level.

CONCLUSION

The results obtained confirm the priority of the unconventional groundnut cakes as plant protein source when compared with the studied Hyacinth beans in this work. A search for alternative processing methods or for cultivars of Hyacinth beans fewer in anti-nutrients and better in nutrients profile may contribute to reduce the dependence on the conventional groundnut cake.

REFERNCES

AOAC (1990). Association of Official Analytical Chemists. Official methods of analysis, 15th Edn.,Washington, DC.

Abeke FO, Ogundipe SO, Sekoni AA, Dafwang II, Adeyinka IA, Oni OO and Abeke A (2008). Effect of Dietary Levels of Cooked *Lablab purpureus* Beans on the Performance of Broiler Chickens. American Journal of Food Technology, 3 (1): 42- 49.

Akanji AM (2002). Enhancing the utilisation of some tropical legume seeds in diets of exotic meat type and egg type chickens, Ph.D. Thesis University of Ibadan, Nigeria.

Akinmutimi AH and Okwu ND (2006). Effect of Quantitative Substitution of Cooked *Mucuna utilis* Seed Meal for Soybean Meal in Broiler Finisher Diet. International Journal of Poultry Science, 5: 477- 481.

Aletor VA and Fasuyi AO (1997). Nutrient composition and processing effects on cassava leaf (*Manihot esculenta*, cranzt) anti-nutrients. Proceedings of 2nd annual conference of Animal Science Association of Nigeria. September, 16-17.

Ani AO and Adiegwu LI (2005). The Feeding Value of Velvet beans (*Mucuna pruriens*) to weaker rabbits. Proceeding of 30th Annual Conf. of Nig Soc. of Anim. Prod. (NSAP) 20th-24th March at University of Nigeria Nnsukka, Nigeria, pp: 186-189.

Ani AO and Omeje OD (2007). Effect of supplementation with enzyme on growth performance of broiler chicks fed diets containing raw bambara nut (*Voandzeia subterranean* L.) waste. Proceeding of the 32nd Annual conference of the Nigerian Society of Animal Production (NSAP) Held at the University of Calabar, Nigeria from 18th-21st March, pp: 278-281.

Beric Z, Cerny T, Posavac J and Janjecic Z (1997). Grain legumes in feeding monogastric livestock. Krmiva, 39: 181-190.

Brenes A, Marquardt RR, Guenter W and Rotter BA (1993a). Effect of enzyme supplementation on the nutritional value of raw, autoclaved, and dehulled lupins (*Lupinus albus*) in chicken diets. Poultry Science, 72: 228 -229.

Brenes A, Marquardt RR, Guenter W and Viveros A (2002). Effect of enzyme addition on the performance and gastrointestinal size of chicks fed whole dehulled lupins and lupin hulls diets. Poult. Sci, 81:670–678.

Choct M (1997). Non-starch polysaccharides: chemical structures and nutritional significance. Feed Milling International, 191: 13– 19.

Choct M, Hughes RJ, Wang J, Bedford MR, Morgan AJ and Annison G (1996). Increased small intestinal fermentation is partly responsible for the anti-nutritive activity of non-starch polysaccharides in chickens. British Poultry Science, 37: 609-621.

Dousa BM, Khadiga AA and Elawad SM (2011). Inclusion of Some Raw Legume Grains as Broiler Chicks Concentrates. International Journal of Poultry Science, 10 (5): 393-396.

Duncan DB (1955). Multiple ranges and multiple F-tests. Biometrics 11: 1-42.

Emenalon OO, Chima MC, Etuk EB and Esonu BO (2007). Comparative evaluation of processed velvet bean (*Mucuna pruriens*), Soyabean and groundnut meals on the performance and internal organ characteristics of broilers. Proc. 32nd Ann. Conf. Nig. Soc. Anim. Prod. (NSAP) Held at the University of Calabar, Nigeria from 18th-21st March, Pp: 220-222.

Emenalom OO (2004). Comparative performance of broiler chicks fed diet containing differently processed *Mucuna puriens* seed meals. Nig. J. Anim. Prod, 31: 12-16.

Hew LI, Ravindran V, Mollah Y, Gill RJ and Bryden WL (1995). Enzyme supplementation improves ileal amino acid digestibility values of wheat for broilers. Proceedings of the Australian Poultry Science Symposium, 7: 189.

Huisman J (1995). Aspects of antinutritional factors (ANFs) in relation to nutrition and pollution. Poult. Adv, 28: 57- 66.

Kperegbeyi JI and Onwumere OS (2007). Effects of raw and toasted bambara groundnut (*Vicia subterranean (L.) verdcourt*) on performance of growing cockerels. Proc. 32nd Ann. Conf. Nig. Soc. Anim. Prod. (NSAP) Held at the University of Calabar, Nigeria from 18th- 21st March, pp: 188-191.

Kumar A, Dingle JG, Wiryawan K and Creswell DC (1997). Enzymes for improved nutritional value of layer diets. In: Queensland Poult. Sci. Symp, 6: 1-12. Gatton, the University of Queensland.

MacDonald P, Edwards RA and Greenhalgh JFD (1994). Animal Nutrition. 5th Edn. Longman. Singapore.

Melansho H, Butler LG and Carlson DM (1987). Dietary tannins and salivary proline- rich proteins: interacting induction and defense- Mechanisms. Ann. Rev. Nutr, 7: 423-440.

(NRC) National Research Council (1994). Nutrient requirements of poultry, 9th rev. ed. National Academy Press, Washington, DC.

Naumann C, Bassler R, Seibold R and Barth C (2004). Methodenbuch Band iii, Die chemische Untersuchung von Futtermitteln. 4th ed. Darmstadt: VDLUFA-Verlag.

Naveed A, Camovic TA and Bedford MR (1999). The influence of carbohydrase and protease supplementation on amino acid digestibility of lupin- based diets for broiler chicks. Proc. Austr. Poult. Sci. Symp, 11: 93–96.

Omeje SI (1999). Issues in Animal Science. Raykennedy Scientific Pub. Enugu, Nigeria.

To cite this paper: Ragab HI, Abdel-Atti KhA, Babiker MS, Elawad SM. 2015. Effect of dietary Hyacinth beans (*Lablab purpureus*) and enzyme additives on performance of broilers. *Online J. Anim. Feed Res*., 5(6): 181-188.
Scienceline/Journal homepages: http://www.science-line.com/index/; http://www.ojafr.ir

Osman MA (2007). Effect of Different Processing Methodson Nutrient Composition, Antinutrional Factors, and in vitro Protein Digestibility of Dolichos Lablab Bean [*Lablab purpuresus* (L) Sweet]. Pakistan Journal of Nutrition, 6 (4): 299- 303.

The Organisation for Economic Co-operation and Development (OECD) and Food and Agriculture Organization of the United Nations (FAO) (2010). Meat. OECD- FAO Agricultural Outlook 2010. OECD Publishing. Pp. 147–158.

Ragab HI, Kijora C, Abdel Atti KA and Danier J (2010). Effect of Traditional Processing on the Nutritional Value of Some Legumes Seeds Produced in Sudan for Poultry Feeding. International Journal of Poultry Science, 9 (2): 198-204.

Ragab H,I Kijora C, Abdel Atti KA and Ibrahim S (2012). Effect of Different Levels of the Processed *Lablab purpureus* Seeds on Laying Performance, Egg Quality and Serum Parameters. International Journal of Poultry Science, 11 (2): 131-137.

Saeed MS and Abdel Ati KA (2007). Inclusion of Pigeon Pea (*Cajanus cajan*) Seed on Broiler Chick's Diet. Research Journal of Animal and Veterinary Sciences, 2: 1-4.

Scott ML, Sandholm M and Hocksterler HW (1976). Effects of Anti Trypsin and hemagglutinin in soyabean and other feedstuffs upon feed digestion in chickens. Proc. Cornell. Nutr. Conf. Page 22-25.

Smiths CHM and Annison G (1996). Non-starch plant polysaccharides in broiler nutrition - towards a physiologically valid approach to their determination. World's Poultry Science Journal, 52: 203 - 221.

Steel RGD, JH. Torri (1980). Principles and procedures of statistics: A Biometrical Approach.2nd ed. McGraw Hill, Kogakusha Ltd., Tokyo.

Sundu B, Kumar A and Dingle J (2008). The Effect of Proportion of Crumbled Copra Meal and Enzyme Supplementation on Broiler Growth and Gastrointestinal Development. International Journal of Poultry Science, 7 (5): 511-515.

Wu W, Williams WP, Kunkel ME, Acton JC, Huang Y, Wardlaw FB and Grimes LW (1996). Amino acid availability and availability-corrected amino acid score of red kidney beans (*Phaseolus vulgaris* L.). Journal of Agricultural and Food Chemistry, 44: 1296 - 1301.

To cite this paper: Ragab HI, Abdel-Atti KhA, Babiker MS, Elawad SM. 2015. Effect of dietary Hyacinth beans (*Lablab purpureus*) and enzyme additives on performance of broilers. *Online J. Anim. Feed Res*., 5(6): 181-188.
Scienceline/Journal homepages: http://www.science-line.com/index/; http://www.ojafr.ir

Instructions for Authors

OJAFR EndNote Style Manuscript Template Sample Articles Declaration form

Manuscript as Original Research Paper, Short Communication, Case Reports and Review or Mini-Review are invited for rapid peer-review publishing in the *Online Journal of Animal and Feed Research (ISSN 2228-7701)*.

Papers can be in any relevant fields of Animal Sciences (Animal Nutrition, Physiology, Reproduction, Genetics and Breeding, Behavior, Health, Husbandry and its economic, Animal products and Veterinary medicines of domestic animals) and relative topics. The journal does encourage papers with emphasis on the nutritive value and utilization of feeds that is depended to methods of Improvement, Assessment, Conserving and Processing feeds, Agronomic and climatic factors, Metabolic, Production, Reproduction and Health responses to dietary inputs (e.g., Feeds, Feed Additives, Specific Feed Components, Mycotoxins). Also, Mathematical models relating directly to animal-feed interactions, Analytical and experimental methods for Feed Evaluation as well as Animal Production studies with a focus on Animal Nutrition that do have link to a feed (Food Science and Technology) are acceptable relative topics for OJAFR**.**

Submission

The manuscript should preferentially be submit online. For facile submission, please embed all figures and tables at the end of the manuscript to become one single file for submission. Once submission is complete, the system will generate a manuscript ID and password sent to author's contact email. If you have any difficulty in submitting the manuscript, kindly send via email: editors@ojafr.ir. All manuscripts must be checked (by English native speaker) and submitted in English for evaluation in totally confidential and impartial way.

Supplementary information:

Author guidelines are specific for each journal. Our MS Word template can assist you by modifying your page layout, text formatting, headings, title page, image placement, and citations/references such that they agree with the guidelines of journal. If you believe your article is fully edited per journal style, please use our Word template before submission.
Supplementary materials may include figures, tables, methods, videos, and other materials. They are available online linked to the original published article. Supplementary tables and figures should be labeled with a "S", e.g. "Table S1" and "Figure S1". The maximum file size for supplementary materials is 10MB each. Please keep the files as small as possible to avoid the frustrations experienced by readers with downloading large files.

Submission to the Journal is on the understanding that:

1.The article has not been previously published in any other form and is not under consideration for publication elsewhere;
2.All authors have approved the submission and have obtained permission for publish work.
3.Researchers have proper regard for conservation and animal welfare considerations. Attention is drawn to the *'Guidelines for the Treatment of Animals in Research and Teaching'*. Any possible adverse consequences of the work for populations or individual organisms must be weighed against the possible gains in knowledge and its practical applications. If the approval of an ethics committee is required, please provide the name of the committee and the approval number obtained.

Ethics Committee Approval

Experimental research involving human or animals should have been approved by author's institutional review board or ethics committee. This information can be mentioned in the manuscript including the name of the board/committee that gave the approval. Investigations involving humans will have been performed in accordance with the principles of *Declaration of Helsinki*.
And the use of animals in experiments will have observed the *Interdisciplinary Principles and Guidelines for the Use of Animals in Research, Testing, and Education* by the New York Academy of Sciences, Ad Hoc Animal Research Committee.
If the manuscript contains photos or parts of photos of patients, informed consent from each patient should be obtained. Patient's identities and privacy should be carefully protected in the manuscript.

Presentation of the article

Main Format:

First page of the manuscripts must be properly identified by the title and the name(s) of the author(s). It should be typed in Times New Roman (font sizes: 12pt in capitalization for the title and the main text, double spaced, in A4 format with 2cm margins. All pages and lines of the main text should be numbered consecutively throughout the manuscript. The manuscript must be saved in a .doc format, (not .docx files). Abbreviations in the article title are not allowed except the well-known ones.

Manuscripts should be arranged in the following order:

a. TITLE (brief, attractive and targeted);

b. Name(s) and Affiliation(s) of author(s) (including post code) and corresponding E-mail;

c. ABSTRACT;

d. Key words (separate by semicolons; or comma,);

e. Abbreviations (used in the manuscript);

f. INTRODUCTION;

g. MATERIALS AND METHODS;

h. RESULTS;

i. DISCUSSION;

j. CONCLUSION;

k. Acknowledgements (if there are any);

1. REFERENCES;

m. Tables;

n. Figure captions;

o. Figures;

The sections "RESULTS AND DISCUSSION" can be presented jointly.

The sections "DISCUSSION AND DISCUSSION" can be presented jointly.

Article Sections Format:

Title should be a brief phrase describing the contents of the paper. Title Page should include the author(s)'s full names and affiliations, the name of the corresponding author along with phone and e-mail information. Present address(es) of author(s) should appear as a footnote.

Abstract should be informative and completely self-explanatory, briefly present the topic, state the scope of the experiments, indicate significant data, and point out major findings and conclusions. The abstract should be 150 to 300 words in length. Complete sentences, active verbs, and the third person should be used, and the abstract should be written in the past tense. Standard nomenclature should be used and abbreviations should be avoided. No literature should be cited.

Following the abstract, about 3 to 7 **key words** should be listed.

Introduction should provide a clear statement of the problem, the relevant literature on the subject, and the proposed approach or solution. It should be understandable to colleagues from a broad range of scientific disciplines.

Materials and Methods should be complete enough to allow experiments to be reproduced. However, only truly new procedures should be described in detail; previously published procedures should be cited, and important modifications of published procedures should be mentioned briefly. Capitalize trade names and include the manufacturer's name and address. Subheadings should be used. Methods in general use need not be described in detail.

Results should be presented with clarity and precision. The results should be written in the past tense when describing findings in the author(s)'s experiments. Previously published findings should be written in the present tense. Results should be explained, but largely without referring to the literature. Discussion, speculation and detailed interpretation of data should not be included in the results but should be put into the discussion section.

Discussion should interpret the findings in view of the results obtained in this and in past studies on this topic. State the conclusions in a few sentences at the end of the paper. The Results and Discussion sections can include subheadings, and when appropriate, both sections can be combined.

Conclusion should be brief and tight, providing a few specific tasks to accomplish: 1-Re-assert/Reinforce the Thesis; 2-Review the Main Points; 3- Close Effectively. The Conclusion section should not be similar to the Abstract content.

Declarations including Ethics, Consent to publish, Competing interests, Authors' contributions, and Availability of data and materials are necessary.

Acknowledgments of persons, grants, funds, etc should be brief.

Tables should be kept to a minimum and be designed to be as simple as possible. Tables are to be typed double-spaced throughout, including headings and footnotes. Each table should be on a separate page, numbered consecutively in Arabic numerals and supplied with a heading and a legend. Tables should be self-explanatory without reference to the text. The details of the methods used in the experiments should preferably be described in the legend instead of in the text. The same data should not be presented in both table and graph forms or repeated in the text.

The Figure legends should be typed in numerical order on a separate sheet. Graphics should be prepared using applications capable of generating high resolution GIF, TIFF, JPEG or PowerPoint before pasting in the Microsoft Word manuscript file. Use Arabic numerals to designate figures and upper case letters for their parts (Figure 1). Begin each legend with a title and include sufficient description so that the figure is understandable without reading the text of the manuscript. Information given in legends should not be repeated in the text.

Declarations section - Please include declarations heading

Please ensure that the sections:
-Ethics (and consent to participate)
-Consent to publish
-Competing interests
-Authors' contributions
-Availability of data and materials
are included at the end of your manuscript in a Declarations section.

Consent to Publish

Please include a 'Consent for publication' section in your manuscript. If your manuscript contains any individual person's data in any form (including individual details, images or videos), consent to publish must be obtained from that person, or in the case of children, their parent or legal guardian. All presentations of case reports must have consent to publish. You can use your institutional consent form or our consent form if you prefer. You should not send the form to us on submission, but we may request to see a copy at any stage (including after publication). If your manuscript does not contain any individual person's data, please state "Not applicable" in this section.

Authors' Contributions

For manuscripts with more than one author, OJAFR require an Authors' Contributions section to be placed after the Competing Interests section. An 'author' is generally considered to be someone who has made substantive intellectual contributions to a published study. To qualify as an author one should 1) have made substantial contributions to conception and design, or acquisition of data, or analysis and interpretation of data; 2) have been involved in drafting the manuscript or revising it critically for important intellectual content; and 3) have given final approval of the version to be published. Each author should have participated sufficiently in the work to take public responsibility for appropriate portions of the content. Acquisition of funding, collection of data, or general supervision of the research group, alone, does not justify authorship.
We suggest the following format (please use initials to refer to each author's contribution): AB carried out the molecular genetic studies, participated in the sequence alignment and drafted the manuscript. JY carried out the immunoassays. MT participated in the sequence alignment. ES participated in the design of the study and performed the statistical analysis. FG conceived of the study, and participated in its design and coordination and helped to draft the manuscript. All authors read and approved the final manuscript.
For authors that equally participated in a study please write '**All/Both authors contributed equally to this work**.' Contributors who do not meet the criteria for authorship should be listed in an acknowledgements section.

Competing Interests

Competing interests that might interfere with the objective presentation of the research findings contained in the manuscript should be declared in a paragraph heading "Competing interests" (after Acknowledgment section and before References). Examples of competing interests are ownership of stock in a company, commercial grants, board membership, etc. If there is no competing interest, please use the statement "The authors declare that they have no competing interests.".
Online Journal of Animal and Feed Research adheres to the definition of authorship set up by the International Committee of Medical Journal Editors (ICMJE). According to the ICMJE authorship criteria should be based on 1) substantial contributions to conception and design of, or acquisition of data or analysis and interpretation of data, 2) drafting the article or revising it critically for important intellectual content and 3) final approval of the version to be published. Authors should meet conditions 1, 2 and 3. It is a requirement that all authors have been accredited as appropriate upon submission of the manuscript. Contributors who do not qualify as authors should be mentioned under Acknowledgements.

Change in authorship

We do not allow any change in authorship after provisional acceptance. We cannot allow any addition, deletion or change in sequence of author name. We have this policy to prevent the fraud.

Acknowledgements

We strongly encourage you to include an Acknowledgements section between the Authors' contributions section and Reference list. Please acknowledge anyone who contributed towards the study by making substantial contributions to conception, design, acquisition of data, or analysis and interpretation of data, or who was involved in drafting the manuscript or revising it critically for important intellectual content, but who does not meet the criteria for authorship. Please also include their source(s) of funding. Please also acknowledge anyone who contributed materials essential for the study.
Authors should obtain permission to acknowledge from all those mentioned in the Acknowledgements. Please list the source(s) of funding for the study, for each author, and for the manuscript preparation in the acknowledgements section. Authors must describe the role of the funding body, if any, in study design; in the collection, analysis, and interpretation of data; in the writing of the manuscript; and in the decision to submit the manuscript for publication.

Data Deposition

Nucleic acid sequences, protein sequences, and atomic coordinates should be deposited in an appropriate database in time for the accession number to be included in the published article. In computational studies where the sequence information is unacceptable for inclusion in databases because of lack of experimental validation, the sequences must be published as an additional file with the article.

References

An OJAFR reference style for **EndNote** may be found **here**.

1. All references to publications made in the text should be presented in a list with their full bibliographical description.

2. In the text, a reference identified by means of an author‘s name should be followed by the date of the reference in parentheses. When there are more than two authors, only the first author‘s surename should be mentioned, followed by ’et al‘. In the event that an author cited has had two or more works published during the same year, the reference, both in the text and in the reference list, should be identified by a lower case letter like ’a‘ and ’b‘ after the date to distinguish the works.
3. References in the text should be arranged chronologically (e.g. Kelebeni, 1983; Usman and Smith, 1992 and Agindotan et al., 2003). 'et al.' should not be italic. The list of references should be arranged alphabetically on author's surnames, and chronologically per author. If an author's name in the list is also mentioned with co-authors, the following order should be used: Publications of the single author, arranged according to publication dates - publications of the same author with one co-author - publications of the author with more than one co-author. Publications by the same author(s) in the same year should be listed as 1992a, l992b,etc.
4. Names of authors and title of journals, published in non-latin alphabets should be transliterated in English.
5. A sample of standard reference is "1th Author surname A, 2th Author surname B and 3th Author surname C (2013). Article title should be regular, in sentence case form, and 9 pt. Online Journal of Animal and Feed Research, Volume No. (Issue No.): 00-00." (Journal titles should be full and not italic.)
6. If available please add DOI numbers or the link of articles at the end of each reference.

Examples (at the text):
Abayomi (2000), Agindotan et al. (2003), (Kelebeni, 1983), (Usman and Smith, 1992), (Chege, 1998; Chukwura, 1987a,b; Tijani, 1993,1995), (Kumasi et al., 2001).

Examples (at References section):
a) For journal:
Lucy MC (2000). Regulation of ovarian follicular growth by somatotropin and insulin- like growth factors in cattle. Journal of Dairy Science, 83: 1635-1647.
Kareem SK (2001). Response of albino rats to dietary level of mango cake. J. Agric. Res.Dev. pp 31-38.
Chikere CB, Omoni VT and Chikere BO (2008). Distribution of potential nosocomial pathogens in a hospital environment. African Journal of Biotechnology. 7: 3535-3539.

b) For symposia reports and abstracts:
Cruz EM, Almatar S, Aludul EK and Al-Yaqout A (2000). Preliminary Studies on the Performance and Feeding Behaviour of Silver Pomfret (Pampus argentens euphrasen) Fingerlings fed with Commercial Feed and Reared in Fibreglass Tanks. Asian Fisheries Society Manila, Philippine 13: 191-199.

c) For edited symposia, special issues, etc., published in a journal:
Korevaar, H., 1992. The nitrogen balance on intensive Dutch dairy farms: a review. In: A. A. Jongebreur et al. (Editors), Effects of Cattle and Pig Production Systems on the Environment: Livestock Production Science. 31: 17-27.

d) For books:
AOAC (1990). Association of Official Analytical Chemists. Official Methods of Analysis, 15th Edition. Washington D.C. pp. 69-88.
Pelczar JR, Harley JP, Klein DA (1993). Microbiology: Concepts and Applications. McGraw-Hill Inc., New York, pp. 591-603.

e) Books, containing sections written by different authors:
Kunev, M., 1979. Pig Fattening. In: A. Alexiev (Editor), Farm Animal Feeding. Vol. III. Feeding of Different Animal Species, Zemizdat, Sofia, p. 233-243 (Bg).
In referring to a personal communication the two words are followed by the year, e.g. (Brown, J. M., personal communication, 1982). In this case initials are given in the text. Where available, URLs for the references have been provided.

Formulae, numbers and symbols

1. Typewritten formulae are preferred. Subscripts and superscripts are important. Check disparities between zero (0) and the letter 0, and between one (1) and the letter I.
2. Describe all symbols immediately after the equation in which they are first used.
3. For simple fractions, use the solidus (/), e.g. 10 /38.
4. Equations should be presented into parentheses on the right-hand side, in tandem.
5. Levels of statistical significance which can be used without further explanations are *P < 0.05, **P < 0.01, and ***P<0.001.
6. In the English articles, a decimal point should be used instead of a decimal comma.
7. Use Symbol fonts for "±"; "≤" and "≥" (avoid underline).
8. In chemical formulae, valence of ions should be given, e.g. Ca2+ and CO32-, not as Ca++ or CO3.
9. Numbers up to 10 should be written in the text by words. Numbers above 1000 are recommended to be given as 10 powered x.
10. Greek letters should be explained in the margins with their names as follows: Aα - alpha, Bβ - beta, Γγ - gamma, Δδ - delta, Eε - epsilon, Zζ - zeta, Hη - eta, Θθ - theta, Iι - iota, Kκ - kappa, Λλ - lambda, Mμ - mu, Nν - nu, Ξξ - xi, Oο - omicron, Ππ - pi, Pρ - rho, Σσ - sigma, Tτ - tau, Yυ - ipsilon, Φφ - phi, Χχ - chi, Ψψ - psi, Ωω - omega. Please avoid using math equations in Word whenever possible, as they have to be replaced by images in xml full text.

Abbreviations
Abbreviations should be presented in one paragraph, in the format: "term: definition". Please separate the items by ";".
E.g. ANN: artificial neural network; CFS: closed form solution; ....

Graphical Abstract:

Authors of accepted articles should provide a graphical abstract (a beautifully designed feature figure) to represent the paper aiming to catch the attention and interest of readers. Graphical abstract will be published online in the table of content. The graphical abstract should be colored, and kept within an area of 12 cm (width) x 6 cm (height) or with similar format. Image should have a minimum resolution of 300 dpi and line art 1200dpi.

Note: Height of the image should be no more than the width. Please avoid putting too much information into the graphical abstract as it occupies only a small space. Authors can provide the graphical abstract in the format of PDF, Word, PowerPoint, jpg, or png, after a manuscript is accepted for publication.

If you have decided to provide a Professional Graphical Abstract, please click **here**.

Review/Decisions/Processing

Firstly, all manuscripts will be checked by Docol©c, a plagiarism finding tool. The received papers with plagiarism rate of more than 40% will be rejected. Manuscripts that are judged to be of insufficient quality or unlikely to be competitive enough for publication will be returned to the authors at the initial stage. The remaining manuscripts go through a double-blind review process by two reviewers selected by section editor (SE) or deputy SE of OJAFR, who are research workers specializing in the relevant field of study. One unfavourable review means that the paper will not be published and possible decisions are: accept as is, minor revision, major revision, or reject. The corresponding authors should submit back their revisions within 14 days in the case of minor revision, or 30 days in the case of major revision. Manuscripts with significant results are typically reviewed and published at the highest priority. The editor who received the final revisions from the corresponding authors shall not be hold responsible for any mistakes shown in the final publication.

Plagiarism: There is an instant policy towards plagiarism (including self-plagiarism) in our journals. Manuscripts are screened for plagiarism by Docol©c, before or during publication, and if found they will be rejected at any stage of processing.

Date of issue

All accepted articles are published bimonthly around 25th of January, March, May, July, September and November, each year in full text on the Internet.

Publication charges

Articles of *Online Journal of Animal and Feed Research (ISSN 2228-7701)* are freely accessible. No peer-reviewing charges are required. Publication of short reports and letter are free of charge; however, a negligible editor fee (100 USD) will be applied for long research and review papers (more than 10 pages) before copyediting and publication. Instruction for payment is sent during publication process as soon as manuscript is accepted.

The Waiver policy

The submission fee will be waived for invited authors, authors of hot papers, and corresponding authors who are editorial board members of the *Online Journal of Animal and Feed Research*. The Journal will consider requests to waive the fee for cases of financial hardship (for high quality manuscripts and upon acceptance for publication). Requests for waiver of the submission fee must be submitted via individual cover letter by the corresponding author and cosigned by an appropriate institutional official to verify that no institutional or grant funds are available for the payment of the fee. Letters including the manuscript title and manuscript ID number should be sent to: editors@ojafr.ir. It is expected that waiver requests will be processed and authors will be notified within two business day.

The OA policy

Online Journal of Animal and Feed Research is an Open Access journal which means that all content is freely available without charge to the user or his/her institution. Users are allowed to read, download, copy, distribute, print, search, or link to the full texts of the articles, or use them for any other lawful purpose, without asking prior permission from the publisher or the author. This is in accordance with the *BOAI definition of Open Access*.

Submission Preparation Checklist

Authors are required to check off their submission's compliance with all of the following items, and submissions may be returned to authors that do not adhere to the following guidelines:

- -The submission has not been previously published, nor is it before another journal for consideration (or an explanation has been provided in -Comments to the Editor).
- -The submission file is in Microsoft Word, RTF, or PDF document file format.
- -Where available, URLs for the references have been provided.
- -The text is double-spaced; uses a 12-point font; and all illustrations, figures, and tables are placed within the text at the appropriate points, rather than at the end.
- -The text adheres to the stylistic and bibliographic requirements outlined in the Author Guidelines.

***

(Revised on 22 January 2015)

Editorial Offices:
Atatürk University, Erzurum 25100, Turkey
University of Manitoba, Winnipeg, Manitoba R3T 2N2, Canada
University of Maragheh, East Azerbaijan, Maragheh 55136, Iran
Homepage: www.science-line.com
Phone: +98 914 420 7713 (Iran); +90 538 770 8824 (Turkey); +1 204 8982464 (Canada)
Emails:
administrator@science-line.com
saeid.azar@atauni.edu.tr

Scienceline Publishing Corporation

Scienceline Publication, Ltd is a limited liability non-profit non-stock corporation incorporated in Turkey, and also is registered in Iran. Scienceline journals that concurrently belong to many societies, universities and research institutes, publishes internationally peer-reviewed open access articles and believe in sharing of new scientific knowledge and vital research in the fields of life and natural sciences, animal sciences, engineering, art, linguistic, management, social and economic sciences all over the world. Scienceline journals include:

Online Journal of Animal and Feed Research

ISSN 2228-7701; Bi-monthly
View Journal I Editorial Board
Email: editors@ojafr.ir
Submit Online >>

Journal of Civil Engineering and Urbanism

ISSN 2252-0430; Bi-monthly
View Journal I Editorial Board
Email: ojceu@ojceu.ir
Submit Online >>

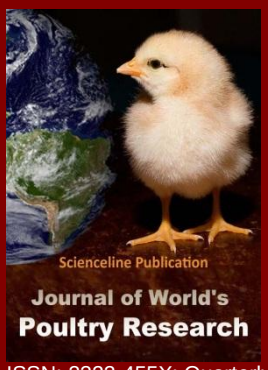
Journal of Life Sciences and Biomedicine

ISSN: 2251-9939; Bi-monthly
View Journal I Editorial Board
Email: editors@jlsb.science-line.com
Submit Online >>

Asian Journal of Medical and Pharmaceutical Researches

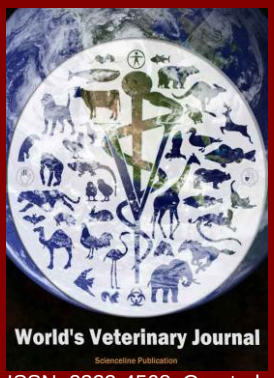
ISSN: 2322-4789; Quarterly
View Journal I Editorial Board
Email: editor@ajmpr.science-line.com
Submit Online >>

Journal of World's Poultry Research



ISSN: 2322-455X; Quarterly
View Journal I Editorial Board
Email: editor@jwpr.science-line.com
Submit Online >>

World's Veterinary Journal

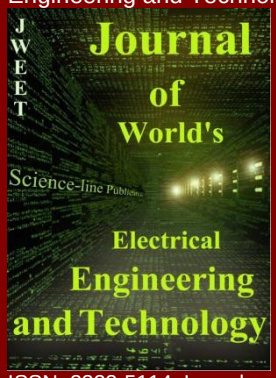


ISSN: 2322-4568; Quarterly
View Journal I Editorial Board
Email: editor@wvj.science-line.com
Submit Online >>

Journal of Educational and Management Studies

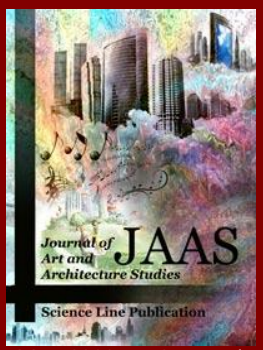
ISSN: 2322-4770; Quarterly
View Journal I Editorial Board
Email: info@jems.science-line.com
Submit Online >>

Journal of World's Electrical Engineering and Technology



ISSN: 2322-5114; Irregular
View Journal I Editorial Board
Email: editor@jweet.science-line.com
Submit Online >>

Journal of Art and Architecture Studies



ISSN: 2383-1553; Irregular
View Journal I Editorial Board
Email: jaas@science-line.com
Submit Online >>

Asian Journal of Social and Economic Sciences

ISSN: 2383-0948; Quarterly
View Journal I Editorial Board
Email: ajses@science-line.com
Submit Online >>

Journal of Applied Business and Finance Researches

ISSN: 2382-9907; Quarterly
View Journal I Editorial Board
Email: jabfr@science-line.com
Submit Online >>

Scientific Journal of Mechanical and Industrial Engineering

ISSN: 2383-0980; Quarterly
View Journal I Editorial Board
Email: sjmie@science-line.com
Submit Online >>

Scienceline Journals
Email: administrator@science-line.com