Journal of Cell and Animal Biology

Volume 8 Number 2 February 2014

ISSN 1996-0867

Academic Journals

ABOUT JCAB

The **Journal of Cell and Animal Biology (JCAB)** (ISSN 1996-0824) is published Monthly (one volume per year) by Academic Journals.

Journal of Cell and Animal Biology (JCAB) provides rapid publication (monthly) of articles in all areas of cell and animal biology such as Cellular metabolism, Cellular differentiation, Alcoholic fermentation etc. All articles published in JCAB are peer-reviewed.

Submission of Manuscript

Please read the **Instructions for Authors** before submitting your manuscript. The manuscript files should be given the last name of the first author

Click here to Submit manuscripts online

If you have any difficulty using the online submission system, kindly submit via this email jcab@academicjournals.org.

With questions or concerns, please contact the Editorial Office at jcab@academicjournals.org.

Instructions for Author

Electronic submission of manuscripts is strongly encouraged, provided that the text, tables, and figures are included in a single Microsoft Word file (preferably in Arial font).

The **cover letter** should include the corresponding author's full address and telephone/fax numbers and should be in an e-mail message sent to the Editor, with the file, whose name should begin with the first author's surname, as an attachment.

Article Types
Three types of manuscripts may be submitted:

Regular articles: These should describe new and carefully confirmed findings, and experimental procedures should be given in sufficient detail for others to verify the work. The length of a full paper should be the minimum required to describe and interpret the work clearly.
Short Communications: A Short Communication is suitable for recording the results of complete small investigations or giving details of new models or hypotheses, innovative methods, techniques or apparatus. The style of main sections need not conform to that of full-length papers. Short communications are 2 to 4 printed pages (about 6 to 12 manuscript pages) in length.

Reviews: Submissions of reviews and perspectives covering topics of current interest are welcome and encouraged. Reviews should be concise and no longer than 4-6 printed pages (about 12 to 18 manuscript pages). Reviews are also peer-reviewed.

Review Process

All manuscripts are reviewed by an editor and members of the Editorial Board or qualified outside reviewers. Authors cannot nominate reviewers. Only reviewers randomly selected from our database with specialization in the subject area will be contacted to evaluate the manuscripts. The process will be blind review.
Decisions will be made as rapidly as possible, and the journal strives to return reviewers' comments to authors as fast as possible. The editorial board will re-review manuscripts that are accepted pending revision. It is the goal of the AJFS to publish manuscripts within weeks after submission.

Regular articles

All portions of the manuscript must be typed double-spaced and all pages numbered starting from the title page.

The Title should be a brief phrase describing the contents of the paper. The Title Page should include the authors' full names and affiliations, the name of the corresponding author along with phone, fax and E-mail information. Present addresses of authors should appear as a footnote.

The 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 100 to 200 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 10 key words that will provide indexing references should be listed.

A list of non-standard **Abbreviations** should be added. In general, non-standard abbreviations should be used only when the full term is very long and used often. Each abbreviation should be spelled out and introduced in parentheses the first time it is used in the text. Only recommended SI units should be used. Authors should use the solidus presentation (mg/ml). Standard abbreviations (such as ATP and DNA) need not be defined.

The 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 authors' 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.

The 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.

The Acknowledgments of people, 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 form or repeated in the text.

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. Tables should be prepared in Microsoft Word. 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.

References: 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 name 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.

Examples:

Abayomi (2000), Agindotan et al. (2003), (Kelebeni, 1983), (Usman and Smith, 1992), (Chege, 1998; 1987a,b; Tijani, 1993,1995), (Kumasi et al., 2001)
References should be listed at the end of the paper in alphabetical order. Articles in preparation or articles submitted for publication, unpublished observations, personal communications, etc. should not be included in the reference list but should only be mentioned in the article text (e.g., A. Kingori, University of Nairobi, Kenya, personal communication). Journal names are abbreviated according to Chemical Abstracts. Authors are fully responsible for the accuracy of the references.

Examples:

Chikere CB, Omoni VT and Chikere BO (2008). Distribution of potential nosocomial pathogens in a hospital environment. Afr. J. Biotechnol. 7: 3535-3539.

Moran GJ, Amii RN, Abrahamian FM, Talan DA (2005). Methicillinresistant Staphylococcus aureus in community-acquired skin infections. Emerg. Infect. Dis. 11: 928-930.

Pitout JDD, Church DL, Gregson DB, Chow BL, McCracken M, Mulvey M, Laupland KB (2007). Molecular epidemiology of CTXM-producing Escherichia coli in the Calgary Health Region: emergence of CTX-M-15-producing isolates. Antimicrob. Agents Chemother. 51: 1281-1286.

Pelczar JR, Harley JP, Klein DA (1993). Microbiology: Concepts and Applications. McGraw-Hill Inc., New York, pp. 591-603.

Short Communications

Short Communications are limited to a maximum of two figures and one table. They should present a complete study that is more limited in scope than is found in full-length papers. The items of manuscript preparation listed above apply to Short Communications with the following differences: (1) Abstracts are limited to 100 words; (2) instead of a separate Materials and Methods section, experimental procedures may be incorporated into Figure Legends and Table footnotes; (3) Results and Discussion should be combined into a single section.
Proofs and Reprints: Electronic proofs will be sent (e-mail attachment) to the corresponding author as a PDF file. Page proofs are considered to be the final version of the manuscript. With the exception of typographical or minor clerical errors, no changes will be made in the manuscript at the proof stage.

Fees and Charges: Authors are required to pay a $550 handling fee. Publication of an article in the Journal of Cell and Animal Biology is not contingent upon the author's ability to pay the charges. Neither is acceptance to pay the handling fee a guarantee that the paper will be accepted for publication. Authors may still request (in advance) that the editorial office waive some of the handling fee under special circumstances

Submission of a manuscript implies: that the work described has not been published before (except in the form of an abstract or as part of a published lecture, or thesis) that it is not under consideration for publication elsewhere; that if and when the manuscript is accepted for publication, the authors agree to automatic transfer of the copyright to the publisher.

Disclaimer of Warranties

In no event shall Academic Journals be liable for any special, incidental, indirect, or consequential damages of any kind arising out of or in connection with the use of the articles or other material derived from the JCAB, whether or not advised of the possibility of damage, and on any theory of liability.
This publication is provided "as is" without warranty of any kind, either expressed or implied, including, but not limited to, the implied warranties of merchantability, fitness for a particular purpose, or non-infringement. Descriptions of, or references to, products or publications does not imply endorsement of that product or publication. While every effort is made by Academic Journals to see that no inaccurate or misleading data, opinion or statements appear in this publication, they wish to make it clear that the data and opinions appearing in the articles and advertisements herein are the responsibility of the contributor or advertiser concerned. Academic Journals makes no warranty of any kind, either express or implied, regarding the quality, accuracy, availability, or validity of the data or information in this publication or of any other publication to which it may be linked.

Journal of Cell and Animal Biology

Table of Contents: Volume 8 Number 2 February, 2014

ARTICLES

Effect of substituting fish meal with poultry by-products meal in broiler diet on nitrogen excretion and litter characteristics
Heshmatollah Khosravinia, Arash Azarfar and Ali Sokhtehzary

Reproductive and productive performance of Kereyu Sanga cattle in Fentalle District of Oromia Region, Ethiopia
Shiferaw Garoma

academicJournals

Vol. 8(2), pp. 23-27, February 2014
DOI: 10.5897/JCAB2013.0397
ISSN 1996-0867 ©2014 Academic Journals
http://www.academicjournals.org/JCAB

Journal of Cell and Animal Biology

Full Length Research Paper

Effect of substituting fish meal with poultry by-products meal in broiler diet on nitrogen excretion and litter characteristics

Heshmatollah Khosravinia[1]*, Arash Azarfar[1] and Ali Sokhtehzary[2]

[1]Department of Animal Sciences, Agriculture Faculty, Lorestan University, P.B. 465, Khoramabad-68135, Lorestan, Iran.
[2]Veterinary Faculty, Lorestan University, P.B. 465, Khoramabad-68135, Lorestan, Iran.

Accepted 10 December, 2013

This study was carried out to investigate the effects of dietary replacment of fish meal (FM) with poultry by-product meal (PBM) at 0, 25, 50, 75 and 100% using 360 one day-old Arian broiler chicken. The mean weight gain, feed intake and feed conversion ratio were significantly decreased in the birds fed on diets containing greater levels of PBM as compared to the control birds during 1 to 21 days of age (P<0.01). Replacement of FM at different levels with PBM significantly affected serum concentrations of urea and uric acid (P<0.05). The serum concentrations of urea and uric acid were lower in the birds that received 100%-PBM containing diets. The mean nitrogen content of litter was similar among the experimental diets, while the moisture content of litter tended to be lower for the birds fed on diets containing 25% PBM as compared to the other birds (P<0.10). Litter pH was similar among the dietary. Treating the litter samples by alum significantly decreased their pH values (P<0.01). The results suggest that, substitution of FM with PBM at different levels had no impact on nitrogen contents of litter.

Key words: Nitrogen excretion, broiler chicken, poultry by-product meal.

INTRODUCTION

Litter management in poultry production, as a means to reduce ammonia emission, has received increasing attention in modern poultry houses. It is well documented that high concentrations of ammonia in poultry houses have detrimental effects on the productive performance and health of the birds (Koerkamp, 1994; Al Homidan et al., 2003; Ritz et al., 2004). Moreover, concerns have arisen with regard to ammonia emission from poultry litter as it may contribute to acidic precipitations (Apsimon et al., 1987). Van der Hoek, 1998 Atmospheric ammonia plays an important role in such precipitations. It has been reported that livestock wastes are the dominant source of ammonia emission in Europe, which is increased by 50% during 1950 to 1980 (Apsimon et al., 1987; Van Aerdenne et al., 2001).

Ammonia volatilization from poultry houses is mainly due to microbial break down of nitrogenous compounds of litter, predominantly uric acid, by uricase (Kimberly et al., 2008; Schefferle, 2008). Different approaches have been implemented to reduce ammonia emission from poultry houses. Among the others, dietary manipulations and litter treatments are effective means to control ammonia emission at poultry houses level. Litter treatments include ammonia-reducing strategies which provide a better in-house environment for birds (Khosravinia, 2006; Choi et al., 2008). Dietary manipulations have the

*Corresponding author. E-mail: Khosravi_fafa@yahoo.com. Tel: (+98)(+661) 4200012, 4200191-2, (+98)(+661) 3205624 or 09166673705. Fax: (+98) (+661) 4200289.

potential to reduce the manure production and nutrients excretion by improving the efficiency of feed utilization in poultry. Therefore, such dietary manipulations may decrease the production of precursors necessary for gaseous as well as odorants emissions (Blair et al., 1999).

The reduction in mass of nutrient input and modification of nutrient form are two feeding strategies for reducing ammonia emission from poultry houses. The former, reduces the ammonia emission by lowering the dietary concentrations of nutrients which are involved in the production of ammonia, such as dietary protein without having any detrimental effects on birds performance (Angel et al., 2006; Applegate et al., 2008). While, the latter reduces the nutrients emissions by altering the chemical forms of the nutrients being excreted from birds. Acidification of diets (Keshavarz, 1991; Koerkamp, 1994; Wu et al., 2007) and dietary inclusion of feed additives (such as urease inhibitors) (Amon et al., 1995) are among the approaches which are considered to reduce the emission of nutrients by converting them to non-volatile forms.

It is also possible to reduce nitrogen excretion and ammonia emission form poultry houses by including dietary protein sources with higher biological values. Therefore, the current study investigates the effects of dietary replacement of fish meal with poultry by-product meal on blood urea and uric acid and certain physic-chemical characteristics of litter in broiler chickens.

MATERIALS AND METHODS

Experimental diets

Poultry by-product meal (PBM) was manufactured using heads, legs and spent carcasses without inclusion of viscera. Pre-cooked material was hydrolyzed under pressurized steam, de-oiled, dried and ground using a hammer mill. The material was then blended and sampled for further chemical analyses. The samples were analyzed for dry matter, crude protein, ether extract, ash, calcium and phosphorus (AOAC, 1980). Metabolizable energy corrected for nitrogen (ME_n) was estimated using the prediction equation from NRC (1994):

ME_n (kcal/kg) = (31.02 × crude protein %) + (74.23 × ether extract %).

The chemical compositions of the PBM used in the current study were reported by Khosravinia and Mohamadzadeh (2006). Experimental diets were prepared by substituting fish meal (FM) by PBM at the levels of 0, 25, 50, 75 and 100%. All experimental diets were formulated to be iso-caloric and iso-proteinous (Table 1). The diets were offered to the birds for *ad libitum* consumption.

Experimental flock and data collection

Three hundred and sixty one-day old straight run Arian chicks were randomly allocated to 30 pens (at density of 0.09 m^2/bird) furnished with wood shavings as litter in an open system partially controlled house. Each of five experimental diets was offered to six pens of 12 chicks each. Data on weight gain and feed intake were recorded at days 1 to 21 and 21 to 42 of experiment. All birds were slaughtered to evaluate the carcass related traits at day 42. At the same time, approximately 200 g of litter samples were taken from the top layer of 50 mm depth at 10 predetermined locations in each pen. The litter sample from each pen was then thoroughly mixed and two sub samples of 50 g were taken in which litter moisture and litter pH was determined, respectively. The sub sample considered for pH measurement was further divided in two parts while one part was cautiously mixed with aluminium sulfate [alum, $Al_2 (SO_4)_3{\cdot}14H_2O$] (10 g/ kg) and the other part remained intact. The nitrogen content of litter samples was measured at day 42 according to AOAC (1999). The pH of litter samples were determined with (0.1 percent, w/w) and without blending with alum.

Statistical analysis

Considering each pen as an experimental unit, data pertained were subjected to one-way analysis of variance using GLM procedure of SAS® (SAS institute, 1998). The statistical model consisted of the fixed effect of experimental diets. Differences between treatments were analysed by a Duncan's multiple range test. For all statistical analysis, significance was declared at P<0.05. The difference between alum treated and non-treated litter samples were examined using t-test. Prior to statistical analysis, percentage data were subjected to *arc sine* transformation.

RESULTS

The effects of FM with PBM on common economic parameters of the birds are presented in Table 2 and are discussed in detail by Khosravinia and Mohamadzadeh (2006). Briefly, weight gain, feed intake and feed conversion ratio were significantly decreased in birds fed on diets containing greater levels of PBM during 1 to 21 days of age (P<0.01). No significant differences were demonstrated in all productive performance indicators as well as carcass weight, carcass yield and mortality percentage during 22 to 42 and 1 to 42 days for the birds fed on diets differing for PBM/FM inclusion level (Table 2; P>0.05).

There were significant differences between the experimental diets with regard to serum urea and uric acid concentrations (Table 3). Full substitution of FM with PBM significantly decreased the serum concentrations of urea and uric acid in the treated birds as compared to the control birds. The birds fed on diets in which 25% of FM was replaced with PBM had the lowest litter nitrogen content among the experimental treatments (Table 4; P < 0.05). The birds fed on diets containing 100% PBM instead of FM experienced the wettest litter (19.2%, Table 4). Dietary substitution of FM by PBM at the level of 25% significantly lowered the litter nitrogen content as well as litter moisture (Table 4; P<0.05). The experiment-tal diets had no significant effect on the litter pH (Table 4; P > 0.05). Addition of 10 g/kg alum into the litter samples significantly lowered the pH value of the samples (Table 4).

DISCUSSION

Inclusion of PBM in starter diets caused significant decrease in productive performance of the birds (Table 2). Silva et al. (2002) reported the same results when PBM was

Table 1. Ingredient and chemical composition of the experimental diets.

Ingredient (%)	PBP[1] (%) in starter diets (1 - 21 days)					PBP (%) in grower diets (22 - 42 days)				
	0	25	50	75	100	0	25	50	75	100
Yellow maize	60.0	60.4	61.6	62.3	63.2	61.5	62.9	63.6	64.0	63.9
Soybean meal	22.0	22.4	22.4	22.6	23.0	18.4	18.8	19.4	19.5	19.6
Wheat	6.05	5.50	4.35	3.55	2.55	10.0	8.10	7.20	6.65	6.90
Wheat bran	0.00	0.00	0.00	0.00	0.00	0.85	0.90	0.60	0.95	0.80
Fish meal	8.00	6.00	4.00	2.00	0.00	5.00	3.75	2.50	1.25	0.00
PBP meal	0.00	2.00	4.00	6.00	8.00	0.00	1.25	2.50	3.75	5.00
Fat	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Bone meal	1.50	1.35	1.35	1.35	1.25	1.50	0.50	1.50	1.17	1.17
$CaCo_3$	0.60	0.55	0.45	0.35	0.30	0.80	0.80	0.80	0.77	0.60
Salt (NaCl)	0.25	0.20	0.15	0.15	0.15	0.20	0.15	0.15	0.20	0.22
V+MM[2]	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
DL-Methionine	0.10	0.00	0.10	0.10	0.15	0.15	0.15	0.15	0.15	0.15
L-Lysine	0.15	0.10	0.10	0.20	0.10	0.10	0.10	0.10	0.10	0.15
Vitamin C	0.10	0.10	0.10	0.10	0.10	0.00	0.00	0.00	0.00	0.00
Calculated nutrient composition (%)										
ME (kcal/kg)	3001	3001	3001	3001	3001	3001	3001	3001	3001	3001
Crude protein	21.50	21.50	21.42	21.41	21.4	18.70	18.70	18.70	18.70	18.70
Crude fiber	3.10	3.10	3.10	3.10	3.10	3.10	3.10	3.10	3.10	3.10
Available Ca	0.91	0.90	0.91	0.93	0.93	0.90	0.94	0.97	0.90	0.87
Available P	0.44	0.42	0.42	0.41	0.38	0.38	0.38	0.39	0.35	0.35
Lysine	1.20	1.20	1.20	1.20	1.20	1.05	1.03	1.01	1.00	1.00
Methionine	0.53	0.41	0.48	0.46	0.49	0.51	0.49	0.48	0.47	0.45
Met.+ Cyst.	0.81	0.70	0.80	0.77	0.79	0.76	0.75	0.75	0.74	0.73

[1]Poultry by products; [2]Vitamin + mineral mixture: supplied mg/kg diet.

included at 50 and 100% level in maize-soybean meal practical diets. The lower performance of the birds fed on PBM in the early ages may have been due to its lower digestibility of this protein source as compared to fish meal. This can be demonstrated by the higher nitrogen excretion (in terms of litter N% in this study) and poorer metabolizability of nitrogen in the birds fed with PBM containing diets as reported by Silva et al. (2002) and Kirkpinar et al. (2004).

There are evidences which suggest that dietary manipulation through incorporation of perfect combinations of different protein sources into broiler diets is a useful means to reduce litter nitrogen content and subsequently ammonia emission from poultry houses (Ferguson et al., 1998). The results of the current study showed that the source of dietary protein has a remarkable effect on blood concentrations of uric acid and urea (Table 3). Such effects are expected to be reflected in the nitrogen (N) content of faeces and litter. However, litter samples did not differ in nitrogen content and no consistent trend in nitrogen content of litter were observed for increased substitution levels of FM with PBM. Nonetheless, the nitrogen content was numerically lower for the litter samples which were collected from the pens pertaining to the birds fed with diets in which FM was replaced with PBM by 25% (Table 4). As confirmed by Silva et al. (2002), this implies that inclusion of perfect combination of different protein sources in broiler diets might be a useful means to reduce litter nitrogen content and subsequently ammonia emission from poultry houses. The mean litter moisture and pH at day 42 was not significantly affected by dietary inclusion of PBM inclusion ($P>0.05$). However, litter samples from the pens assigned to the birds fed on control diets (containing no PBM) tended to be higher as compared to those fed with 25% PBM-included diets ($P<0.1$; Table 4). Due to high ambient temperatures, the values recorded for litter moisture were generally low in the current study. There is a well known association between litter pH and ammonia emission from litter (Fergusen et al., 1998). Higher nitrogen content in litter provides uerolytic bacteria with a precursor which results in a higher level of NH_3 and consequently a higher pH value.

Dietary inclusion of protein sources with greater biological value lead to greater nitrogen retention and subsequently resulted in higher growth rates in birds. Moreover, it would be expected that dietary inclusion of a protein source with a higher biological value causes a lower serum

Table 2. Effect (mean ± S.E.) of substituting fish meal with poultry by-product on weight gain, feed intake, feed conversion ratio, carcass weight (CW), carcass yield (CY) and morality (Mor.) of broiler chickens.

Parameter	Level of substituting fish meal with Poultry by -product (%)					PBP effect
	0	25	50	75	100	
Weight gain (g)						
1-21d	462.9±7.19[a]	437.4±6.39[b]	439.1±8.27[b]	435.1±9.65[b]	427.5±5.21[b]	*
22-42d	1200.3±24.51	1176.3±22.45	1191.1±25.87	1211.6±19.97	1212.6±30.11	NS
1-42d	1663.2±28.51	1613.7±24.01	1630.1±32.88	1647.3±18.47	1640.6±33.41	NS
Feed intake (g)						
1-21d	944.3±19.11[a]	903.5±7.69[a]	846.3±22.74[b]	836.3±11.97[b]	829.5±23.36[b]	***
22-42	2698.0±105.2	2475.7±54.7	2600.3±122.3	2703.3±73.6	2535.7±83.9	NS
1-42d	3642.3±122.3	3379.2±53.0	3446.7±132.9	3539.7±72.6	3365.2±99.4	NS
Feed conversion ratio (feed intake : weight gain)						
1-21d	2.040±0.037[ab]	2.065±0.034[a]	1.927±0.054b[c]	1.922±0.027[c]	1.940±0.050[c]	***
22-42d	2.247±0.109	2.104±0.037	2.183±0.084	2.231±0.087	2.091±0.072	NS
1-42d	2.189±0.089	2.094±0.026	2.115±0.072	2.148±0.063	2.052±0.064	NS
CW (g)	1254.6±6.84	1202.5±49.40	1201.9±20.49	1229.1±15.82	1217.6±31.09	NS
CY (%)	73.72±1.06	72.81±1.93	72.62±0.54	72.92±0.58	72.47±1.14	NS
Mor. (%)	6.94±2.5	5.55±1.75	8.33±2.15	7.50±3.56	6.94±2.56	NS

[A-C]Means with in a row with no common superscript differ significantly (P<0.05). *P<0.05, **P<0.01, ***P<0.001, NS, non significant.

Table 3. Effects of experimental treatments on serum urea and uric concentrations of birds.

R. level[1] (%)	Serum (mg/dl)	
	Urea	**Uric acid**
0	3.25± 0.22[ab]	3.16± 0.31[ab]
25	3.55± 0.21[a]	4.15± 0.73[a]
50	3.67± 0.26 [a]	3.68± 0.37[a]
75	3.25± 0.18[ab]	3.22± 0.27[ab]
100	2.83± 0.17[c]	2.63± 0.27[b]
SEM[2]	0.006	0.032
	P > F	
R. level[1] (%)	0.0464	0.0325

[1]R. level: Replacement level of fish meal with poultry by-products. [2]Standard error of means. [a-c] Means within a column with no common superscript differ significantly (P<0.05).

concentrations of urea and uric acid concentrations as compared to those with lower biological values (Hevia and Clifford, 1977). Therefore, urea and more decisively uric acid can be used as influential criteria to assess the bio-availability of a protein source alone or in combination with different protein sources for broilers. Indeed, our data supported such an idea. The birds fed on diets containing 100% FM showed higher weight gain as compared to the other birds at days 1 to 21. Many studies reported that, manipulation of protein sources in poultry diets can alter the nitrogen content of litter and thereby ammonia emission (Hai and Blaha, 2000; McGrath et al., 2005). In most of such studies, dietary inclusion of either protein sources with high biological values or synthetic amino acids were the main policy (Angel et al., 2006; Richert and Sutton, 2006).

Inclusion of 10 g/kg alum in litter samples significantly decreased the litter pH in all treatments (Table 4; P<0.05). The pH lowering effect of alum in poultry litter was also confirmed by Do et al. (2005). The prominent advantage of alum-reduced pH is lowered microbial activity. Therefore, alum is an effective chemical treatment in reducing ammonia (NH_3) emissions and solubility of certain nutrients in poultry litter (Smith et al., 2001).

Conclusion

In conclusion, the results of current study suggest that FM can be totally replaced by PBM in broiler diets without increasing the nitrogen content of the litter. It is possible that the slight differences in blood uric acid and urea of the birds fed the different experimental diets were reflected as faecal nitrogen so that little differences were observed in nitrogen content of litter among the Experimental treatments. It is also possible that the immediate initiation of huge urolytic activity of litter microbes obliterated faecal nitrogen resulting in almost similar nitrogen content in the litter.

Table 4. Effects of experimental treatments on litter nitrogen, litter moisture and litter pH.

R. level[1] (%)	Litter N (%)	Litter moisture (%)	Litter* pH (-alum)	Litter* pH(+alum)
0	1.77± 0.06[ab]	17.57 ± 1.13[ab]	6.07±0.1[a]	4.99±0.1[a]
25	1.70± 0.04[b]	15.17± 0.64[b]	6.08±0.1[a]	4.81±0.2[a]
50	1.79± 0.06[a]	16.90± 1.19[ab]	6.02±0.2[a]	5.06±0.1[a]
75	1.76± 0.06[ab]	16.80± 0.65[ab]	6.02±0.1[a]	4.88±0.1[a]
100	1.75± 0.04[ab]	19.23± 1.12[a]	6.23±0.1[a]	4.82±0.2[a]
SEM[2]	0.047	0.047	0.055	0.066
			P > F	
R. level[1]	0.8106	0.0920	0.7819	0.7227

[1]R. level: Replacement level of fish meal with poultry by-products. [2]Standard error for pooled means. [a-c]Means within a column with no common superscript differ significantly (P<0.05). *The difference between pH +alum and pH -alum was significant ($\hat{t}$ =-13.62, P<0.05).

REFERENCES

Al Homidan A, Robertson JF, Petchey AM (2003). Review on effect of ammonia and dust concentrations on broiler performance. World's Poult. Sci. 59:340-349.

Amon M, Dobeic M, Misselbrook TH, Pain BF, Phillips VR, Sneath RW (1995). A farm-scale study on the use of De-Odorase for reducing odour and ammonia emissions from intensive fattening piggeries. Bioresource Technology 51:163-169.

Angel R, Powers W, Bastyr S, Wu W, Applegate T (2006). Dietary modifications to reduce air emissions from broiler chickens. Workshop on Agricultural Air Quality: State of Science. pp. 460-463.

Applegate TJ, Powers WJ, Angel R, Hoehler D (2008). Effect of amino acid formulation and acid supplementation on performance and nitrogen excretion in turkey toms. Poult. Sci. 87:514-520.

Apsimon HM, Kruse M, Bell J (1987) Ammonia emissions and their role in acid deposition, Atmospheric Environment 21:1939-1946.

Association of Official Analytical Chemists (1999). Association of Official Analytical Chemists, 1984. Official Methods of Analysis, 14th ed. Association of Analytical Chemists, Washington, DC.

Blair R, Jacob JP, Ibrahim S, Wang P (1999). A quantitative assessment of reduced protein in diets and supplements to improve nitrogen utilization. J. Appl. Poult. Res. 8:25-47.

Choi IH, Kim JN, Kwon YM (2008). Effects of chemical treatments on pH and bacterial population in poultry litter: a laboratory experiment. British Poult. Sci. 49:497- 501.

Do JC, Choi IH, Nahm KH (2005). Effects of chemically amended litter on broiler performances, atmospheric ammonia concentration, and phosphorus solubility in litter. Poult. Sci. 84:679-686.

Ferguson NS, Gates RS, Taraba JL, Cantor AH, Pescatore AJ, Straw ML, Ford MJ, Burnhams DJ (1998). The effect of dietary protein and phosphorus on ammonia concentration and litter composition in broilers. Poult. Sci. 77:1085-1093.

Hai DT, Blaha J (2000). Effect of low-protein diets adequate in levels of essential amino acids on broiler chicken performance. Chech. J. Anim. Sci.45:429-436.

Hevia P, Clifford J (1977). Protein intake, uric acid metabolism and protein efficiency ratio in growing chicks. J. Nutr. 107(6):959-964.

Keshavarz K (1991). The effect of calcium sulfate (gypsum) in combination with different sources and forms of calcium carbonate on acid-base balance and eggshell quality. Poult. Sci. 70:1723-1731.

Khosravinia H (2006). Effect of oiling and antimicrobial spray of litter on performance of broiler chicken reared on leaves and corn cob bedding materials under heat stress condition. Asian-Australasian J. Anim. Sci. 19(11):35-42.

Khosravinia H, Mohamadzadeh S (2006). Use of poultry by-products in broiler diets. Indian J. Poult. Sci. 41(2):150-154.

Kimberly L, Michael J, Rothrock Jr J, Warren G, Sistani KR, Moore PAJr (2008). Effect of Alum Treatment on the Concentration of Total and Ureolytic Microorganisms in Poultry Litter. J. Environ. Qual. 37:2360-2367.

Kirkpinar F, Acikgoz Z, Bozkurt M, Ayhan V (2004). Effects of inclusion of poultry by-product meal and enzyme-prebiotic supplementation in grower diets on performance and feed digestibility of broilers. Br. Poult. Sci. 45(2):273-279.

Koerkamp PWG (1994). Review of emissions of ammonia from housing systems for laying hens in relation to sources, processes, building design and manure handling. J. Agric. Eng. Res. 59:73-87.

McGrath, J.M., J.T. Sims, R.O. Maguire, W.W. Saylor, C.R. Angel, and B.L. Turner (2005). Broiler diet modification and litter storage: Impacts on phosphorus in litters, soils, and runoff. J. Environ. Qual. 34:1896-1909.

National Research Council (1994). Nutrient Requirements of Poultry, 9th rev. edn. Washington, DC, National Academy Press.

Richert BT, Sutton AL (2006). Nutrition, nutrient excretion and odor: Current and future opportunities. Proc. 37th Annual Mtg. American Assoc, Swine Vet. Pg. 42-55. Kansas City. MO.

Ritz CW, Fairchild BD, Lacy MP (2004). Implications of ammonia production and emissions from commercial poultry facilities: A review. J. Appl. Poult. Sci. 13:684-692.

SAS Institute (1998). SAS® User's Guide: Statistics. Version 6.0 Edition. SAS Institute, DC.

Schefferle HE (2008). The decomposition of uric acid in built up poultry litter. J. Appl. Microbiol. 28:412-420.

Silva SSP, Priyankarage N, Gunaratne SP, Mangalika ULP and Gunaratne GDJK (2002). Effect of substituting fish meal with poultry offal meal on performance, nutrient utilization and nitrogen excretion in broiler chicken. British Poult. Sci. 43:S48-S50.

Smith DR, Moore PA, Maxwell Jr CV, Daniel TC (2001). Dietary phytase and aluminum chloride manure amendments to reduce phosphorus and ammonia volatilization from swine manure. Pages 502-507 in Addressing Animal Production and Environmental Issues. Sheraton Imperial, Research Triangle Park, NC.

Van der Hoek KW (1998). Estimating ammonia emission factors in Europe: Summary of the work of the UNECE Ammonia Expert Panel, Atmos. Environ. 32:315-316.

Wu W, Powers W, Bastyr S, Applegate TJ, Hale C, Angel R (2007). Effect of an acidifying diet combined with zeolite and slight crude protein reduction on air emissions from laying hens of different ages. Poult. Sci. 86:175-181.

academicJournals

Vol. 8(2), pp. 28-33, February 2014
DOI: 10.5897/JCAB2014.0404
ISSN 1996-0867 ©2014 Academic Journals
http://www.academicjournals.org/JCAB

Journal of Cell and Animal Biology

Full Length Research Paper

Reproductive and productive performance of Kereyu Sanga cattle in Fentalle District of Oromia Region, Ethiopia

Shiferaw Garoma

Asella School of Agriculture, Adama Science and Technology University, P.O.Box 193, Ethiopia.

Accepted 30 January, 2014

This study was carried out to generate information on some productive and reproductive performance of Kereyu Sanga cattle in their home tract. The data was collected through questionnaire from 114 Kereyu Sanga cattle owners. Fifty four third parity lactating Kereyu Sanga cows were randomly selected for milk yield measurement. According to the respondents, the mean age at puberty, age at first calving, lactation length and calving interval for Kereyu Sanga cows were 47.5, 54.1, 8.5 and 18 months, respectively, with associated lifetime calf crop production of 7.1 and reproductive lifespan of 13.2 year. The overall fertility rate of Kereyu Sanga cows was 55.4%. The mean reported age at puberty and reproductive life span for Kereyu Sanga bulls were 49 months and 9.2 years, respectively. The mean reported daily and lactation milk yield of Kereyu sanga cows were 1.8 and 463.1 L, respectively, whereas the mean measured third parity daily and lactation milk yield were 2 and 543 L, respectively. The reported variations both in some productive and reproductive performance and the observed variations in measured milk yield among the individual animals under such harsh environment indicate the possibility of improving the performance of this adapted Sanga breed through selection in their home tract so as to enhance their contribution towards poverty alleviation.

Key words: Cattle, fertility, Kereyu Sanga breed, lactation, milk yield, reproduction.

INTRODUCTION

In the semi-arid area of Africa where livestock support livelihoods for the majority of the population, indigenous livestock breeds form the backbone of livestock production because of their ability to survive and reproduce under stressful tropical environments. Native livestock breeds are often regarded as unproductive. What is generally meant, however, is that such animals have low levels of output. Productivity implies some relationship between inputs and outputs whereas production is merely an output function. The cattle industry, in particular as producer of meat and milk, is very poor as evidenced by the annual growth rate of 1.8% for milk and 2.8% for meat (ILCA, 1993) which is far below the recommended average growth rate of 4.0% that is needed to meet the demand of the growing human population (Winrock International, 1992).

Indigenous livestock breeds whose adaptive traits permit survival and reproduction under the harsh climatic, nutritional and management conditions typically associated with resource-poor livestock keepers have been shown to outperform crossbreeds under such circumstances (Ayalew et al., 2003).

The Kereyu (Synonym: Doba as it is named and called by the Kereyu people) breed derives its name from

Email- shiferawgf@yahoo.com or shiferaw.garoma@gmail.com. Fax: 0223313430.

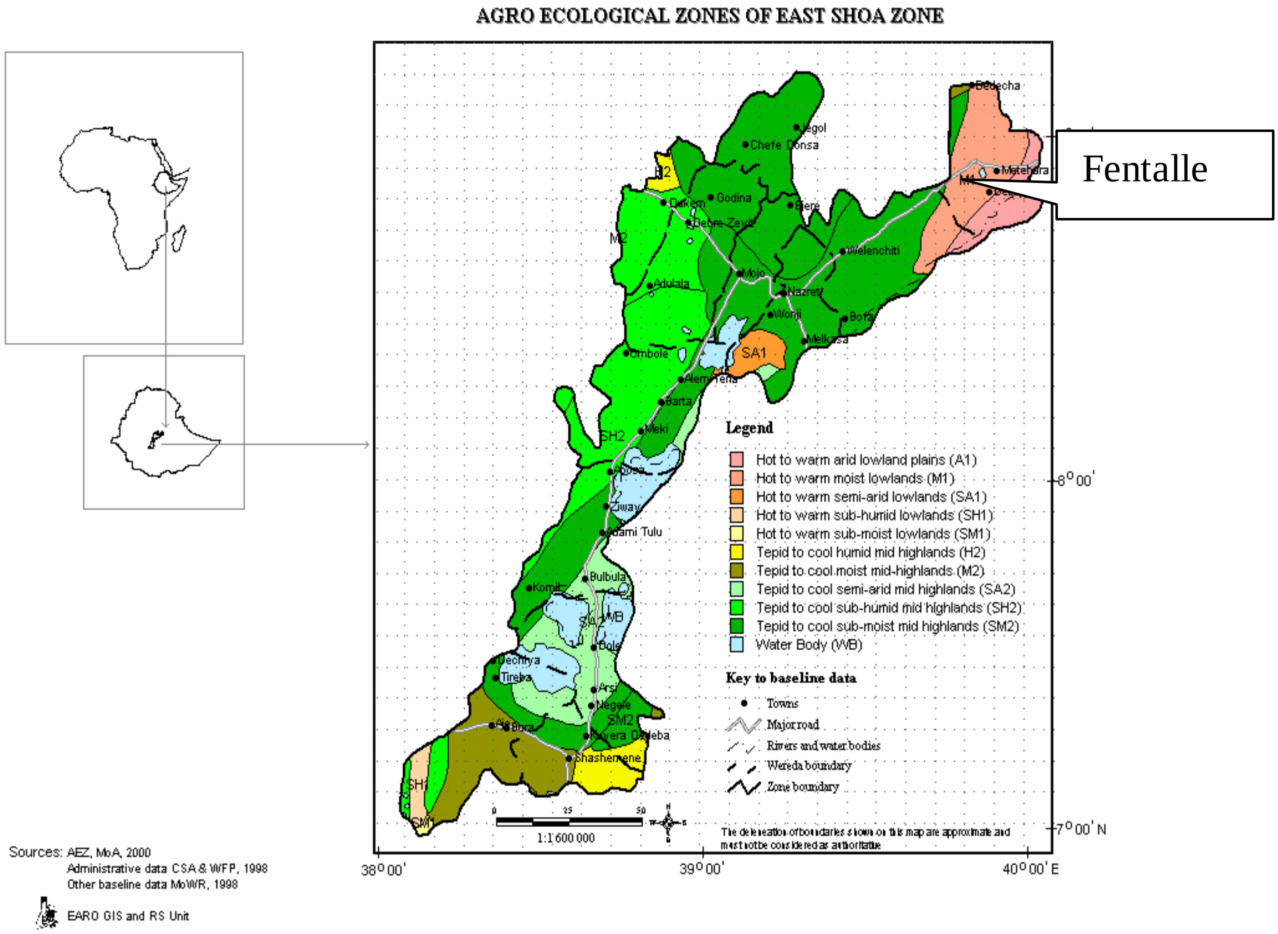

Figure 1. Map of east Shoa zone and Fentalle district.

Kereyu people who maintain the breed in the Fentalle district of east Shoa zone of Oromia, which is the major natural breeding tract of the breed. The breed is well-adapted to the extremely harsh condition of the area, where milk production plays a considerable role in the traditional economy of pastoral and agro-pastoral communities. They also serve as a source of draught power for the neighboring districts as well as beef.

The great advantages of the indigenous livestock of Ethiopia are their adaptation to the stressful environments and their ability to produce any output at all. The majority of the information that is available on indigenous cattle in Ethiopia is from on-station evaluation. Information on productive and reproductive performance of Kereyu cattle is scanty. Hence, this study was carried out to evaluate some reproductive and productive performance of Kereyu Sanga breed in their breeding tract.

MATERIALS AND METHODS

Study area

Pastoralism and agro-pastoralism are the main livelihood systems in the area. Major crops in the district (in order of importance) are maize, tomatoes, onions and teff (Fentalle District Rural Development Office, Personal communication). Fentalle district is located in east Shoa zone of Oromia, southern part of the northern Rift Valley of Ethiopia (Figure 1). The area falls within an altitude range of 800-1100 masl. However, there are high peaks on the Fentalle Mountain from which the district derives its name, reaching up to 2007 masl (Abule, 2004). The study area is found at a distance of about 200 km from the capital city of Ethiopia, Addis Ababa, on the way to Harar. It is affected by recurrent droughts due to disrupted rainfall patterns.

The total land area of the district is 1170 km^2 (CSA, 2000). The study district falls in a semi-arid zone, and receives an annual rainfall ranging from 400 to 700 mm. Temperature ranges from 29 to 38°C. Agro-ecologically, the district falls in hot to warm moist lowlands. Fentalle district lies in one of the most geologically active areas of the world (Abule, 2004).

Sampling technique

To help determine the sampling frame, exploratory discussions were held with the experts of the rural and agricultural development office, with the representative of the pastoral community of the district and with the elderly Kereyu Sanga cattle owners to identify major production systems, concentration of Kereyu Sanga breed and cattle production constraints in the district. Currently, in Fentalle district there are 20 peasant associations (2 urban and 18 rural) of which 55.6 and 44.4% are agro-pastoral and pastoral, respectively.

Table 1. Summary of reported indicative reproductive performance for sample female cattle population by production systems.

Production system	Variable	Mean	SD	Minimum	Maximum	CV (%)
	Age at puberty (month)	41.7	7.63	24	60	18.3
	Age at first calving (month)	50.7	7.07	42	72	13.9
Pastoral (n=38)	*LTCP (number)	7	1.57	4	10	22.3
	Calving interval (month)	18	3.00	12	24	16.7
	Reproductive lifespan (year)	11	2.40	7	16	21.7
	Age at puberty (month)	47.7	7.71	30	60	16.2
	Age at first calving (month)	55.8	9.13	42	84	16.4
Agro-pastoral (n=76)	*LTCP (number)	7.0	1.91	3	11	27.2
	Calving interval (month)	18	3.43	12	24	19.0
	Reproductive lifespan (year)	14.3	4.13	5	23	28.9
	Age at puberty (month)	45.7	8.16	24	60	17.9
	Age at first calving (month)	54.1	8.81	42	84	16.3
Overall	*LTCP (number)	7.1	1.79	3	11	25.6
	Calving interval (month)	18.0	3.28	12	24	18.2
	Reproductive lifespan (year)	13.2	3.95	5	23	29.9

*LTCP = Lifetime calf crop production.

Based on the outcome of the discussions, a total of three peasant associations (PAs), one from pastoral and two from agro pastoral production systems were purposively selected for the study. From each site 19 Kereyu Sanga cattle owners were randomly selected for administration of semi-structured questionnaire. Fifty four lactating Kereyu Sanga cows were randomly selected for milk yield measurement to estimate the daily and lactation milk yield of the sample animals and to verify what has been reported by the respondents. All the selected lactating cows were in their third parity at different lactation stages (early, mid and late). Each lactation stage comprised 18 milking cows.

Method of data collection

In each sampling site, the selected cattle owners were briefed about the importance and objectives of the study before the commencement of the actual data collection. Data was collected by six trained enumerators through the designed and pre-tested semi-structured questionnaires from 114 randomly selected households under close supervision of the researcher. The milk yield of the 54 selected cows was measured using plastic measuring cylinder (with the measuring capacity of 1000 ml) twice a day, morning and evening, from each lactation stage (early, mid and late lactation). The period the milk yield measured was dry season.

Data management and analysis

The data collected from the field through questionnaire and milk yield measurements and secondary sources were entered into computer using Excel software. SAS (1999) was employed to analyze the data using descriptive statistics, including summary statistics, correlations and frequency counts.

RESULTS AND DISCUSSION

Purposes of keeping Kereyu cattle

In both pastoral and agro-pastoral systems Kereyu cattle are kept for multipurpose functions. Milk (98.2%), source of income (97.4%), dowry payment (80.7%), breeding (78.1%), meat (57%), hide (55.3%) and saving (52.6%) were among the frequently reported reasons for which Kereyu cattle are kept in the study areas. Similar results were reported earlier by Mukasa-Mugerwa et al. (1989) and Rege et al. (2001) in Ethiopia and Kenya, respectively. In developing countries, especially in low input smallholder production systems, the most valuable livestock attributes are often those that successfully guarantee multifunctionality, flexibility and resilience in order to deal with variable environmental conditions.

Reproductive performance

The average reported age at sexual maturity for Kereyu female and male cattle were 45.7 (Table 1) and 49 (Table 4) months, respectively, which are longer than the recent on-farm survey report for indigenous cattle breeds. Workneh and Rowlands (2004) reported the overall mean sexual maturity of 39.6 months for female and 39.9 months for male of indigenous cattle of Oromia Regional State. The same authors reported the mean age at sexual maturity of 41.7 for female and 42.5 months for male in pastoral production system and 43.3 months for female and 45.6 months for males in agro pastoral production system. Zewdu (2004) reported age at sexual maturity of 55.6, 57 and 55.7 months for Semien, Wegera and Mahibere-Sillasie breeding bulls which are slightly longer than the reported age at sexual maturity for Kereyu breeding bulls.

The overall reported mean age at first calving (AFC) for Kereyu breeding females was 54.1 months. Similar age was reported for some indigenous cattle types by different authors. Takele (2005) reported 54.1 months for

Table 2. Correlation matrix of reported reproductive traits in female cattle population sample.

Parameter	AAP	AFC	LTCP	CI	RLP
AAP		0.81 (<0.0001)	0.02 (0.8550)	0.21 (0.0267)	0.34 (0.0002)
AFC			0.02 (0.8005)	0.25 (0.0080)	0.28 (0.0021)
LTCP				0.02 (0.8372)	0.39 (<0.0001)
CI					0.25 (0.0071)
RLP					

AAP = Age at puberty, AFC = age at first calving, LTCP = lifetime calf crop production, CI = calving interval, RLP = reproductive lifespan.

Table 3. Summary of some indicative reproductive performance for male cattle population sample.

Production system	Variable*	Mean	SD	Min	Max	CV (%)
	AAP (month)	47.5	6.60	30	60	13.9
Pastoral (n=38)	RLP (year)	8.3	1.63	5	13	19.6
	AAC (year)	5.8	0.97	4	7	16.8
	AAP (month)	49.7	6.32	30	60	12.7
Agro-pastoral (n=76)	RLP (year)	9.6	2.59	5	14	26.9
	AAC (year)	5.2	1.16	2	8	22.1
	AAP (month)	49.0	6.47	30	60	13.2
Overall (n=114)	RLP (year)	9.2	2.39	5	14	26.0
	AAC (year)	5.4	1.12	2	8	20.7

* AAP = Age at puberty, RLP= reproductive lifespan, AAC = age at castration.

Sheko breed whereas, Dereje (2005) reported 53.1 months for Raya-Sanga cattle. Similarly, Zewdu (2004) reported 54.7 and 53.4 months of age at first calving for Wegera and Fogera cattle, respectively. Mekonnen and Goshu (1987) and Enyew (1992) reported a lot shorter AFC on-station of 32.8 and 38.8 months for Arsi and Fogera cattle, respectively. Mekonnen (1994) and Kassa and Arnason (1986) reported average age at first calving of 41.5 and 45.2 months, respectively for Borana cattle.

The longer average age at first calving reported for Kereyu cattle might be associated with scarcity of feed and shortage of water for the long dry season of the year in the study area. Regardless of the breed, the association of feed availability with attaining age at first calving for heifers was reported (Kiwuwa et al., 1983).

The average calving interval for Kereyu cattle was 18 months (Table 3), which was longer than what had been reported by Takele (2005) for Sheko cows (15.6 month) and by Dereje (2005) for Wello highland zebu cattle (16 months) but slightly lower than Raya Sanga cattle (19 month). Zewdu (2004) reported similar calving interval for Wegera (17.5 month) and Fogera (17.3 month) cattle whereas longer calving interval for Semien (22.4 month) cattle. The range calving interval estimates for Kereyu cattle (12-24 months) was within the range of the earlier estimates of calving intervals for Ethiopian zebu cattle of 12.2 to 26.6 months (Mukasa-Mugerwa and Azage, 1991). The mean reported reproductive lifespan of Kereyu breeding female was 13.2 years with associated lifetime calf crop production of 7.1. These values are slightly lower than what has been reported by Takele (2005) for Sheko breed.

The analysis of the correlation matrix (Table 2) indicates that most of the reported fertility traits considered in this study showed from low to high positivecorrelations. The strongest relationship was between age at puberty and age at first calving (r = 0.81, *P*<0.0001). Age at puberty was positively correlated with the reproductive lifespan of the animal (r = 0.34, *P* = 0.0002) indicating that reducing age at first calving would increase the reproductive lifespan of a cow. Lifetime calf crop production was positively correlated with the reproductive lifespan of the animal (r =0.39, *P*<0.0001) indicating the possibility of improving both fertility traits through improved management (feeding, health care or breeding). Fertility measures were reported to be closely related to each other (Kadarmideen et al., 2000). However, the correlation of lifetime calf crop production with the rest of the fertility traits considered in this study was found to be very minimal. This might be due to the small sample size, size of the variance (Table 1) and some unexplained factors.

Age at puberty and age at first calving were slightly shorter in pastoral area than in agro-pastoral probably due to their proximity to the bordering rangelands and their grazing areas are relatively better than that of the agro-pastoral. The mean reported reproductive lifespan of Kereyu breeding bulls was 9.2 year which is longer than the reported value (6.5 year) for Sheko breeding

Table 4. Summary of first, second and third parity lactation milk yield as reported by sample households.

Parity	Variable	Mean	SD	Min	Max	CV (%)
	Lactation length (month)	8.2	2.34	3	12	28.4
First	Lactation daily milk yield (liter)	1.4	0.53	0.4	3	39.2
	Lactation milk yield (liter)	329.4	161.53	90	900	49.0
	Lactation length (month)	8.6	2.24	4	12	26.2
Second	Lactation daily milk yield (liter)	1.9	0.63	0.6	3.3	33.0
	Lactation milk yield (liter)	490.9	217.72	84.0	1089	44.3
	Lactation length (month)	8.8	2.26	4	12	25.7
Third	Lactation daily milk yield (liter)	2.2	0.69	0.5	3.8	31.9
	Lactation milk yield (liter)	569.0	246.34	144	1260	43.3
	Lactation length (month)	8.53	2.25	3.7	12	26.3
Overall	Lactation daily milk yield (liter)	1.8	0.54	0.5	3.3	30.1
	Lactation milk yield (liter)	463.1	189.72	108	1070	40.9

bulls (Takele, 2005) and mean age at castration of Kereyu male animals was 5.4 year that is almost similar to the reported value (5.7) for Sheko male animals.

Milk production and lactation performance of Kereyu cattle

The mean reported first, second and third parity daily and lactation milk yield of Kereyu cattle (Table 4) were 1.4 and 329 L; 1.9 and 491 L and 2.2 and 569 L, respectively, with the overall mean daily and lactation milk yield of 1.8 and 463 L, respectively. The reported (1.8 liters) mean daily milk yield for Kereyu cattle was higher than the recent report from extensive livestock breed survey done in Oromia Regional State with overall average daily milk yield of 1.4 L (Workneh and Rowlands, 2004) and the earlier report (CSA, 1995) for the national overall average of 1.17 L per day. Dereje (2005) reported similar on-farm daily milk yield of 1.8 and 1.9 L per day for Raya Sanga and Wello highland zebu cattle, respectively. However, this average value was slightly lower than the reported figure (2.3 L) for Sheko breed (Takele, 2005).

The mean reported first, second and third lactation lengths for Kereyu cattle were 8.2, 8.6 and 8.8 months, respectively, with the overall mean lactation length of 8.53 months. Dereje (2005) reported similar mean lactation length for Wello highland zebu cattle (8.6 months) and longer lactation length for Raya Sanga cattle (11 months). Zewdu (2004) reported mean lactation length of 8.7 months for Fogera cattle for the second parity, which was similar to the present report for Kereyu cattle for similar parity. The mean on-farm first and second lactation length reported by Zewdu (2004) for Semien and Wegera cattle breeds were 4.6 and 7.5 months, respectively that were shorter than the present finding for Kereyu cattle.

In general, however, the present result of lactation length of Kereyu cattle was longer than the earlier report for national average of 6.33 months (CSA, 1995). Lactation length has a genetic basis and is a major limiting factor of milk production in the tropics (Rege et al., 2001). There was a gradually increasing trend in the reported mean daily and lactation milk yield from the first to the third parity. Tadele et al. (2005) reported a similar increasing trend for Simmental x Borana crossbred cows under on-farm conditions. Individual variations were observed both for reproductive and productive traits considered in this study. These types of variations provide a solid basis for genetic improvement through selection.

Measured third parity lactation milk yield from sample population

Even though, the time of data collection was during the long dry season, the overall mean measured third parity daily and lactation milk yield was 2 and 543 L, respectively, as indicated in Table 5. This result was based on a single day, morning and evening, milk yield measurements from each lactation stage to verify what had been reported by the respondents through questionnaire. Accordingly, the result of the measured milk yield was similar to what had been reported by the respondents. This indicates the soundness of information generated from the respondents through questionnaire. High variation both in daily and lactation milk yield was observed (Table 5) as in the case of the reported one indicating the possibility of improving the performance of Kereyu cattle type through selection from within the existing breed.

Conclusions and recommendations

Kereyu cattle breed has both regional and national importance. They are kept for multipurpose functions. It has been practically observed during the study period that Kereyu people, who maintain the breed, mostly rely on milk production for their diet. The observed productive and reproductive performance of Kereyu cattle type is satisfactory under the prevailing stressful and very challenging environment, where the ability to survive under

Table 5. Measured third parity daily and lactation milk yield from sample population.

Variable	N*	Mean (L)	SD	Min	Max	CV (%)
Early daily milk yield (1-3 month)	18	2.6	0.86	1.2	3.8	33.2
Mid daily milk yield (4- 6 month)	18	2.1	0.82	1.2	4	39.8
Late daily milk yield (7-9 month)	18	1.4	0.79	0.5	3.5	55.9
Overall daily milk yield	54	2.0	0.41	1.2	2.6	20.1
Lactation milk yield		543	109.14	324	702	20.1

* N = Number of milking cows per lactation stage.

natural calamities (drought, climatic extremes, feed and water shortage) is necessarily more important than high production. The observed variations in quantitative traits among the sample populations in both sexes coupled with their adaptive traits, which they acquired through generations, would indeed justify the need for designing breed improvement programme for Kereyu Sanga cattle. Such a plan can fully exploit their genetic potential and thereby enhance their contribution in improving the nutritional status of the cattle owners and improving their role towards attaining the national development goals.

ACKNOWLEDGEMENT

The author wishes to express his gratitude to the Kereyu cattle owners for allowing him to use their animals for this study and for devoting their precious time in providing the required information through the questionnaire. The author would like to extend his appreciation to the Ethiopian Institute of Agricultural Research (EIAR) for its financial support to undertake this work.

REFERENCES

Abule E (2004). Rangeland Evaluation in Relation to Pastoralists perceptions in the Middle Awash of Ethiopia. Ph.D Thesis, University of the Free State. Bloemfontein. South Africa. pp. 87-120.

Ayalew W, King J, Bruns E, Rischkowsky B (2003). Economic evaluation of smallholder subsistence livestock production: lessons from an Ethiopian goat development program. Ecol. Econ. 45(3): 473–485.

Central Statistical Authority (CSA) (1995). Livestock Resource and Production Statistics in Ethiopia. In: proc 4th Annual Conference of Ethiopian Society of Animal Production (ESAP). April 18-19.1996. Addis Ababa, Ethiopia. pp. 69-76

Central Statistical Authority (CSA) (2000). Statistical abstract of Ethiopia. Central Statistical Authority. Addis Ababa, Ethiopia. pp. 40-63

Dereje T (2005). On-farm Phenotypic Characterization of Cattle Genetic Resources and their Production Systems in South and North Wello zones of Amhara Region, Ethiopia. MSc Thesis. Alemaya University, Ethiopia. pp. 120-165.

Enyew N (1992). Reproductive Performance of Local and Crossbred Dairy Cattle at Asella Livestock Farm. M.Sc Thesis. Alemaya University of Agriculture, Ethiopia. p.104.

International Livestock Centre for Africa (ILCA)(1993). Handbook of African Livestock Statistics, ILCA. Addis Ababa, Ethiopia. pp. 64-89.

Kadarmideen HN, Thomson R, Simm G (2000). Linear and threshold model genetic parameters for disease, fertility and milk production in dairy cattle. Anim. Sci. 71: 411-419.

Kassa A, Arnason T (1986). Non-genetic factors affecting growth in Borana cattle. World Rev. Anim. Prod. 22: 45-55.

Kiwuwa HG, Trail CMJ, Kurtu YM, Getachew W, Anderson MF, Durkin J (1983). Crossbred dairy cattle productivity in Arsi region, Ethiopia. ILCA research paper 11. Addis Ababa, Ethiopia. p. 26.

Mekonnen Hailemariam (1994). Genetic Analysis of Boran, Friesian and Crossbred Cattle in Ethiopia. Ph.D. thesis. Swedish University of Agricultural Sciences. Upsala, Sweden. pp. 84-117.

Mekonnen Haile-Mariam, Goshu Mekonnen (1987). Reproductive performance of Fogera cattle and their Friesian crosses. Eth. J. Agric. Sci. 9(2): 95-114.

Mukasa-Mugerwa E, Azage T (1991). Reproductive performance in Ethiopian zebu (*Bos indicus*) cattle: Constraints and impacts on production.. In: Proceeding of the 4th National Livestock Improvement Conference (NLIC), 13-15 November 1991. Institute of Agricultural Research. Addis Ababa, Ethiopia. pp. 1-29

Mukasa-Mugerwa E, Ephrem B, Tadesse T (1989). Type and productivity of indigenous cattle in central Ethiopia. Trop. Anim. Health Prod. 21: 20- 25.

Rege JEO, Kahi AK, Okomo-Adhiambo M, Mwacharo J, Hanotte O (2001). Zebu cattle of Kenya: Uses, performance, farmer preferences, measure of genetic diversity and options for improved use. Animal genetic resources research 1. ILRI (International Livestock Research Institute) Nairobi, Kenya. p. 103.

Statistical Analysis System (SAS) (1999). SAS Institute Inc., SAS/STAT user's guide, version 8, Cary, NC: SAS institute Inc., 1999. p3884.

Tadele M, Nega T, Tatek W, Hailu D, Tesfaye AA, Abule E, Shiferaw G, Dadi G (2005). Lessons from on-farm performance evaluation of Simmental x Borana crossbred cows at Adami Tullu and Arsi Negelle Districts, Mid Rift Valley. In: Proc. 12th Annual Conference of the Ethiopian Society of Animal Production (ESAP), Addis Ababa, Ethiopia, August 12-14, 2004. ESAP, Addis Ababa. Ethiopia. pp. 147-154.

Takele T (2005). On-Farm Phenotypic Characterization of Sheko Breed of Cattle and Their Habitat in Bench Maji zone, Ethiopia. M.Sc Thesis. Alemaya University, Ethiopia. pp. 24-66.

Winrock International (1992). Animal Agriculture in sub-Saharan Africa. Winrock International, Institute for Agricultural Development, Morrilton, Arkansas, USA. pp. 250-255.

Workneh A, Rowlands GJ (2004). Design, execution and analysis of the livestock breed survey in Oromia Regional State, Ethiopia. OADB (Oromia Agricultural Development Bureau), Addis Ababa, Ethiopia and ILRI (International Livestock Research Institute), Nairobi Kenya. p. 260.

Zewdu W (2004). Indigenous Cattle Genetic Resources, Husbandry Practices and Breeding Objectives in Northewestern Ethiopia. M.Sc Thesis. Alemaya University, Ethiopia. pp. 36-74.

UPCOMING CONFERENCES

BIT's 4th Annual World Congress of Molecular & Cell Biology (CMCB2014), Dalian, China, 25 Apr 2014

International Conference on Cellular and Molecular Biology, Copenhagen, Denmark, 12 Jun 2014

ICCMB 2014 : International Conference on Cellular and Molecular Biology

Conferences and Advert

February 2014
7th Asia-Pacific Organization for Cell Biology Congress, Biopolis, Singapore, 24 Feb 2014

March 2014
American College of Medical Genetics and Genomics (ACMG) Annual Clinical Genetics Meeting, Nashville, USA, 25 Mar 2014

April 2014
18th Annual International Conference on Research in Computational Molecular Biology, Pittsburgh, USA, 02 Apr 2014

Society for General Microbiology Annual Conference, Liverpool, UK, 14 Apr 2014

BIT's 4th Annual World Congress of Molecular & Cell Biology (CMCB2014), Dalian, China, 25 Apr 2014

May 2014
International Conference on Biochemistry and Molecular Biology, Vienna, Austria, 17 May 2014

International Conference on Molecular Biology, Biochemistry and Biotechnology, Tokyo, Japan, 29 May 2014

June 2014
16th International Conference on the Cell and Molecular Biology of Chlamydomonas, Pacific Grove, USA, 08 Jun 2014

Tissue Engineering and Regenerative Medicine International Society (TERMIS) EU 2014 Congress, Genova, Italy, 10 Jun 2014

International Conference on Cellular and Molecular Biology, Copenhagen, Denmark, 12 Jun 2014

11th Gordon Conference on Cell Biology of the Neuron, Waterville Valley, USA, 22 Jun 2014

EMBO Conference on Microbiology after the Genomics Revolution: Genomes 2014, Paris, France, 24 Jun 2014

Journal of Cell and Animal Biology

Related Journals Published by Academic Journals

- *International Journal of Genetics and Molecular Biology*
- *Journal of Microbiology and Antimicrobials*
- *International Journal of Biodiversity and Conservation*
- *Journal of Bacteriology Research*
- *Journal of Developmental Biology and Tissue Engineering*
- *Journal of Evolutionary Biology Research*

academicJournals