ADDENDUM

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57	References	02	[2]	[8]
56	03	08	[4]	[6]
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SHORT COMMUNICATION

THE OBSERVATIONS MADE CONCERN WEIGHT GAIN, LOCATION AND CALVING INTERVALS IN THE RED SINDHI CATTLE-LFRU AT THATTA, SARC, PRIOR TO AUCTION

*Khan Ulfata-un-Nabi **Junejo Salahuddin and ***Muhammad Hafeez

*Director General, SARC-Karachi. **PSO-NSCRI, Thatta
***Director LDF-Islamabad and Chief Executive PLWO, Islamabad.

ABSTRACT

A total of 32 (thirty two) Red Sindhi Cattle, categorized as Cows 05, Bulls 12, Heifers 07 and Calves 08 were bred at Livestock and Fisheries Research Unit (LFRU) Thatta. These animals were farm produced w.e.f. 2000-2001 except two animals purchased in 2001 and 2004. The book value at the time of auction on 10-11-2010 for whole the lot was estimated at Rs.5,91,120-00. The auction of these animals was announced in the news papers and appeared in the Daily DAWN, The News, The Nation, The Daily Jang, Daily Sindh and others on 4th and 5th of November, 2010. The routine auction methodology was exercised on the DAY OF AUCTION from 10:30 a.m. to 3:30 p.m. when the individual animals were introduced to the bidders. The cumulative amount obtained from this auction was Rs.10,36000/- which was collected from the highest bidders and was deposited in the treasury as an income to the state which was almost double the amount of book volume. Various observations of this herd, as observed have been detailed in this short communication.

Key words: Weight Gain, Lactation, Calving Interval, Red Sindhi Cattle, Thatta, Pakistan.

OBSERVATIONS:

Land of lactation. The lactation duration was from a minimum of 154.67 days and the maximum was 248 days with an average of 187.55 days in form bred cows while in the purchased cow, it was 288 days.

Range of calving interval. The minimum calving interval observed was 334.60 days and the maximum range was 482 days, in the farm bred cows, with an average of 403 days while in the purchased cow it 725 days.

Milk Produced per lactation. The minimum of 574 liters per lactation was observed in the farm bred cows and 647.33 liters as maximum with an average of 581.77 liters this quantity of milk was recorded as 1190 liters in the purchased cows.

Average milk yield per animal. The minimum yield per animal was 2.30 liters per time while the maximum was 4.20 liters, with an average of 3.5 liters per time, as detailed in Table-II.

Average weight Gain (Kgs). The average weight gained in 04 bulls (S. No.20, 22, 23 and 24) with DOB of 2006 was 288 Kgs (Range 260 Kgs – 300 Kgs) while the average weight gained of four bulls (sno: 26, 27, 28, 29 and 30) with

date of birth of 2004 was 380 Kgs (range of 360 Kgs-440Kgs). The bull with date of birth of 2005 weighted 380 Kgs alone, as detailed in Table-I

The **Average Weight** of 05 calves (S.Nos.14, 15, 16, 17 and 18) was 9.6 Kgs with a range of 30 Kgs to 60 Kgs of the calves with date of birth of 2009, 2010, 2010, 2010 and 2010 respectively. (Table-I).

The **apparent health status** was apparently good. These animals had regularly been vaccinated for endemic diseases. Although no extra-ordinary rich diet were provided, these animals were nicely managed but these strains of Red-Sindhi were low producers of milk, hence not deemed worth a stock for further breeding.

This stock of Red Sindhi cattle breed, initially, was started from 05 cows and 03 bulls, as a side issue, at Livestock and Fisheries Research Unit (LFRU) Thatta, SARC, Sindh, were not on special diet but prevailed on crop residues, grasses and sugar cane tops. In-breeding based on natural service of breeding bulls, within this stock, continued. F_1 and F_2 strains were obtained but no out-standing animals could be produced. The average gain was also at the lowest and milk yield was also lowest, as compared to good Red Sindhi Cattle of the selected animals, at Government as well as private farms.

Some of the Farm Young Stock (FYS), pregnant and dry heifers were growing well to become future good cows but due to no future breeding program foreseen, these were subjected to open auction.

Table Showing the name, class, date of birth and weight of animals prior to auction.

Sr. No	Name of animal	Class	DOB	Weight (Kgs)
1	Soomal	Cow	1/7/2000	300
2	Wederi	Cow	1/5/2004	160
3	Soomal	Cow	15-09-2004	240
4	Soomal	Cow	13-08-2005	260
5	Waderi	Cow	29-09-2006	160
6	Soomal	FYS	25-06-2007	150
7	Faiza	FYS	1/11/2007	40
8	Waderi	FYS	24-01-2008	120
9	Waderi	FYS	21-02-2008	130
10	Soomal	FYS	27-05-2008	130
11	Soomal	FYS	27-05-2008	130

--------Table continued on page No.133

From Pre Page

Sr. No	Name of animal	Class	DOB	Weight (Kgs)
12	Soomal	FYS	10/12/2008	90
13	Faiza	FYS	18-12-2008	90
14	Soomal	FYS	4/7/2009	60
15	Faiza	FYS	5/2/2010	36
16	Waderi	FYS	22-02-2010	36
17	Soomal	FYS	16-03-2010	36
18	Soomal	FYS	6/4/2010	30
19	Sindhri	Bull	2/7/2003	360
20	Faiza	Bull	1/4/2004	360
21	Bhambhor	Bull	1/7/2001	480
22	Sindhri	Bull	22-07-2004	360
23	Zeba	Bull	26-07-2004	440
24	Kajal	Bull	17-08-2004	360
25	Faiza	Bull	15-03-2005	380
26	Shabnum	Bull	28-02-2006	300
27	Sindhri	Bull	1/7/2006	320
28	Soomal	Bull	27-07-2006	270
29	Rehana	Bull	26-08-2006	260
30	Faiza	Bull	27-10-2006	260
31	Soomal	MYS	28-04-2009	80
32	Waderi	MYS	15-02-2010	40

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availability of Rinderpest vaccine readily available as reported in the initiated PC-I and Final Report.

The main objectives of this project included:-

- Final eradication of Rinderpest disease from the country.
- Control of Foot and Mouth disease through successful progressive strategies.
- Strengthening epidemiological units and making them functional for proper diagnosis, monitoring and surveillance of animal diseases.
- Enhancing efficiency and effectiveness of veterinary health services.
- Improving animal nutrition through enhanced availability of feed stuff/fodder.
- Establishing proper marketing system to meet the local and export requirements.
- Establishing reliable livestock management information system at Federal, Provincial and District levels.
- Enhancing the Federal and Provincial Government capabilities to address policy issues of livestock sector.
- Up-dating and harmonizing Livestock Legislation at Federal and Provincial levels.

SLSP-Targeted districts/areas

Balochistan: Pishin, Zhob, Kalat, Qilla Saifullah, Loralai, Mastung
Khyber PK Peshawar, Charsadda, Swat, Mardan, Abbotabad, Nowshera
Punjab: Kasur, TT Singh, Bhakkar, Gujrat, Chakwal, Bahawalpur

FPMU Sub-Units: AJK, NAs, FATA and Islamabad Capital Territory (ICT)

METHODOLOGY AND PLAN OF WORK.

The project was implemented throughout the country with its components and target districts as spelt out in the project proposal No. EU/GOP/PAK and RELEX/2001/0129

a. Project Brief at a glance(SLSP)

- Project Title: Strengthening of Livestock Services Project
- Execution: Livestock Wing MINFAL GOP, Islamabad.
- Sponsoring: MINFAL & European Union
- Duration 6 years
- Start date: September, 2003
- Expected completion September, 2009
- Cost of the Project Rs.1992.66 million
- Local (PSDP): Rs.1587.27 million

b. Project components (original)

- Policy and Regulatory Framework
- Vaccine Production
- Human Resource Development
- Information & Communication
- Regional Coordination
- Disease Surveillances & Diagnostic
- Strengthening of Field Services
- Inter Disciplinary Research
- Studies and Surveys
- Core Project Management

c. Project Management

- FPMU 03 GOP Officers, 02 EC Officer, 03 Accounts Officers personnel EC one PRO, One Secretary EC, 01 Auxiliary EC and 07 GOP.
- PPMU Punjab Punjab 03 GOP Officer, One EC, Secretary EC, 03 EC and 03 GO Punjab auxiliary staff.
- PPMU-Khyber PK 03 GO Khyber PK, 03 EC Officer, 03 EC and Auxiliary staff.
- PPMU Balochistan GO Baluchistan 03 GOP and one EC Officer, 03 EC and one GOBalochistan Auxiliary staff
- PPMU-Sindh 02 EC Officer, 03 GoSindh Officer, One each EC and Balochistan GoSindh Auxiliary staff

d. Disease Reporting Network Institution (DRNI)

FPMU-Islamabad, Muzaffarabad, Mirpur, Gilgit Skardu.

Punjab Lahore, TTS, Gujrat, Chakwal Bahawalpur, Kasur and Bakhar (O7)

Khyber PK Nowshara, Mardan Charsadda, Chitral, Swat and Abboatabad (06)

Balochistan Pishin, Zhob, Mastung, Loralia, Kalat and Qila Saifulla (06)

Sindh Khairpur, Sanghur, Therparkar, Badin, Thatha, Dadu and Kotli (07)

e. District Disease Reporting Centre (DDRC)

AJK-02, NAs 02, Khyber (FATA) 01, ICT-Tarlai, 01

Punjab-Rawalpindi-Sargodha-Multan, Sahiwal, Layah, Faisalabad (06)

Khyber PK -D.I. Khan, Lucky Marwat, Karak, Kohat, Haripul Mansehra (06)

Balochistan-Quila Adullah, Nushki, Barkhan, Uthal, Dera Murad Jamali and Musa Khel (06)

Sindh (06)

Models Veterinary Hospitals

AJK=2, NAs(1), Khyber PK=06, Punjab=06, Balochistan=06, Sindh=06
Total = 93 Institutions

i. Epidemiological Units for disease reporting Network Setup in 64 districts out of 93

ii. Futuristic approach.

- Expansion of such project activities to all Districts of the country.
- Provision of training to interested Veterinary Staff, Para Veterinary Staff and Lab: Technicians including WLEW and CLEWs etc.
- Continuator of all the above program on sustainable basis.

RESULT AND ACHIEVEMENTS:

Result 1: Public & Private Sector Service Delivery System Improved

- Series of Strategic Planning Workshops held at District, Provincial and National level.
- Public private partnership encouraged, collaborative forums of service providers organized.
- Livestock Training Institutes Strengthened to improve their service delivery.
- DVM Degree curriculum revised and improved in collaboration with Pakistan Veterinary Medical Council (PVMC).
- Review of existing Legislations has been completed by 4 commissioned consultants.
- Capacity of Livestock and Dairy Development Department (L&DDD) staff enhanced for effective service delivery.
- AJK-Stock Assistant's Diploma curriculum revision was in progress, to bring it at par with other provinces.

Result 2: Disease Reporting & Surveillance System Functional

- Pakistan achieved the status of Rinderpest Disease Free Country (RDFC) in May, 2007
- Six officers obtained Masters degree in Epidemiology from England & Netherlands
- Thirteen TADinfo/Disease reporting trainings workshops conducted.
- PCs, printers & accessories distributed in target districts and sub units of FPMU.
- District Diagnostic Labs strengthened in target districts.
- Two hundred and ninety two VOs/VAs trained in Lab. Diagnostic Techniques.

Result 2 (Contd..)

- Disease Reporting Network established in 34 target districts.
- Expansion of Disease Reporting Network in 70 districts in progress.
- National Policy on use of imported PPR vaccine notified.

- One million doses of PPR vaccine procured from Jordan and distributed for control of the disease.
- PPR vaccine production training at CIRAD (France) for two scientists sponsored.
- PPR vaccine production started in CASVAB Quetta

Result 3: Model for Improved Productivity & Service Delivery Developed/Demonstrated

- Baseline Survey in 30 target districts completed.
- Two thousand two hundred motorcycles procured and distributed to field staff to improve mobility.
- Two hundred and fifty two local training of field staff and farmers conducted.
- Study tours for staff/exposure visits for members of community organizations arranged.
- Three hundred and ninety CLEW's and two hundred and forty WLEW's have been trained and are effectively working at village level.

Result 3: (Contd..)

Production/Services Delivery Models

- Production models introduced in NWFP:
  - i. Backyard Poultry Model.
  - ii. Wool Production Model-Chitral
  - iii. Beef Production model
  - iv. Small Holder Dairy Model
  - v. Fodder Production Model
- Service Delivery Models Introduced in Punjab:
  - i. CLEWs model-livestock
  - ii. WLEWs model-poultry and small ruminants
- Tours arranged for progressive farmers from Sindh & Balochistan to study these models.
- Replication of production/service delivery models initiated in Sindh and Balochistan

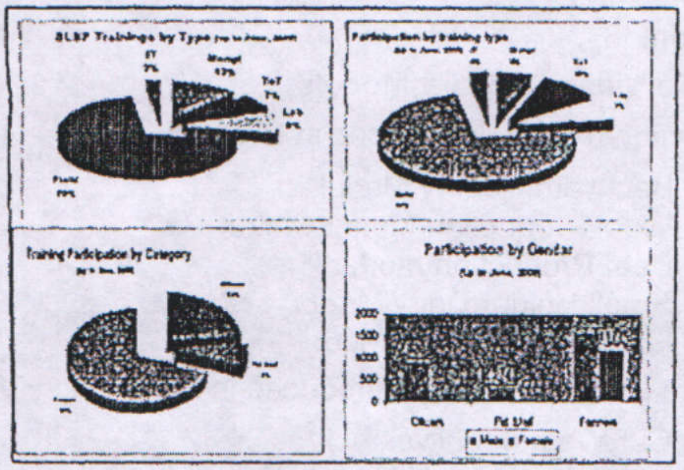
Result 4: Information & Communication System form Central part of Livestock Service Delivery

- Information Management units setup at FPMU-Islamabad, PPMUs-Lahore, Quetta & Peshawar.
- Local Area Network System at FPMU established and functional.
- Five Quarterly news Letters (Confluence) published.
- Project Web Site launched (www.slsp.org.pk)
- Extensive range of messages, leaflets, posters for vaccination and diseases, calendar, booklets prepared for field Vet. Staff and farmers.

- One hundred Radio, thirty five TV programs & five thousand short messages in national and local languages produced for farmers awareness.
- Stage and Puppet Shows arranged in target district of Punjab.
- Activity participated in Sibi, Bhitt Shah, Cholistan and other Melas.
- Participated in international Livestock & Poultry Congress and exhibition at Lahore.

Result 5: System, Capacity & Structure of Project Management Developed and Transferred to GOP

- FPMU building is constructed and operational at NARC.
- SLSP office building renovated at Peshawar.
- System & Capacity for effective project implementation developed.
- Short-term TA provided in various components of the project.
- Financial Management System developed and implemented.



CONCLUSIONS:

A project like this when prepared at the GOP, implemented in all the four provinces, AJK and Northern areas, has really achieved its objectives not less than 80-85%, despite administrative and other constraints. When compared with other projects. The farmers response had been encouraging and, the continuation of similar projects in the livestock sector would further improve in terms of awareness, disease reporting system, more trainings to Technical Staff, Para-Veterinary Staff and farmers in the country, as appear in the SLSP final/completion report (PC-IV), documented in 2009 [4] with recommendations in the light of various concluding/seminars and workshops.

The training of CLEWs and WLEWs was most welcomed by the farmer community and now the CBO based Animal Health and Production Centers (AHPCs) started developing, the concept of which has been advocated by Administrators Planner and Farmers and even by the NGOs as earlier reported by Muhammad Hafeez [6]. Such centers will not only provide the basic animal health facilities but Veterinary Services will also be available in the livestock

community, leading to self reliance and poverty alleviation, in the light of a new approach to agriculture development at national and eight national cooperative programs which form the core of Sustainable Agriculture and Rural Development (SARD), agenda 21 (FAO-1991) and a number of programs launched across the developing world, often in partnership with NGOs, as advocated by Andrew shepherd (1994) [7]. This approach is rightly in support with the work done towards Sustainable Rural Support Program (SRSP) reported in detail in their recent Annual Report of Network of Rural Support Program (NRSP) of 2008-09 [8]

RECOMMENDATIONS:

Continuation of such projects is recommended to help assist the remaining parts of the country in the light of presentations made in the Ministry of LDD GOP, Islamabad together with feed back from various stake holders of the farmers in the best interest of Livestock Development and Sustainable Rural Development.

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FATTENING OF MALE GOAT KIDS BY FEEDING VARIOUS LEVELS OF CRUDE PROTEIN AND TOTAL DIGESTIBLE NUTRIENTS

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* * * Department of Livestock Management, Sindh Agriculture University Tandojam

ABSTRACT

An experiment was conducted on fattening of goat kids fed on different levels of CP and TDN at Department of Animal Nutrition, Sindh Agriculture University Tandojam in 2008-09. Twelve (12) goats of mixed breeds, age 4-6 months were divided in 4 groups (A,B,C and D) having 3 kids each and fed on various levels i.e. 12,14,16 and 18% CP and 73% of TDN respectively, for 90 days (excluding 15 days adaptation period). The results indicated that the fattened goat kids responded significantly with increase in CP levels in ration and kids fed ration containing 16% CP gained 10.92 kg weight in 90 days, had consumed 177.19 kg of feed, resulted 16.50 FCR and generated highest net profit of Rs.1028.91 per animal. Goat kids fed ration containing 18% CP consumed 177.35 kg feed, gained 9.84 kg weight, resulted 18.05 FCR and generated net profit of Rs.850.47 per animal. Kids fed on14% CP ration consumed relatively greater feed (181.82 kg), gained 8.94 kg weight with FCR of 20.21, and resulted net profit Rs.676.38 per animal. The kids fed 12% CP ration consumed maximum quantity of feed (183.32 kg), gained lowest (8.27 kg) weight, resulted poor FCR (22.14) and generated lowest net profit of Rs.586.80 per animal. The results suggested that the goat kids responded maximally to ration containing 16% CP for all the growth and economic parameters, and higher CP level (18%) showed excessiveness with adverse effects on weight gain. Hence, the goat kid fattening will be a profitable enterprise with a balanced ration containing 16% CP.

Key words: Goat, feeding, fattening, proteins, TDN, CP, profit SAU - Pakistan.

INTRODUCTION

Pakistan has numerous domestic goat breeds and the animal refers to a ruminant and hollow-horned mammal belonging to the genus *Capra*, of the family Bovidae (Coffey *et al* 2000). According to Pak:: Economic Survey (2009-10), the goat population in the country was 59.9 million heads, which produced 739 thousand tons of milk, while during this period the mutton production was 603 thousand tons. In case of other byproducts, the production of goat skin was 22.5 million numbers and the ceiling of goat hair production was 22 thousand tons. (GOP, 2007-08). Mutton obtained from young goats is a material of full value which can be utilized in the production of cured meats, characterized by a low intramuscular fat content and a high level of protein and mineral elements (Luo *et* a!., 2000). Research on the slaughter value of goat kids butchered at various body weight yielded varying results. They show that the share of high-priced cuts and meat tissue in animals slaughtered at higher body weights was higher and the meat was characterized by more favourable physicochemical parameters (Pieniak *et* al. *2005).* Intensive feeding increases the slaughter performance of goat kids, therefore, it is profitable to fatten intensively and

obtain heavier animals, provided cheaper feeds are available and the demand for goat meat is high (Stanisz and Gut, 2005). An exception to it is that, the goat kids destined to obtain the so-called "white meat". They are slaughtered at lower body weight and fed mainly on goat milk (Mioc *et al* 2001). The importance of small ruminants in the less developed parts of the world considered being a source of animal protein and income is increase. Small ruminants are preferred as a source of red meat and they are being slaughtered regularly for social and religious occasions. Small ruminants fattening contribute a significant portion of red meat production. However, farmers tend to use high Crude Protein (CP) level in rations, in order to obtain higher growth rates regardless of its true effect as reported by Kasprzyk and Krupa, (2000). Proteins play an extended role in the animal body. They are major parts of all structural tissues, besides their essentiality for most body functions. Protein concentrates originated from plants are commonly byproducts of vegetable oils. Groundnut, cottonseed and sunflower seeds are the oil seeds byproducts of which are most frequently available. The residue after extraction of the oils is still a valuable source of nutrients for livestock, especially protein and energy. The content of crude protein decreases while the content of crude fiber increases, resulting in a decreased digestibility of all nutrients and hence a decreased energy content of the grass. Consumption of goat meat increases traditionally because of the low fat content compared to that of lamb, that meat is the first choice in the rest of the year (Butterworth, 1995). Diet content in crude protein does not affect empty body and carcass weights, dressing percentage, and external (skin, head and feet) and thoracic organs (lungs and heart). However, goats fed medium protein level produce heavier liver and guts. Muscle, bone and adipose tissues mean weights do not follow the increase of crude protein level in the diet. However, animals receive optimum crude protein diet may result more muscle and less fat than those fed high diets. Animals fed high proteins produce more omental and mesenteric fat and total body fat in absolute and relative value than those with optimum level while values for the low diet kids may be intermediate. Meat of kids receiving the optimum diet crude protein level may be juicier than meat from other kids. It contented more protein and less fat (Atti *et al.*, 2004). Feed is a major component of livestock farming and many experiments have been completed to improve the nutritive value of low quality feeds utilized by ruminants. Feed cost represents the largest portion of the production cost. Therefore, differences among small ruminants and digestive efficiency are very important criteria for the selection of the most appropriate animal to be kept in any particular circumstance (Haddad and Obeidat, 2007). Therefore, this study was conducted to compare fattening performance of goat in response to different dietary CP levels.

MATERIAL AND METHODS

Twelve 12 goats of mixed breeds of 4-6 months age, were purchased and after ration formulation (Table-I), the kids were fed on various levels I 2%(Group A), 1 4%(Group B), I 6%(Group C) and 18% (Group D) crude

proteins and 70% of TDN respectively. Each group contained three goats. The feeding continued for 90 days along with 15 days adaptation period. The goats were reared under semi-intensive housing management system. Before the beginning of this experiment, all kids were treated against external and internal parasites. Experimental kids were marked with numbers. The initial weight was recorded in the morning before offering any feed or water. The weight of experimental kids was recorded weekly and this process continued up to 13 weeks. ad *libitum* water and feed were given to each kid separately. The following parameters of fattening and economic importance were measured:

i. Feed consumption (kg)
ii. Water consumption (ml)
iii. Body weight (kg)
iv. Feed efficiency (FCR)
v. Economics (Rs)

Statistical analysis of data

The data collected were statistically analysed following Gomez and Gomez (2000), analysis of variance was worked out to obtain significance of treatment, while LSD test was applied to compare the treatment means. MSTAT-C computer software package was used to work out the above analysis.

RESULTS

The results on feed, water consumption, growth, feed conversion ratio and per kid net profit are presented in Table 2-3. The experimental kids showed significantly ($P<0.01$) varied feeding response to rations containing different crude protein levels. The kids fed on ration with 16% CP (group C) consumed significantly minimum feed (177.19 per animal), closely followed by the kids in group D, where the animals were reared on ration containing 18% CP, consuming - 177.35 per animal feed in 90 days (Table-2). The goat kids fed on ration-A containing 12% CP consumed significantly maximum feed of 183.32 per animal, closely followed by the kids in group B, fed on ration containing 14% CP with average feed consumption of 181.42 per animal. In 90 days. The results in Table-2 further indicated that feed consumption of kids in the 1st, 2nd, 3rd and 4th week was 10.37, 10.72, 11.44 and 12.11 per animal, respectively which followed an increasing trend continuously in the 6th 7th and 8th week with average feed consumption of 12.66, 13.28, 13.85 and 14.46 kg per animal, respectively. The results indicated that goat kids reared for fattening consumed significantly ($P<0.0$ 1) more water when fed on rations containing higher CP levels. The kids fed on ration with 16% CP (group C) consumed significantly maximum water (168.29 liters per animal), closely followed by the kids in group B, where the animal were fed on ration containing 14% CP, consuming 165.95 liters water in 90 days (Table-7). The kids fed on ration-D containing 18% CP consumed average 164.61 liters water, while the minimum water consumption (143.62 liters per animal) was recorded in case of kids fed on ration containing 12% Cp.

It was noted from the results that the water consumption in the 1st, 2nd, 3rd, 4th and 5th week was 9.28, 9.7, 10.28, 10.74 and 12.87 liters per animal,

respectively. The water consumption of the kids increased with the advancement of age and in the 6th, 7th 8th 9th and 10th week the average water intake was 12.87, 14.62, 16.95, 14.66 and 14.66 liters/ animal, respectively.

The kids in group-C fed on ration containing 16% CP gained significantly highest weight (10.92 kg per animal) in 90 days indicating daily weight gain of 121 g. Inverse effects was observed in case the CP level was increased to 18%, where the kids gained average weight of 9.84 kg in 90 days showing a daily weight gain of 109 g (Table-2). The results (Table-2) further showed that the kids gained more weight with progress of their age and in the 1st, 2nd, 3rd and 4th week the weight gain was *0.550, 0.57,* 0.61 and 0.64 per animal, respectively which showed gradual increase and in the 6th 7th and 8th week, the average weight gain was 0.66, 0.69, 0.73 and 0.74 per animal, respectively. The weight gain in the 9th 10th 11th and 12th week followed more acceleration and averaging 0.77, 0.81, 0.85 and 0.87 kg per animal, respectively. Feed conversion ratio is gauged on the basis of quantity of feed consumption for gaining one kg weight by the animal and performance of any feed formulation is evaluated on the basis of feed efficiency. The goat kids in group-C fed on ration containing 16% CP indicated most efficient feed formulation with FCR value of 16.50 which showed that for gaining I kg weight, the kids consumed 16.50 kg of feed (Table-2). The economics of various rations was worked out on the basis of a series of variables which accumulate production costs, income and net profits etc. The details to this effect is presented in Table-03. The results indicated that goat kids in groups A, B, C and D, fed on rations containing 12, 14, 16 and 18% CP, the total costs including the purchase cost of the kids was Rs.2886.31, 2887.89, 2889.30 and 2903.28 per animal, respectively. And income was Rs.3473.11, 3564.27, 3918.20 and 3753.75 and generated a net profit of Rs.586.80, 676.38, 1028.91 and 850.47, respectively. The above figures suggested that kids in group C, where they were fed ration containing16% CP had remarkably higher net profit as kids of other ration groups.

DISCUSSION

Meat prices in Pakistan have increased substantially in the recent past which has reduced the consumption of meat particularly in the lower middle class and poor. The solution of the problem lies only in the adoption of proper fattening of the meat animals to increase meat production per animal; because due to unbalanced feeding, the potential meat production from the animals is not being achieved. In order to examine fattening performance of goat kids in response to different dietary CP levels, the experiment was conducted at Sindh Agriculture University Tandojam. The results indicated that the fattening goat kids responded significantly to increasing CP levels in ration and kids fed on ration containing 16% CP gained 10.92 kg weight in 90 days, consumed 177.19 kg feed, resulted *16.50* FCR and generated highest net profit of Rs.1028.91 per animal; while kids fed on ration containing 18% CP consumed *177.35* kg feed, gained 9.84 kg weight, resulted 18.05 FCR and generated net profit of Rs.850.47 per animal. The results suggested that the goat kids

responded maximally to ration containing 16% CP for all the growth and economic parameters, and higher CP level (18%) showed excessiveness with adverse effects on weight gain. Hence, the goat kid fattening will be a profitable enterprise with a balanced ration containing 16% CP. Considerable research has been found supporting the findings of the present experiment. McGregor (1994) recommended 15.4% crude protein for economical fattening of goat kids; while Jia *et* al. (1995) investigated the effects of dietary crude protein level on weight gain of Angora goat kids found high weight gain under 16% CP level. Similarly, Sleiman *et al.* (1995) indicated crude protein levels for kids reared on pastures having crude protein *5.8-9.2%* and Murugan *eta!.* (1997) reported that CP contents of concentrates and grass were 19.35 and 10.24%; while Terril *et al.* (1998) found that a balanced ration for goat fattening contained 16% crude protein (CP). In a similar study in Pakistan, Buriro (1999) indicated that live body weights at 1st week of treatment with 16% CP were not significantly different in both groups. From 2' week of feeding upto 3 week the results showed significant weight gain in ration fed group (6.35 kg versus 1.70 kg). Similar trend was observed in carcass weights and carcass cuts. Moreover, Lue *et al.* (2000) reported that all kids had commercial goat starter diet with 20% CP, and Prieto *et al* (2000) determined the effects of protein concentration on growth of kids offered diets contained 10.2, 14.2, 18.3, and 23.6% CP, and concluded that the protein requirement seemed to have been met by consumption of diets with at least 14% CP. The findings of the present study are also in concurrence with those of Shahjalal *et al.* (2000) who considered 20.3% as a high protein and 16.9% low protein concentration for feeding growing goats; while Titi *et al.*2000 experimented rations containing 12,14,16 or 18% CP and body weights and gain were economically better when fed with 16% ration. In another study, Tegene *et al* (2001) examined effect of concentrates containing 8.7, 11.7, 14.4 and 17.6% crude protein (CP) on growth of goat kids and concluded that dietary CP concentrations and maintenance N requirements depend on the traits desired. The results of Zundt *et al.* (2002) were also agreed with our findings, who reported that the largest returns were obtained with the ration contents with 12% CP, under feed lot system; while Choi *et al.* (2005) suggested 14-16% crude protein level in growing goats and Wildeus *et al* (2007) suggested 16.3 percent CP for economical growth of goat kids. The studies conducted by Abdullah *et al* (2008) suggested *15%* CP for growth of goat kids and for getting higher weight gain in a fattening project; whereas Ismail *et a!.* (2009) determined the effects of feed with 10, 13 and 16% CP and 30% hay on lambs and recommended 16% CP for fattening. The above discussion suggested that the results of the present investigation were mostly in concurrence with the findings reported from other parts of the world on similar aspects. However, the goat farming, particularly for meat production purpose needs to be given attention for achieving higher net returns. However, the variation in CP levels for goat fattening was mainly associated with the breeds, economical conditions and management standards in different parts of the world.

Table-1. Ration formulation and chemical composition of various groups

Groups							
A		B		C		D	
Ingredients	Unit	Ingredients	Unit	Ingredients	Unit	Ingredients	Unit
Maize Crush	20	Maize Crush	12	Maize Crush	10	Maize Crush	10
Wheat Bran	34	Wheat Bran	37	Wheat Bran	33	Wheat Bran	28
Rice Polish	16	Rice Polish	15	Rice Polish	10	Rice Polish	8
Barseem	6	Barseem	6	Barseem	6	Mustard Cake	7
Molasses	15	Cotton Seed Cake	3	Cotton Seed Cake	16	Barseem	6
Mineral Misture	0.25	Molasses	11	Molasses	8	Cotton Seed Cake	20
Salt	1	Mineral Mixture	0.25	Mineral Mixture	0.25	Molasses	4
Mung Kutta	8	Salt	1	Salt	1	Mineral Mixture	0.25
-	-	Moong Kutta	15	Moong Kutta	16	Salt	1
-	-		-	-	-	Moong Kutta	14
Total Quantity	**100.3**	**Total Quantity**	**100.3**	**Total Quantity**	**100.3**	**Total Quantity**	**100.3**

Table 1-a Chemical Compositions of various rations of Table-I above.

Nutrients %	A	B	C	D
DM	84.13	84.79	8522	8531
CP	12.48	14.09	16.05	18.09
TON	7339	7333	73.94	73.93
CF	*5.13*	5.82	6.62	7.13
Ca	1.02	098	0.90	0.92
P	0.73	0.82	0.83	0.85
Fat	2.91	329	3.76	443

Table-2 Growth of goat kids fed on different CP and TDN levels.

Parameters	Groups				F-value	P-Value
	A	B	C	D		
Feed Intake (kg)	183.32	181.42	177.19	177.35	14.0282	0.001
Water intake (ml)	143.58	165.95	168.29	164.61	80.4562	0.001
Weight gain (kg)	8.27	8.94	10.92	9.84	75.7384	0.001
FCR	22.14	20.21	16.50	18.05	140.5287	0.001
Per kid net profit (Rs.)	586.80	676.38	1028.91	850.47		

Table-3 Summarized economics of growing kids of this study

Particulars	Groups			
	A	B	C	D
Expenditure (Rs.)	2886.71	2887.89	889.30	2903.29
Income (Rs.)	2473.11	2564.27	3918.20	3753.75
net profit per kid (Rs.)	586.80	676.38	1028.91	850.47

CONCLUSIONS

It can be concluded from the present results that the goat kids responded maximally to ration containing 16% CP for all the parameters. It was also observed that kids provided with 18% CP in ration, showed an excessiveness with adverse effects on weight gain. Hence, under prevailing conditions it can be concluded that goat kid fattening will be a profitable enterprise with a balanced ration containing 16% CP.

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DETERMINATION OF BEEF PRODUCTION CAPABILITIES IN CATTLE MALE CALVES

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ABSTRACT

In order to examine the beef production capabilities, male cattle calves were fed on rations A, B, C and D containing 12, 14, 16 and 18 % Crude Protein (CP), respectively for a project period of 90 days. It was noted that the beef production performance of cattle calves was significantly (P<0.0l) improved by increase in the CP levels. The calves fed on ration containing 16% CP consumed *470.05* kg feed and gained 79.19 kg weight which resulted average FCR of 6.07 and generated a net profit of Rs.8927.63 per animal. Calves fed on ration containing 1 8% CP consumed more feed of 509.75 kg for 81.10 kg weight gain which caused FCR upto 6.29 and net profit of Rs.9021.28 per animal. Fattening calves fed on 14% CP ration, although consumed lesser feed of 379.96 kg, but weight gain declined to 57.89 kg with FCR upto 6.69 and net profit Rs.5863.10 per animal. Experimental calves fed on 12% CP ration consumed minimum feed of 330.93 kg and produced lowest weight gain of 47.71 kg which resulted FCR value of 7.04 and net profit Rs.4609.33 per animal. The average daily weight gain of the calves fed on 12, 14, 16 and 18% CP ration was 524, 635, 870 and 902 grams . The calves in group C, where they were fed ration containing 16% CP had remarkably better beef production capabilities as compared to those fed on experimental rations containing 12, 14 or 18% CP levels. It was also noted that each increment in CP level in feed resulted significant improvement in growth of calves, but CP level beyond 16% did not show economical results.

Keywords: Cattle, Male calves, beef production capabilities, C P levels.

INTRODUCTION

Cattle fattening is gaining prominence as an important business project of the livestock industry in Pakistan. It gives the farmer year-round work and provides with extra income. The farmer can make use of cheap, plentiful farm byproducts such as corn stovers, rice straw, copra meal, rice bran and sugarcane tops, which ordinarily go waste. Most importantly, it helps meet the urgent demand for high-protein foods in the human diet. Cattle fattening on a large scale can be profitably undertaken. It consists of buying healthy stock, feeding and fattening them for 120 to 180 days, and selling them at anytime of the year (Khan, 2005).

Pakistan is fortunate in having abundant livestock resources. It has great potential to develop meat industry to meat the needs of not only local market but also the Middle East and Gulf States. Some of the best tropical breeds of cattle and buffaloes are found in Pakistan. According to the latest Pak: Economic Survey (2008-09), the population of cattle, buffalo, sheep, goat, camel, horses, asses and mules was 34.3, 30.8, 27.8, *59.9*, 1.0, 0.4, 4.6 and 0.2 millions, while milk produced by cows, buffaloes, sheep, goat and camel was *15.54*, 27.85, 36, 74 and 8.08 thousand tons, respectively. The beef, mutton and poultry meat produced in the country was 1655, 603 and 707 thousand tons, respectively (GOP, 2010).

There is an urgent need to exploit this potential for increasing meat production and consumption in the country. The meat available in the market is of low quality because it comes as a byproduct of dairy farming i.e. coming from culled, emaciated and old animals of low quality. With the increasing of population in Pakistan at the rate of *2.6* percent (GOP, 2009), there is increasing demand for quality meat particularly in urban centers, where the per capita income is increasing, bringing change in life style. Seeing the future scenario of changing life style in urban areas, there will be immense demand not only for quantity but also for quality of meat. This situation urges that the planning for supply of more meat of high quality be made to produce better quality of meat for local marketing and for export also.

Fattening of calves for beef production has recently attained a position of most promising entrepreneur which has attracted a high volume of investment in livestock sub-sector. The basic requirements of rearing calves are availability of land for farming, availability of healthy calves, supplying technical know-how to farmers regarding management, feeding, disease control and availability of finance. If one year old calves are reared for fattening, they can be fed with urea molasses, which will finish the calf for beef production and will be a cheaper source of protein as compared to other sources available in market. The average weight gain will be more than 250 kg, which is the best production, and the beef will be with more than 60 percent fleshy, nutritious, and tasty (Junejo, 2003).

MATERIALS AND METHODS

The study was carried out on 16 cattle calves of approximately 12 months age, during the year 2008 for a period of 90 days to determine their beef production capabilities. The cattle calves of mixed breeds were housed at the Livestock Experimental Station (LES) Department of Livestock Management, Faculty of Animal Husbandry and Veterinary Sciences, Sindh Agriculture University SAU, Tandojam. The animals were properly identified and were randomly distributed into four equal groups according to their body weight. On arrival of the calves, they were drenched before start of the adaptation period. The animals were kept off feed and water for 12 hours before recording their initial body weight. They were weighed on every .7th day before feeding till the expiry of the experiment. The calves were randomly allotted four experimental rations namely; R1, R2, R3 and R4 containing 12, 14, 16 and 1 8 percent Crude Proteins (CP) (Table-I).

Table-I Experimental design

Groups		R1	R2	R3	R4
Total No. of calves		4	4	4	4
Breed		mixed	mixed	mixed	mixed
Age of calves (months)		12	12	12	12
Ration	CP%	12	14	16	18
	TDN%	70	70	70	70

The rations were fed for 90 days excluding adaptation period (from 1st October to 29 December, 2008). The rations containing various protein levels were weighed and fed individually to the animals twice a day (morning and evening). The refusal of feed (of individual animals) was weighed every day. The water was offered *ad libitum* and it was replaced two times in 24 hours, i.e. the water given early in the morning was replaced at 3:00 p.m. and again at 8:00 p.m. Rock salt licks were made available for animals and they were provided with same management for housing, space, lighting, drenching, vaccination, grooming etc. The nutrient requirements of calves were according to the standards of National Research Council (1978). The calves were under close watch of the researcher for any sort of diseases problems or other disorders and lesions. The animals in the herd were vaccinated and de-wormed regularly against Anthrax spore vaccine, Enterotoxirnia, Foot and Mouth, Rinder pest, Black quarter diseases and Liver fluke and gastro-intestinal worms. In case of sudden occurrence of any of the above diseases or any other disorder, the disease diagnosis was performed promptly and treated accordingly. The animals were fed with dry fodder or wheat straw at the rate of 4-5 kilograms a day mixed with concentrates. The concentrates commonly used were composed of cotton seed cake, rice polish, till cake, and wheat bran with addition of common salt. The most important element of the experiment was absence of green fodder and the experimental animals were provided only with dry fodder mixed with concentrates. The data thus collected was analysed by the standard methods of analysis of variance and DMR test was applied to test the significance of differences between the means, using MSTAT-C Computer Software Package as per the statistical methods suggested by Gomez and Gornez (1984). On the basis of statistical analysis, the data was tabulated and interpreted in the following paragraphs.

RESULTS

Feed consumption

Weekly feed consumption indicated that the cattle calves initially consumed feed in relatively less quantity and the intake was gradually increased with the progression of age. (Table-2). The calves consumed 22.98 kg feed per day in the first week, which increased to 24.64, 26.21, 27.57, 29.02, 30.33, 32.26 kg in per day 2nd , 3rd 4th 5th 6th and 7th week, respectively. The feed consumption was further increased to 33.72, 35.45, 37.44, 39.41 and 41.23 in the 8th 9th 10th 11th and 12th week, respectively. The maximum feed of 42.37 kg was consumed by the fattening calves in their last (13th) week of experiment. So far the effect of crude protein levels on the feed consumption of cattle calves is concerned, a significant ($P<0.01$) increase in consumption was recorded, probably due to improved palatability of feed enriched with high levels of crude protein. The calves assigned Ration-A (12% CP) consumed 330.93 kg feed in 90 days of the experimental period, while a marked increase in feed consumption (379.96 kg) was noted for calves fed Ration-B (14% CP). A rapid increase in feed consumption was recorded in calves assigned Ration-C (16% CP) where the average feed consumption reached 470.05 kg per animal in 90

days. The maximum feed consumption *(509.75* kg/ animal) in 90 days was recorded in calves of Ration-D (18% CP). However, the differences in feed consumption between calves of Ration-C and Ration-D were statistically non-significant, which suggested that the ration containing 16% CP could be more economical as high CP ration.

Table-2 Weekly feed consumption (kg per animal) of fattening cattle calves fed on ration containing different CP levels:

Weeks	Crude Protein (%)				Average
	A (12%)	B (14%)	C (16%)	D(18%)	
I	20.00	22.16	25.80	23.96	22.98
2	21.40	23.50	27.43	26.26	24.64
3	21.80	*25.36*	28.73	28.96	26.21
4	22.16	26.73	30.46	30.96	27.57
5	22.73	27.63	32.33	33.40	29.02
6	23.96	28.43	33.43	35.50	30.33
7	25.93	29.13	34.96	39.03	32.26
8	26.50	29.46	37.16	41.76	33.72
9	27.53	30.30	39.43	44.56	35.45
10	28.56	31.70	41.63	47.90	37.44
11	29.80	33.43	44.33	50.10	39.41
12	30.20	35.50	46.53	50.10	41.23
13	30.36	36.63	47.83	54.66	42.37
Total	330.93	379.96	470.05	509.75	422.63
Weekly	25.45 c	29.22 b	36.15 a	39.21 a	32.51
Daily	3.67	4.22	5.22	5.66	4.69

S.E=1.5555 LSD0.05=3.749 LSD 0.01=4.993

Weight gain (kg per animal)

Weight gain is mainly associated with the quality and quantity of feed as well as the age of the fattening calves. Weekly weight gain of cattle calves (Table-3) indicated that with the development of age, the calves gained significantly more weight and the gain was higher in the later period as compared to the initial period. The weight gain during 1st week was 3.07 kg, while claves gained weight of 3.35, 3.72, 4.12, 4.50, 4.83 and 5.19 kg during 2^{nd} 3^{rd} 4^{th} 5^{th} 6^{th} and 7^{th} weeks, respectively. The weekly weight gain followed an increasing trend and it was 5.54, 5.84, 6.18, 6.51 and 6.81 kg during the 8^{th}, 9^{th}, 10^{th} 11^{th} and 12^{th} week, respectively. The maximum weight of 7.04 kg was gained by the calves during last week of experiment. The results further indicated that the effect of crude protein contents in fattening ration was highly significant ($P<0.01$). The calves fed on ration containing 12% CP gained minimum weight of 47.71 kg during 90 days experimental period, and calves given Ration-B (14% CP) gained *57.89* kg weight during the same period. Similarly, the calves fed on ration containing 16% CP resulted in weight gain of 79.19 kg during 90 days project; while the maximum weight of 82.10 kg was

gained by the calves fed on ration with highest CP concentration of 18%. The average daily weight gain in calves fed on ration containing 12, 14, 16 and 18% CP was 524, 635, 870 and 902 g, respectively averaging 732 g per animal. The LSD test indicated that the differences in weight gain of calves fed on ration containing 16 and 18% CP ration were non-significant, suggested that the cattle calves were capable to result economically higher beef production under 16% CP contained ration and 18% CP ration did not have economical viability in calves fattening.

Table-3 Weekly weight gain (kg per animal) of fattening cattle calves fed on ration containing different CP levels.

Weeks	Crude Protein (%)				Average
	A(12%)	B(14%)	C(l6%)	D(18%)	
1	2.48	2.76	3.64	3.40	3.07
2	2.65	3.03	4.02	3.73	3.35
3	2.83	3.40	4.41	4.26	3.72
4	3.03	3.73	4.92	4.80	4.12
5	3.18	4.06	5.34	5.40	4.50
6	3.38	4.30	5.77	5.86	4.83
7	3.73	4.46	6.12	6.46	5.19
8	4.00	4.66	6.58	6.93	5.54
9	4.13	4.90	6.94	7.40	5.84
10	4.31	5.20	7.32	7.90	6.18
11	4.53	5.50	7.75	8.26	6.51
12	4.65	5.83	8.07	8.70	6.81
13	4.81	6.06	8.31	9.00	7.04
Total	47.71	57.89	79.19	82.1	66.73
Weekly	3.67	4.45	6.09	6.32	5.13
Daily	0.524 c	0.635 b	0.870 a	0.902 a	0.732

S.E= 0.2524 LSD 0.05=0.6976 LSD 0.01=0.8296

Feed Efficiency/Feed Conversion Ratio (FCR)

FCR is the most important parameter in the animal fattening programs for meat production. It is the quantity of feed (kg) consumed by an animal for producing one kilogram of meat. The results for FCR of cattle calves (Table-4) followed the trend recorded for weight gain and during initial period calves consumed more feed and gained lesser weight as compared to later period of the project. The feed efficiency during 1st week was 7.67, while it was 7.42, 7.11, 6.77, 6.54, 6.37 and 6.30 during 2nd, 3rd 4th 5th 6th and 7th weeks, respectively. The FCR followed an accelerative trend in the later period and it was 6.16, 6.14, 6.11, 6.11 and 6.10 during 8th, 9th 10th, 11th and 12th week, respectively. However, the best FCR of 6.52 was recorded during last week of the 90 days project. The effect of CP level in ration on the fattening performance was highly significant (P<0.0l). The calves fed on ration containing

12% CP had FCR upto 7.04 during 90 days experimental period, and calves fed on ration with 14% CP resulted in relatively increased FCR upto 6.69. The maximum feed efficiency with 6.07 FCR was resulted by the calves fed on ration containing 16% CP during 90 days project; while the calves fed on ration with highest CP concentration of 18% resulted FCR upto 6.29. The average feed efficiency of all groups during the 90 days fattening program was 6.52, which showed that for producing one kilogram of meat, the calves consumed 6.52 kilograms of feed. Hence, calves fed on ration with 16% CP consumed minimum feed of 6.07 kilograms for producing one kilogram of meat during this 90 days fattening program. The LSD test suggested that the differences in feed efficiency of calves fed on ration containing 16 and 18% CP ration were non-significant. which led to say that the cattle calves were capable to result highest feed efficiency under 16% CP contained ration and CP level higher than 16% resulted adverse effect on the fattening capability of calves due to higher feed consumption and relatively lower weight gain.

Table-4 Weekly feed conversion ratio (FCR) of fattening cattle calves fed on ration containing different crude protein levels

Weeks	Crude protein (%)				Average
A (12%)	B (14%)	C (16%)	D (18%)		
I	8.04	8.01	7.607	7.04	7.67
2	8.07	7.74	6.83	7.03	7.42
3	7.69	7.46	6.50	6.78	7.11
4	7.30	7.15	6.19	6.44	6.77
5	7.13	6.79	6.05	6.18	6.54
6	7.08	6.56	5.79	6.04	6.37
7	6.94	6.52	5.71	6.03	6.30
8	6.64	6.32	5.65	6.02	6.16
9	6.65	6.18	5.69	6.02	6.14
10	6.61	6.09	5.69	6.05	6.11
11	6.58	6.08	5.72	6.05	6.11
12	6.49	6.08	5.76	6.05	6.10
13	6.30	6.03	5.75	6.07	6.04
Average	7.04 bc	6.69 b	6.07 a	6.29 a	6.52

S.E.=0.0854 LSD 0.050.2390 LSD O.O1=O.3786

Economics of the experiment

The details in relation to the economic parameters of the experiment are given in Table-5. It was noted that the cattle calves fed on rations A (12% CP), B (14% CP), C (16% CP) and D (18% CP) consumed average feed amounting to Rs.*2514.91,* 3042.66, 3705.62 and 4121.23 per animal, while after including remaining costs, the ceiling of the total costs including the purchase cost of the calves was Rs.*14589.91,* 15583.20, 16363.40 and 17129.00 per animal, respectively. The total weight of the experimental calves at the end of the project (90 days) was 109.71, 122.55, *144.52* and 149.43 kg per animal in

groups A, B, C and D, respectively; while after deduction of initial body weight of 62.00, 64.66, 65.33 and 67.33 kg per animal, the weight gain came to 47.71, *57.89*, 79.19 and 82.1 kg, respectively. On average, the calves in groups A, B, C and D fetched a price of Rs.19199.25, 21446.30, 25291 and 26150.30. which generated a net profit of Rs.4609.33. 5863.10, 8927.63 and 9021.28, respectively. The economic parameters indicated that the calves in group C. where they were fed ration containing 16% CP had remarkably better beef production capabilities as compared to those fed on rest of the experimental rations.

Table-5 Economics of 90 days male cattle calves fattening project

Sr. #	Particulars	A (I2%CP)	B (14%CP)	C (16%CP)	D (18%CP)
A	Dry feed (kg per animal)	330.93	379.96	470.05	509.75
B	Concentrate (kg per animal)	90	112.5	126.45	144
C	Rate of concentrate (Rs/kg)	13.22	13.97	14.36	14.65
D	Amount of concentrate(Rs) B*C	1189.8	1571.63	1815.82	2109.6
E	Quantity of fodder (kgper animal) A-B	240.93	267.46	343.6	365.75
F	Rate of fodder (Rs/kg)	5.5	5.5	*5.5*	5.5
G	Amount of fodder (Rs/anirnal) E*F	1325.115	1471.03	1889.8	2011.63
H	Total feed cost per animal (Rs) D+G	25 14.915	3042.66	3705.62	4121.23
I	Cost of medication/ Vaccination	225	225	225	225
J	Labour cost	500	500	500	500
K	Misc. cost	500	500	500	500
I	Initial cost of animals	10850	11315.5	11432.8	11782.8
J	Total Costs	14589.915	15583.2	16363.4	17129
K	Weight gain/ animal in 90 days	47.71	57.89	79.19	82.1
L	Initial weight per animal	62	64.66	65.33	67.33
M	Total weight (kg per animal)	109.71	122.55	144.52	149.43
N	Sale of animals	19199.25	21446.3	25291	26150.3
0	Net profit N-J	4609.33 5	5863.1	8927.63	9021 .28

DISCUSSION

The livestock resources in our country are not being utilized properly. Milch animals are not being fed on feed with proper nutrients and beef producing animals are being reared with considering the needed nutrients (Junejo, 2003). The present study indicated that the beef production performance of cattle calves was significantly (P<0.0 1) improved by increase in the CP levels and the calves fed on ration containing 16% CP consumed 470.05 kg feed and gained 79.19 kg weight which resulted average FCR of 6.07 and generated a net profit of Rs.8927.63 per animal. The average daily weight gain of the calves fed on 12, 14, 16 and 18% CP ration was *524*, 635, 870 and 902 grams per animal. The calves in group C, where they were fed ration containing 16% CP had remarkably better beef production capabilities as compared to those fed on experimental rations containing 12, 14 or 18% CP levels. It was also noted that each increment in CP level in feed resulted significant improvement in growth of calves, but CP level beyond 16% did not show economical results. Moss and Good child (2001) suggested 16-18% CP for fattening heifers, while Moss and Murray (2002) recommended 14% CP in ration for cattle calves fattening. Similarly, in studies of Shin *et* al (2002a), the animals were given the diets containing 14.1, 12.1 and 11.2% crude protein (CP) and Ahmed and Jabbar (2003) suggested 13.7% C.P. for calf fattening

The findings of the present investigation are also in line with those of Ferreiro and Preston (2003) who reported live weight gain of 630 g per day. Ruangprim *at al* (2003) recorded body weight of fattening cattle calves upto 400 kg, while Alvarez and Preston (2004) reported 734 g per day weight gain in fattening calves.

Considerable research on the similar aspects has been conducted and reported through various research journals. The above discussion clearly shows that the findings of the present study are well comparable with most of the studies reported by past researchers. It is worth to suggest that feed and feeding patterns may be analyzed critically and fattening programs may be formed under the expertise supervision of animal nutritionists.

CONCLUSIONS AND RECOMMENDATIONS.

- The calves fed on ration containing 16% CP consumed more feed and water as compared to rest of the rations, higher weight was gained and better FCR as compared to other groups resulting better profit hence recommended for calf fattening programs.

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FATTENING PERFORMANCE OF BALOCHI LAMBS UNDER CONVENTIONAL AND COMMERCIAL FEED RESOURCES

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ABSTRACT

Twenty four Balochi lambs were used to study their fattening performance under conventional (green fodders: sorghum, barley, berseem) and commercial (concentrate mixture) feed resources. Twelve lambs were kept in group-A fed green fodders, while twelve lambs were designated as group-B fed concentrate mixture. During 1st week lambs in group A, consumed 3.717±0.196 kg feed, gained 0.313±0.060 kg weight and gave 11.875±3.027 FCR as compared to lambs of group B, which consumed *2.467±0.351* kg feed, gained 0.667±0.144 kg weight with 3.698±0.376 FCR. Almost similar situation continued upto the last experimental week, when lambs in group 'B' consumed lesser feed *(6.650±0.492* kg per animal) to produce 1.217±0.029 kg weekly weight gain with mean feed conversion ratio of *5.341±0.503* as compared to group-A with 7.950±0.427 kg feed intake, 0.650±0.029 kg weight gain and feed conversion ratio of 12.230±0.404. Total feed intake for the overall 14 weeks experimental period in group A was 91.487 kg which resulted in a weight gain of 7.339 kg with 12.449 FCR, while in group B (compound feed) total feed consumption was 76.05 kg, gaining 17.365 kg weight with 4.386 FCR. Balochi lamb responded well to the commercial feed and thus farmers are suggested to feed their lambs with commercially manufactured feed to achieve high profits from sheep business. The lambs fed on commercial feed (group B) earned net profit of Rs.5 10.00 per lamb, while the lambs fed on farmers feed earned net profit of only Rs.108.00 per lamb. The cost benefit ratio worked out was 1:1.03 in group A as compared to 1:1 .18 in group B. It was concluded that compound feed is cheaper and remarkably effective for fattening the lambs, while poor performance of the lambs was observed when fed on farmers feed.

Keywords: Balochi lambs, conventional feed, commercial feed fattening performance.

INTRODUCTION

Pakistan is an agricultural country and majority of the rural public living below poverty line. Rearing of lambs is common economic activity of rural poor to meet household needs. According to Pak: Economic Survey (2009-10), the sheep population of the country was 27.8 million heads, which produced 36 thousand ton of milk and total mutton production of 590 thousand tons. In case of other byproducts, the wool production from sheep was 41 thousand tons. Although, sheep and lambs are produced all over Pakistan, this production is concentrated mainly in Balochistan, NWFP and southern region of Sindh province. Anonimous (2010).

Feeding and management has great significance in profitable sheep production. Permanent pasture is the predominant source of nutrition for sheep flocks. Intensive production systems where, sheep are housed and fed, harvested feeds are not where they harvest their own feed. When a sufficient

quantity of forage is available, sheep are able to meet their nutrient requirements from forage alone along with a supplemental source of salt and minerals. Clover should be over-seeded on permanent pastures in the winter to improve the quantity and quality of forage produced during the grazing season. Sheep prefer to graze leafy, vegetative growth that is 2 to 6 inches tall rather than stemmy, more mature forages. When additional energy and protein are required, corn and soybean meal commonly form the basis of the grain portion of the diet. However, when justified by supply or price, other grains may replace all or part of the corn and soybean meal in a diet. The energy value of other common grains compared to corn and the maximum amounts to use in ewe and lamb diets. Because of its high fiber content, the replacement value of oats ranges from 50 to 100 percent (Macit *et al.* 2002)

Feeding programs for growing and finishing lambs are different for winter and spring lambing production systems. Lambs born from November through early February will likely be grown and finished on high concentrate feeds. Lambs born after the middle of February are placed on pasture with their dams where they remain throughout the spring and summer. Lambs on a winter lambing program should have access to a high quality feed by the time they are seven days old; the feeds should contain 18 to 20 percent crude protein and be low in fiber (Iman and Slyter, 2006). The source of protein in commercially prepared lamb pellets should be all natural protein. Winter born lambs should be weaned and adjusted to a growing diet by the time they are two months of age. A growing diet for lambs weighing 20 to 30 kg should contain approximately 16 percent crude protein. At body weights of 30 kg and up, the level of crude protein in the diet can be lowered to 14 percent (Leeds and Lewis, 2006).

Feeding regimes with crude protein do not affect only body, but carcass weights, dressing percentage, and external (skin, head and feet) and thoracic organs (lungs and heart) and other body conformations are also affected. However, animals fed medium protein level produce heavier liver and gut. Muscle, bone and adipose tissue mean weights do not follow the increase of crude protein level in the diet. However, animals receive optimum crude protein diet may result more muscle and less fat than those fed high diets. Meat of kids or lambs receiving the optimum diet may be juicier, more in quantity than meat from other kids or lambs (Atti *et al.* 2004).

Since lambs can be feed in many different ways, the time taken to reach a certain slaughter weight or carcass weight can vary from little more than two months to more than a year. Sheep convert vegetation into products consumable by man. A flock of sheep can provide a family with food each day in the form of milk and mutton, but only in limited parts of the world sheep are milked or bred. In all parts of the tropics sheep meat is eaten. In contrast to large ruminants, sheep are small enough to be totally consumed on the day of slaughter, thus avoiding the need of storage, which is very difficult in a hot climate. The present study was carried out to compare the fattening

performance of Balochi lambs under conventional and commercial feed resources.

MATERIAL AND METHODS

Twenty-four castrated male Balochi lambs, around 6 month of age and weighing between *15-24* kgs were randomly selected from the farm one week before the start of the experiment. All the animals were drenched with systamax (Welcome, Pakistan) and dipped with Tagavan for endo and ecto parasitic control, respectively. The animals were inoculated against enterotoxaemia, anthrax, sheep pox, contagious caprine pleuro-pneumonia and foot and mouth disease. All animals were properly identified sheared one week before the start of this experiment. All animals were ear tagged with different tag numbers 261-284. The lambs were randomly divided into two main groups balanced for age and weight. Each group was further sub-divided into three sub-groups of four animals each to serve as blocks/replicates. Randomized complete block design was employed for the conduct of this experiment as shown in Table-1.

Table-I Experimental Design of the Study

Group	Sub-group/block replicate No.	No. of Lambs per replicate	Average weight	LAMB IDENTITY Tag Nos.
A (conventional feed)	1	4	17.25	271, 278, 281, 284
	2	4	25.75	269, 276, 280, 279
	3	4	20.25	262, 263, 265, 266
B (commercial feed)	1	4	17.25	272, 273, 274, 277
	2	4	24.25	270, 275, 285, 283
	3	4	21.75	261, 264, 267, 268

Before the start of experiment, all lambs were fed the experimental ration for an adaptation period of 15 days, to remove previous feed effects, if any. The lambs were kept off-feed and -water for twelve hours before the start of experiment and their initial weights were recorded on the following morning. There-after, the lambs were weighed weekly at the same time before morning-feeding, till the completion of this study. Two experimental rations i.e., A-Control (conventional feed) with CP 11.25% and TDN 60.94% and B-treated (commercial feed) with 16% CP and TDN 73.08 on DM basis were offered. Composition of the two experimental rations is given in Table-2.

Table-2 Formulation of experimental rations

S. #	Ingredients	A (%)	B (%)
1.	**Concentrates**		
i.	Wheat	-	10
ii.	Wheat bran	-	27
iii.	Rice polish	-	8
iv.	Rape seed cake	-	3
v.	Rape seed meal	-	I
vi.	Cotton seed cake	-	12
vii.	Cotton seed meal	-	1
viii.	Sun flower meal	-	1
ix.	Maize	-	15
x.	Molasses	-	10
xi.	Common salt	-	1
xii.	Di-calcium phosphate	-	1
xiii.	Sorghum (whole)	20	-
xiv.	Barley (whole)	20	-
2.	**Green roughages**		
i.	Barseem/sorghum/barley	60	10
	Total	**100.0**	**100.0**

Table-3 Chemical composition of experimental rations (% on D.M basis)

Sr. No	Nutrients	Rations	
		A	B
01	Crude Protein %	5.29	14.0
02	Total Digestible Nutrients	35.94	62.08
03	Crude Fiber	0.94	5.91
04	Crude Fat	3.4	3.18
05	Crude Ash	3.63	4.38

Table-4: Chemical composition of experimental ration "A" (% on D.M basis)

Sr. No	Ingredients %	Kg	M.M	C.P	T.D.N	C.F	C.Fat	C.Ash
	1. Concentrates							
i.	Sorghum (whole)	20	18	2.05	14.4	0.43	0.50	0.30
ii.	Barley (whole)	20	18	1.8	13.86	0.21	2.10	1.61
	2. Green Roughage							
i.	Barseem	60	12	1.44	7.68	0.3	0.8	1.72
	Total	100	48	5.29	35.94	0.94	3.4	3.63

Table-5: Chemical Composition of experimental ration "B" (% on D.M. basis)

Sr. No	Ingredients%	Composition						
1	**Concentrates**	Kg	D.M	C.P	T.D.N.	C.F	C.Fat	C.Ash
i.	Wheat	10	8.8	1.31	6.86	0.22	0.15	0.14
ii.	Wheat bran	27	24.03	3.65	15.13	2.49	0.93	1.48
iii.	Rice Polish	8	7.2	0.87	5.83	0.23	0.90	0.54
iv.	Rape Seed Cake	3	2.76	1.02	1.90	0.37	0.24	0.20
v.	Rape Seed Meal	1	0.9	0.35	0.57	0.12	0.01	0.06
vi.	Cotton Seed Cake	12	10.56	3.97	6.96	1.51	0.38	0.70
vii.	Cotton Seed Meal	1	0.91	0.37	0.60	0.10	0.02	0.05
viii	Sun Flower Meal	1	0.93	0.43	0.60	0.10	0.02	0.07
ix.	Maize	15	13.2	1.26	10.82	0.27	0.51	0.17
x.	Molasses	10	9.0	0.35	4.95	00	0.009	0.69
xi.	Common Salt	1	-	-	-	-	-	-
xii.	Di-calcium Phosphate	1	-	-	-	-	-	-
2	**Green Roughage**	-	-	-	-	-	-	-
i	**Barseem**	10	2.0	0.42	7.86	0.5	0.013	0.28
	Total	100	80.29	14.00	62.08	5.91	3.18	4.38

Animals fed on ration A were supplemented with green chaffed-barseem fodder fed *ad libitum* to the three replicates sub-groups in group I while the lambs fed on ration B were supplemented with green chaffed barseem open daily as source of vitamin A, to the three replicates /block in group 2, twice a day, at 8:30 A.M and 5:30 PM. Water was offered twice a day till the completion of this study. Each morning before feeding, the refusals of feed were collected and weighed. Common saltlick in feeding troughs was made available for control group 1 animals during the trial. Dung was removed from the pens on daily basis.

PREPARATION OF THE RATION

Ration A, ingredients were available at the farm and were mixed manually, while ration, the dail is available in the Table-2 above.

Ration B: was purchased from the market manufactured by Shukrana Feed Mill Quetta and was formulated as per the experimental requirements.

RESULTS

The results revealed that feed intake, weight gain and feed conversion ratio were significantly ($P<0.01$) affected Balochi lambs when fed on different conventional feeds. During initial week of the experiment, that the lambs fed on farmers' feed (group A) consumed feed of 3.717±0.196 kgs on average, weight gain 0.3 13±0.427 kgs and feed conversion ratio of 9.2 17±3.027 as compared to those fed on compound feed, consumed average feed of 2.467±0.351 kgs, weight gain 0.667±0.492 kg and feed conversion ratio of 3.567±0.376. Similarly, in the second week, group 'A' consumed 4.290+0.017 kg per lamb feed and weight gain 0.400 ± 0.085 kgs with feed conversion efficiency/FCR of

11.467±2.579, while group B' consumed 3.567±0.115 kgs feed, weight gain 0.767±0.225 kgs and feed conversion ratio of 4.933±1.626 (Table-I).

During week-3 group 'A' consumed feed of 4.833±0.029 kg! animal, weight gain of 0.450 ± 0.087 kg and feed conversion ratio of 10.80±2.615, and in group 'B' consumed feed of 4.033±0.058 kgs, weight gain of 0.913±0.040 kgs and feed conversion ratio of 4.420±0.259. Likewise, in 4th week group-A consumed feed of 5.44±0.235 kg per animal, weight gain of 0.473±0.137 kg with feed conversion ratio of 12.733±0.702 was recorded as compared to group-B consuming feed of 4.623±0.214 kgs, weight gain 1.167±0.144 kg with mean feed conversion ratio of 3.893±0.494 (Table-I).

During 5th week group 'B' consumed feed of 5.157±0.160 kg per animal, weight gain of 1.333 ± 0.144 kgs with feed conversion ratio of 3.893±0.494 as compared to group consumed significantly greater feed of 6.370±0.316 kgs, weight gain of 0.500±0.050 kg with feed conversion ratio of 12.733±0.702. Similarly, during 6th week, group 'B' consumed feed of *5.530±0.177* kg per animal, weight gain 1.283±0.189 kg with mean feed conversion ratio of *4.347±0.665* as compared to group-A, where feed consumption was 6.633±0.208 kgs, weight gain of 0.480±0.101 kgs with mean feed conversion ratio of 14.267±3.536 (Table-I).

The results for 7th week showed that lambs in group 'B' consumed feed of 5.667±0.208 kg per animal, weight gain of 1.467 ± 0.058 kgs with mean feed conversion ratio of 3.850±0.104 against group 'A' consumed 6.800±0.100 kg feed, weight gain of 0.750 ± 0.00 kg with 9.053±0.150 mean feed conversion ratio. Moreover, during 8th experimental week, lambs in group-B consumed feed of 5.467±0.45 1 kg per animal, weight gain of 1.467±0.616 kgs with mean feed conversion ratio of 3.847±0.453 as compared to those fed on farmers' feed (group A), where feed consumption was 6.6 17±0.076 kg, weight gain of 0.483±0.029 kgs with mean feed conversion ratio of 13.700±0.794 (Table-i). During 9th week the lambs in group 'B' fed on compound feed had lowest feed intake of 5.933±0.0115 kgs, weight gain of 1.317±0.161 kg with mean feed conversion ratio of 4.557±0.603 against lambs in group 'A' had 7.030±0.079 kgs feed intake, producing weight gain of 0.600±0.132 kg with mean feed conversion ratio of 12.00±2.358. Similarly, during 10th experimental week lambs in group 'B' consumed less feed (6.090±0.066 kg per animal) for producing weight gain of 1.417±0.144 kg with mean feed conversion ratio of 5.003±1.014 as compared to those fed on farmers' feed (group A) showed feed consumption of 7.037±0.032 kgs to produce weight gain of 0.540±0.069 kgs with mean feed conversion ratio of 13.033±1.762 (Table-I).

During the 11th week, Balochi lambs in group 'B' consumed 6.890±0.475 kgs feed per animal, producing weight gain of 1.750±0.433 kg with mean feed conversion ratio of 4.080±0.878 as compared to the lambs in group 'A' consumed more feed (8.160±0.694 kgs), weight gain of 0.590±0.026 kg and feed conversion ratio of 13.800±1.308. Likewise, similar was the situation during 12th week Lambs in group 'B' consumed mean feed of 7.163±0.944 kg

per animal, producing weight gain of 1.4 17±0.144 kgs with mean feed conversion ratio of 5.093±1.063 as compared to farmers' feed (group A) with feed consumption of 8.283±0.465 kgs and weight gain *0.577* ± 0.025 kgs and feed conversion ratio of 14.367±1.365 (Table-I).

During the 13th week of experiment, lambs in group B' consumed average feed of 6.963±0.343 kgs to produce 1.233±0.275 kgs weight gain, with mean feed conversion ratio of 5.800±1.609 as compared group-A, where feed consumption was 8.367 ± 0.153 kgs. Weight gain 0.533±0.021 kgs with feed conversion ratio of 15.633 ± 0.404. Similar was situation during last week of the experiment, when lambs in group 'B' consumed lesser feed (6.650±0.144 kgs per animal) to produce 1.217±0.029 kgs weight gain with mean feed conversion ratio of 5.467±0.503 as compared group-A, with 7.950±0.060 kgs feed intake, 0.650±0.100 kgs weight gain with mean feed conversion ratio of 12.453±2.588 (Table-I).

The lambs fed on compound feed earned a net profit of Rs.5 10.00 per lamb, while the lambs fed on farmers feed earned net profit of Rs.108.00 per lamb. It was concluded that compound feed is obviously found cheaper and found remarkably effective for fattening the lambs, while poor performance of the lambs was observed when fed on farmers feed (Table-II).

Table-6 Summary of the average feed intake, weight gain and FCR of fattening lambs fed conventional (farmers) feed as compared to commercial feed.

Weeks	Feed intake (kg)		Weight gain (kg)		F.C.R	
	A	B	A	B	A	B
1	3.717a	2.467b	0.313a	0.667ab	11.875a	3.698ab
2	4.250a	3.567b	0.400a	0.767ab	10.625a	4.650b
3	4.833a	4.033b	0.450a	0.913ab	10.740a	4.417b
4	5.440a	4.623b	0.473a	I.167b	11.501a	3.961b
5	6.370a	5.i57b	0.500a	I.333ab	12.740a	3.868b
6	6.633a	5.530b	0.480a	I.283b	13.187a	4.3i0ab
7	6.800a	5.667a	0.750a	1.467ab	9.066a	3.862b
8	6.617a	5.467ab	0.483a	1.4I7b	13.699a	3.858b
9	7.030a	5.933a	0.600a	1.317b	11.7a	4.504ab
10	7.037a	6.090a	0.540a	1.417bb	13.031a	4.297b
11	8.160a	6.890ab	0.590a	1.750b	13.830a	3.937b
12	8.283a	7.163ab	0.577a	I.4I7b	14.355a	5.055b
13	8.367a	6.963ab	0.533a	1.233b	15.697a	5.650b
14	7.950a	6.5Oab	0.650a	1.217b	i2.230a	5.341ab
Total	**91.487**	**76.05**	**7.339**	**17.365**	**174.287**	**61.408**
Average	**6.534**	**5.07**	**0.524**	**1.240**	**12.449**	**4.386**

ECONOMICS

After completion of the study, costs and expenditures incurred on lambs were calculated to work out the economics (Table-2). The results of the economics revealed that the average initial cost of the lambs was Rs.1837.00, while the feed cost per lamb was Rs.748.00 and Rs.719.00 in groups A and B respectively. After adjustment of Rs.187 as cost of labour, medicines and miscellaneous expenses, the total cost remained Rs.2872.00 and Rs.2839.00 per lamb in group A and B, respectively. The price received from the experimental lambs on live weight basis was Rs.2880.00 and Rs.3349.00 in groups A and B, respectively which indicated that the lambs fed on compound feed earned a net profit of Rs.5 10.00 per lamb, while the lambs fed on farmers feed earned net profit of only Rs.108.00 per lamb. It was concluded that compound feed is obviously found cheaper and remarkably effective for fattening the lambs while poor performance of the lambs was observed when fed on farmers feed as detailed in Table-7 below:-

Table-7 Economics of experimental lambs and Cost Benefit ratio

S. #	Expenditures	Group A Rs.	Group B Rs.
1	Average initial cost per lamb	1837.00	1837.00
2	Average cost of feed per lamb	748.00	719.00
3	Average cost of medicine and misc. etc	100.00	100.00
4	Average cost of labour per lamb	187.00	187.00
5	Total recurring cost	2872.5	2839.00
6	Average sale price per lamb	2980.00	3349.00
7	Average profit/loss per lambs	108.00	510.00

DISCUSSION

The performance of Balochi lambs fed on farmers/conventional feed was poor the animals consumed significantly greater amount of feed and gained weight quite low even half of the quantity recorded in the lambs fed on compound feed. Similar was the situation with feed intake and feed conversion efficiency, which was three times better in case of the lambs fed on compound feed as compared to those fed on farmers conventional feed during 14 weeks experimental period. Thus, it was quite obvious that compound feed (group-B) can provide better lamb fattening, as compared to farmers' feed. Moreover, feeding lambs on farmers' feed is quite laborious and time consuming while in compound feed, labour and time costs can also be minimized. Moreover, compound feed contained all recommended ingredients, suitable for fattening lambs, and was economically more efficient and productive as compared to the farmers' feed. Obtaining higher weight gains with remarkably less amount of feed, the lambs may be fed on compound feed for an economic and profitable fattening process. It was further to mention that the performance of lambs fed with forages and roughages (farmers' feed) offered by the farmers were not equally efficient neither in the gaining weight nor in case of the feed conversion

efficiency. Thus, it was apparently visual that compound feed was far better in all lamb fattening parameters as compared to farmers' feed. The results reported by Ogan (2000) suggested that the fattening lambs through roughages and forages may not be profitable but considerably high returns have been achieved when fattening lambs were fed on scientifically formulated feed. Karaoglu et *al.* (2001), Zundt *et al.* (2002) and Mecit *et al.* (2002) have also reported that weight gain, feed conversion ratio and net profits were considerably efficient in the lambs fed on compound feeds as compared to those fed on forages and grasses.

CONCLUSIONS

It was concluded from the results of the present study that the fattening performance of Balochi lambs fed on compound feed (group B) was significantly higher and the lambs in this group consumed considerably less amount of feed and produced significantly (P<0.O1) more weight gain with remarkably efficient feed conversion throughout the experimental period. The lambs fed on forages and roughages resulted poor feed efficiency and in the last week of experiment they consumed 12.453 kg of feed for gaining one kilogram of weight as compared to those fed on compound feed consumed only *5.467* kgs of feed to gain one kilogram weight. The lambs in group B earned a net profit of Rs.5 10.00 per lamb, while the lambs fed on farmer's feed earned net profit of Rs.108.00 per lamb.

SUGGESTIONS

1. Balochi lambs respond well to the compound feed and the farmers are required to feed their lambs with commercially manufactured feed to achieve high profits from the sheep business.
2. The farmers are advised to add compound feed in feeding their lambs and use it to analyze the results and compare the profitability margins.

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COMPARATIVE STUDY ON CHEMICAL COMPOSITION OF THE SELECTED RABI FORAGES AND GRASSES OF LARKANA DIVISION

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ABSTRACT

Forages and grasses are the major roughage components of livestock diet, without the detailed knowledge of their chemical composition. It is difficult to compute balanced and economical rations. Larkana Division has been chosen as study area Various forages and grasses samples were collected for the determination of chemical composition in the laboratory, of Department of Animal Nutrition, Faculty of Animal Husbandry and Veterinary Sciences, Sindh Agriculture University, SAU, Tandojam. Results showed that legumes contained higher (P0.000) crude protein, calcium, phosphorus and ash than non-legumes (16.0 Vs 10.8 percent; 2632866 Vs *345309* ppm; *595536* Vs 4638 ppm, and 19.8 Vs 14.8 percent) respectively. The non- legumes contained higher Nitrogen Free Extract (NFE) (50.6 Vs 41.9 percent, P= 0.000.) and they tended to be rich in dry matter (21.9 Vs 18.4 percent. P0.06). Legumes and non-legumes were not significantly different in crude fibre (20.2 Vs 22.2 percent) and Ether Extract (EE) (2.2 Vs 2.0 percent). Furthermore calcium had a positive relationship with the phosphorus, ash and crude protein levels Crude Protein (CP) also had a positive correlation with phosphorus content of forages and grasses. It is concluded that farmers and nutritionists of Larkana Division be suggested that they can feed those legume forages and grasses which are rich in crude protein, calcium, phosphorus and ash to improve their livestock productivity.

Key Words:- RABI forages grasses chemical composition Larkana Pakistan.

INTRODUCTION

The growth in livestock population in Sindh province is not satisfactory while human population is increasingly rapidly. The land under cultivation is also reducing day by day due to the increase in civilization which is directly decreasing the production of forages and grasses, available to the livestock. The animals under such conditions have to thieve on less nutrition and poor quality forages at sub-optimum levels of 'production. Presently cattle holders have been well known to the common feed stuff values, fed to their animals, almost based on the traditional experiences. Some efforts were made for the determination of chemical values of cattle feed ingredients and its digestibility. Limited information was available cattle holders of Larkana Division but only the choice to use the chemical compositions of forages and grasses of other areas. Keeping such views in mind, an experiment designed to study the chemical composition of various available Rabi forages and grasses of Larkana division, for the improvement of the live stock production and also for the computation of balanced cattle rations for their better performance, with the main objectives as (i) to determine the chemical composition of various legume, non-legume, forages and grasses, locally grown in Larkana Division. (ii) to help in the selection of indigenous varieties of forages for the formulation of the various rations for livestock and (iii) to provide the basis for computation of economical rations to achieve optimum production, from local livestock.

MATERIAL AND METHODS

Larkana Division comprising, Jacobabad, Shikarpur and Larkana districts were included for the collection of samples of forages and grasses grown in this area. Randomly three samples were chosen and samples were collected for comparing the legumes and von-legumes during February and March, 1992 of selected Rabi forages and grasses were harvested by band cutting and weighed up to one kilogram at pre flowering stage, were partially air dried and packed in the polythene bags and were labeled for their local names taken into the hot air oven for drying. However, during over night stay samples were shortly taken out of bags. The methodology detailed in AOAC-1990 was adopted for sampling and analysis.

Forages and grasses identification their local names were confirmed from farmers of that area. One whole plant of each kind was pressed in the blotting paper sheet for proper identification after ascertaining the physical characteristics and botanical names.

Dry matter the collected samples were dried in the hot air oven with the constant temperature of *105°C* over night. The loss in weight after drying was noted as moisture.

Chemical analysis each sample was then milled by using a grinding machine at 1 mm sieve and kept in air tight sample bags and each bag was properly identified.

Crude protein the crude protein was determined by digestion of 2 gram samples on Macro Kjedhal nitrogen digestion assembly, after digestion the sample was passed through Markum still apparatus with steam generator than the reading of titration was multiplied by *6.25* for crude protein. (A.O. A.C, 1990)
The crude fibre was determined by digesting the 2g samples with weak sulphuric acid and then with weak sodium hydroxide on crude fibre extractor apparatus. After sieving the residue was kept in oven at 1350 C for two hours the remaining material was registered as crude fibre (A.O. A.C, 19.90)

The Ether Extract was determined by continuously evaporation of petroleum ether through 2g samples on Soxhlet extraction apparatus, than sample was kept in hot oven at 105°C for two hours. The loss in weight was registered as ether extract.
For determination of ash, 2g sample was kept into Muffle furnace ignited at 600°C for two hours to burn off all organic matters. Muffle furnace was shut down and left for one hour, each sample taken out and kept into desiccators for 30 minutes then finally weighed.

The N.F.E. was determined by following formula. (A.O. A.C, 1990).

NFE 100 - (Crude protein % + Crude Fibre % + Ether Extracts % + Ash %)

The determination of calcium ','as done by flame photometer, by taking 0.05 g of ash. Over night digestion of sample in l0mi of 2NHCL and filtered then 10ml aliquot acid digested filtrate was taken in 1 Omi volumetric flask. The 50 ml aliquot was taken in 250m1 volumetric flak. and was made l00ml and *250*

volumetric respectively. The reading on flame photometer instrument was recorded and calculation has been carried out.

The determination of phosphorus was done by using spectrophotometer instrument, aliquots solutions was transferred to 100 ml volumetric flasks and 20 ml molybodo vanadate added in each flask. Diluted to volume water and mixed well. Then reading was taken on spectrophotorneter and calculation has been carried as per detailed method.

Data Analysis

The data for each sample, determined, for forages and grasses collected from Jacobabad, Shikarpur and Larkana districts of Larkana division were tabulated and a Minitab statistical package was used for analysis of variance etc (MTB., USA).

Dry matter non-legume forages and grasses tended to be higher in dry matter than the legumes, (P=0.062, SEDO.355) Table-I and 2. Furthermore the Kharaho non- legume contained maximum (average 43%) and Chhatalo legume had minimum average 12% dry matter. The district area and it's interaction with legumes and non- legumes were not different statistically P0.668, SEDO.46 and *P0.935,* SEDO.741, respectively.

Table-1 Dry matter *(%)* of forages and grasses of Larkana division.

Legume	Non-Legume	Sed	Prob.
18.38 ± 1.425	21.92 ± 1.275	0.355	0.062

Table-2 Analysis of variance for dry matter.

Source of Variance	D.F	S.S	M.S	Ratio	Prob.
Legume and non-legume	1	167.25	167.5	3.64	0.062
Errors	52	2389.17	45.95		
Total	53	2556.41			

Crude protein the non-legume forages and grasses had contained least Crude protein than the legumes (P= 0.000, SED = 0.18 Table No.3 and 4). Matar legume contained maximum crude protein average 20.4%, where as Banik non-legume contained minimum crude protein average 6.5%. The districts area and their interaction between legume and non-legume arid districts were also found non significant (P = 0.87, SEDO.322 and P0.805, SED0.29, respectively

Crude fibre crude fibre contents of legumes and non-legumes had been not showing any statistical difference (P0.257, SED=0.327) Table-5 and 6. Similarly there were no difference for district area (P=0 706, SED 0.442) and its interaction with legume and non-legume (P0. 760, SELi0. 761), respectively.

Ash. The ash contains was higher in legume than the non-legume and forages and grasses (P=0.000, SEDO.123), Table-7 and 8. The districts area had no

statistical difference for ash contents (P0.941, SEDO.037) but the interaction between the legume and non-legume and district area had been almost significant (P0.077, SED=0.0291) Black lucerne legume was containing minimum ash average 23%, while Naro non-legume was at minimum average 11%.

Table-3 Crude protein (percent) of forages and Grasses of Larkana division.

Legume	Non-legume	Sed	Prob:
15.98 ± 0.724	10.75 ± 0.647	0.180	0.000

Table-4 Analysis of variance for crude protein.

Source of variance	D.F.	S.S	M.S	F. ratio	Prob:
Legume and non-legume	1	363.98	363.38	30.74	0.000
Errors	52	614.79	11.82	-	-
Total	53	98.18	-	-	-

Table- 5 Crude fibre (percent) of forages and grasses of Larkana division.

Legume	Non-Legume	Sed	Prob.
20.20 ± 1.301	22.15 ± 1.164	0.325	0.257

Table-6 Analysis of variance for crude fibre.

Source of variance	D.F.	S.S	M.S	F.ratio	Prob
Legume and non-legume	1	50.77	50.77	1.32	0.257
Errors	52	2006.08	38.58	-	-
Total	**53**	**2056.86**	-	-	-

Table-7 Ash (percent) of forages and grasses of Larkana division.

Legume	Non-Legume	Sed	Prob.
19.79 ± 0.8179	14.82 ± 0.71	0.213	0.000

Table-8 Analysis of variance for ash.

Source of variance	D.F.	S.S	M.S	F.ratio	Prob
Legume and non-legume	1	328.57	328.57	19.79	0.000
Errors	52	863.46	16.60	-	-
Total	53	1192.03	-	-	-

Chemical composition

Ether extract the level of ether extract contents for legumes and Non-legumes was not different (P=0.425, SED0.045) Table-9 and 10, followed by districts area (P- 0.28, SEDO.92), respectively Kherol non-legume was containing maximum ether extract average 3.3%, while banik also non-legume was at minimum average 61%.

Nitrogen free extract. The nitrogen free extract contents was found higher in non-legume than forages and grasses (P 0.000, SED=0.3 8')), Table-I 1 and 12) However, the districts area and their interaction with legumes and non-legume were also found non-significant (Pr0.599 and P0810; SEDI.198), respectively.

Table-9 Ether extract (percent) of forages and grasses of Larkana division.

Legume	Non-Legume	Sed	Prob.
2.192 ± 0.1778	2.002 ± 0.1591	0.045	0.0425

Table- 10 Analysis of variance for ether extract.

Source of variance	D.F.	S.S	M.S	F.ratio	Prob
Legume and non-legume	1	0.483	0.483	0.65	0.425
Errors	52	39.96	0.749	-	-
Total	53	39.429	-	-	-

Table-11 Nitrogen free extract (percent) of forages and grasses of Larkana division

Legume	Non-Legume	Sed	Prob.
41.89 ± 1.556	50.63 ± 1.392	0.389	0.000

Table-12 Analysis of variance for nitrogen free extract.

Source of variance	D.F.	S.S	M.S	F.ratio	Prob
Legume and non-legume	1	10020.6	1020.6	18.42	0.000
Errors	52	2880.6	55.4	-	-
Total	53	390.6	-	-	-

Calcium the Calcium content was lowest in non-legume than legume forages and grasses (P0.000, SEDO.078), Table-13 and 14. Both districts area and their interaction with legumes and non-legumes were not found statistically different for calcium contents (P0.787, SED1.122 and P0.800, SEDO.244),

respectively. Barseem legume was containing the maximum calcium (average 6546046 ppm.) while Sawari non.-legume was at minimum (average 161935 ppm).

Phosphorus. The phosphors contents was higher in legume than non-legume forages and grasses (P=0.000, SEDO.099) Table-15 and 16). Further more the districts area and its interaction with the legumes and non-legumes were also no found different (P0.997 SEDO.122 and P0.995, SEDO.244) respectively.

Tahle-13 Calcium (ppm) of forages and grasses of Larkana division.

Legume	Non-Legume	Sed	Prob.
2632866 ± 317654	345309 ± 284118	0.078	0.000

Table-14 Analysis of variance for calcium.

Source of variance	D.F.	S.S	M.S	F.ratio	Prob
Legume and non-legume	1	6.977	6.977	30.68	0.000
Errors	52	1.183 + 14	2.274 + 12	-	-
Total	53	1.880 + 14	-	-	-

Table-15 Phosphorus (ppm) of forages and grasses of Larkana division.

Legume	Non-Legume	Sed	Prob.
59536 ± 4035	6438 ± 36.9	0.099	0.000

Table-16 Analysis of Variance for phosphorus.

Source of variance	D.F.	S.S	M.S	F.ratio	Prob
Legume and non-legume	1	759E + 10	3.759E + 10	104.17	0.000
Errors	52	1.877E + 10	360872064	-	-
Total	53	5.636E + 10	-	-	-

Matar legumes was containing the maximum phosphorus level (average 72790 ppm), while banik non-legume was at minimum level for phosphorus (average 1857 ppm).

Correlation regression. Nitrogen free extracts had poor positive relation with dry matter contents but negative reaction with crude protein, crude fibre, ash, ether extracts and phosphorus. Calcium had positive relation with phosphorus, ash and crude protein contents of forages and grasses. Crude protein had positive relationships with phosphorus contents, respectively (Table- 17):

Table- 17 Correlation regression

	D.M	C.P	C.F.	Ash	E.E	N.F.E	Ca
CP	-077	-	-	-	-	-	-
CV	-221	-.156	-	-	-	-	-
Ash	-037	.237	-.252	-	-	-	-
EE	0.029	-176	.094	.267	-	-	-
NEF	0.300	-.540	-.521	-.512	-.409	-	-
Ca	0.111	.366	-.196	.393	-.051	-.265	-
P	-.221	.453	-.190	.473	0.111	-.377	0.412

DISCUSSION.

The results of dry matter are in agreement with Leghari (1992) who reported that Rabi forages of Hyderabad division contained 10 to *45* percent dry matter. Furthermore, Rafique and, Akhter *(1995)* reported that common fodder of Punjab like Mott and Sadabahar were containing 17 and 24 percent dry matter, respectively.

The above results are in agreement with Leghari (1992) who reported that legumes contained higher crude protein than non-legume forages. The legumes has ability to fix the environmental nitrogen through the nodules in their roots, legumes crude protein also contained high level of nitrogen (Khoso, 1992). However, Utley *et al.* (1988) studied various three grasses of U.S.A. and their results are close to this study. Rafique and Akhter *(1995)* studied use of concentrates and reported that oat contained 10.4 percent crude protein, which is so close to this study.

Kall non-legume was containing maximum crude fibre (average 36.8%) while Jhill was at minimum average 12%. Utley *et al.* (1988) reported that most grasses contained low crude fibre during early than later harvests. Furthermore, Awan *(1995)* reported that fodders of Punjab contained 18 to *35%* crude fibre However, Bughti (1996) reported from Karachi, Sindh that various grasses contained *1.2.5* to 37.0 percent crude fibre which is near to this study.
Malik and Chugtai (1979) studied local 75 grasses in Lahore, Punjab and reported that some of grasses contained comparatively less ash than the present study and may be due to the Soil and variety etc. Saeed-ur-Rehman *(1995)* workeci on chemical composition of S.S. hybrid ± Bajra and S.S. hybrid +Bajra + Mott grass at Bahadur nagar, Punjab. He reported that grasses contained average 14.0 percent ash, which is closely related to this study.

The above results are lying in between the results of Awan *(1995)* who studied *237* forages, grasses and fodders and reported that it's ether extract range form 1.6 to 4.2 percent. Utley *et al.* (1988) studied three different grasses varieties in U.S.A. and their results are nearer to this study.
The non-legume forages and grasses such as Jhill was containing maximum nitrogen free extract average *60.5%,* but Kall containing the minimum average 34.2%. These results are in agreement with Bugti (1 96), Malik and Chughtai (1979) from Karachi and Lahore and they reported that nitrogen free extract ranged between 38.3 to 71.2 and *25.0* to 51.5 percent, respectively. These

results contained wide ranged of N.F.E as this present study. Bugti (1996) also reported that the legume contained more calcium than non legume forages. Bugti (1996) reported that legume contained more phosphorus than non-legumes as reported in this study. Phosphorus increasing the supply of nitrogen to legumes (Khoso 1995).

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COMPARATIVE STUDY ON CHEMICAL COMPOSITION OF THE SELECTED WINTER FORAGES AND GRASSES OF KARACHI DIVISON

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ABSTRACT

Forages and grasses are mostly used in feeding of ruminants. Their availability and quality is highly important. An experiment was designed to study chemical composion of the winter grasses i.e. legumes and non-legume from irrigated and non-irrigated areas of Karachi Division. Fresh plant samples were collected at pre-flowering stage, properly identified, weighed and kept in polythene bags. After air drying, samples were dried in hot air oven at 105 °C for determination of DM, CP, CF. E.E. Ash, Ca, P. and N.I.H. Non-irrigated plants contained higher (P<0.00i) dry matter than irrigated *(29.536* vs 20.678%) hut no significant difference was observed between legume and non-legume (P<0.155). Crude protein was higher in legumes than non- legumes (13.865 was 8.070%. P<0.001), followed by irrigated than non-irrigates plants (9.787 vs 6.640%, R<000.1). Crude fiber and ash contents were not significantly different between legumes and non-legumes, as well as between irrigated and non- irrigated area (P<0.05). Ether *extract* was higher in legumes than non-legumes (4.322 vs 3.2 I P<0.01) and in irrigated and non-irrigated, plants (3.669 vs 2.442%. P 0.01) NFE. calculations showed not so much difference between legumes and non-legumes (26.892 vs 25.1 50%, P0.05) but this was higher irrigated than non-irrigated forages and grasses (26.272 vs 21.460%, P0.O23), Calcium was rich, in legumes than non-legumes (61.523 vs 30.340%. P<0.0l) and it was also found rich in irrigated than non-irrigated (40. 11 vs 19.83%, P-0.05'). Phosphorus was higher in legumes than non-legumes (6.602 vs 1. 196%. P=0.05) and irrigated was also rich in phosphorus than non- irrigated (2.727 vs 0.238%, P=0.05) respectively. It is concluded that local legumes and grasses will be economical for preparation of least cost rations, for improvement of livestock productivity.

Key Words: Chemical Compositions Winter Forages/Grasses Karadvi

INTRODUCTION

In Pakistan production of livestock is closely connected with crop production and still depends on traditional feeding methods. The role of farm animals in the overall agriculture development is now well documented subject. For this, we should have choice those feeds which contain all essential nutrients, such as proteins, carbohydrates, fats, vitamins, minerals, ash and water. If we see overall that grasses and forages are those feeds which contains almost all essential nutrients, the balanced ration is more essential for proper growth and development of animals because of their economical and physical reasons. The high quality forages provide high level of production at minimal feed cost, per animal as compare to concentrates.

Unfortunately the farmers of Sindh province especially rural areas, did not know about the chemical composition of forages and grasses, for that farmers arc not interested to sow the forages and grasses on commercial basis. One must have in mind that for the improvement of milk and meat production,

feed quality, grasses and forages have dominancy to all over the ration ingredients, because grasses contain all important nutrients which are essential for the animal body. Forages and grasses improves, not only meat and milk production but these arc also important for draught animals, like milk buffaloes, horses and camels, and those are eaten or grazed by animals. Awan (1995) observed that irrigated and non-irrigated forages have different DM contents, while Bugti (1996) assessed no effect on the quality of forages under irrigated and non- irrigated conditions. Similarity Klebaniuk *et al.* (2003) also reported that crude fibre content in forages were not different under irrigated and non-irrigated conditions. Verbi (1999) advocated that ash content in different forages and grasses will not differ significantly under irrigated and non-irrigated conditions.

Channa (1997) and Singh *et el* (2004) have reported significantly higher ether extract level in irrigated forages as compared to non-irrigated forages.

From the above reported fact, it can be understood that steps must he taken to fulfill the feedings requirements of animals to get more production. Along with some conventional fodder crops that can be used for animals, we have lot of varieties of forages and grasses used for this purpose. It is proposed to know the chemical composition of different identified and unidentified forage crops use to bridge the shortage of feed sup]y to livestock farmers.

MATERIAL AND METHODS

Experimental area. All the five districts of Karachi division East, West, South, Central and Malir were selected for the collection of samples of forages, and grasses grown in these areas. Randomly three samples were collected from each selected area for comparing on the basis of legumes and non- legumes, during February-March, 1997.

Samples collection. The samples of selected winter forages and grasses were harvested by hand cutting weight up to 500 grams, (0.5 kg) at pre-flowering stage, partially air dried, and packed in the polythene bags were properly identified (labbled for their local names and area) till taken into the hot air oven for drying. However, during over night stay samples were shortly taken out of bags.

The Dry matter of the collected samples were found by the hot air oven to constant temperature of 105°C over night. The methodology for DM, CR, Crudifiber, EE Ash, Ca++, P and other minerals, obtained using the AOAC-1990 instructions and formulation in this study.

Crude protein: The crude protein was determined by digestion of 2 grams of sample ativiacro Kjeldahl digestion as:'emhly. After digestion the sample was passed through Markum still apparatus with. Steam generator, than reading of titration was multiplied by 6.25 for crude protein (A.O.A.C. 1990).

Crude fibre: The crude fibre was determined by digesting 2g sample with weak sulphuric acid and then with sodium hydroxide on crude fibre extractor apparatus. After sieving the residue was kept in oven at 105°C for two hours, the remaining material was registered as crude fibre.

Ether extract (Fat): The ether extract (fat) *was* determined by continuously evaporation of petroleum Ether through 2g sample on soxhiet-extraction apparatus, then sample was kept in hot oven t 105°C' for two hours. The loss in weight was registered as ether extract.

Ash: For determination of ash. 2g sample was kept in the Muffle furnace, ignited at 600°C for two hours to burn off all organic matters. Muffle furnace wasshu1 down and left for one hour, each sample taken out, and kept into desiccators for 30 minutes then finally weight.

Nitrogen Free Extract (N.F.E): The N.F.E was calculated by using following formula.

Calcium: The determination of calcium was (lone by Flame photometer, by taking (.).05 g of ash. Over night digestion of sample in 1 0 ml of 2N HC1. and filtered then 10 ml aliquot acid digested filtrate was taken in 100 ml volumetric flask. The 50 ml aliquot was taken. in 250 ml volumetric respectively. The reading on flame photometer instrument was recorded and capsulation carried-out.

Phosphorus. The determination of phosphorus content was done by using spectrophotometer, aliquots solutions were transferred to 100 ml volumetric flasks, and 20 ml molyhodo vanadate added in each flask. Diluted to volume water and mixed well. Then reading- was taken on spectrophotometer and calculation had been carried accordingly.

Data Analysis. The data gathered for each sample, determined for forages and grasses from district East, West, Central. South and Malir of Karachi division were tabulated and Minitab Statistical package was used for analysis of variance (M.T.B. USA 1992).

i. Results ii. Dry matter iii. Legume and Non-legume

Non-legume forages (arid grasses) were slightly richer in their dry matter contents than the legumes (P<0.155) Table-I. Furthermore Sara non-legume contained maximum average 50.63 % while Barseem, the legume had minimum (average 9.20%) dry matter content.

Table- 1 Dry matter of legume and non-legume forages and grasses of Karachi Division (%).

Legume	Non-legume
19.199^{b}	22.844^{a}
± 8.659	± 9.109
20.678^{b}	29.536^{a}
± 7.861	± 11.681

Non-irrigated forages and grasses were higher in dry matter contents than irrigated forages and grasses (P0.001) Tabele-1. Further more sara grown in non-irrigated areas contained maximum average 50.63% and Berseem belongs to the irrigated areas had minimum average 9.20 % dry matter respectively.

Crude Proteins of Legume and non-legume forages and grasses contained less crude protein than the legume forages and grasses of Karachi- (P<0.000) Table-2. Both Lucerne and Barseem legumes contained more crude proteins in average 15.62% whereas (Thhahar. Bhatar. Kamoo. Kandero. Patatir. Sara. Goon, Qalarn. Kamandri. Dinehi and Pan. Non-legume contained less crude protein average 6.25%. (Lucerne).*(Medicago saliva)* contained higher crude proteins in corn rison to concentrates which fed to lambs and their performance was similar to the concentrate offered lambs in Ohio, USA. Table-3 Crude protein of legume and non-legume forages and grasses of Karachi Division (%).

Irrigated and non-irrigated

Dry matter of forages and grasses; was higher in its crude protein contents than non-irrigated grasses and forages of Karachi (P<0.000) Table-2. Furthermore Kanak of irrigated areas contained the maximum crude protein average 1 2.50% whereas Naro, K.asni. Kamo, Bhatar, Dinohi and Chhahar contained less crude protein levels. Non-irrigated areas looni contained 7.8 1% of CP, but rest of non- irrigated and grasses contained less CP average, 6.25%.

Table-2 Crude protein of irrigated and non irrigated of forages and grasses of Karachi Division (%).

Irrigated	Non-irrigated
13.865^{a}	0.070^{b}
± 1.599	± 1.679
9.787^{b} ± 2.882	6.640^{b} ± 0.706

Crude Fibre of Legume and Non-legume had not been showing any statistical difference (P=0.113) Table-3. There was no difference for district areas and its interaction with legume and non-legume, respectively Jawa non-legume was containing maximum crude fibre average 20.83%

Tahle-3 Crude fibre of' legume and non-legume forages and grasses of Karachi Division (%).

Legume	Non-legum
26.875^{a}	25.692^{b}
± 1.628	± 2.821
26.016^{a} ± 2.496	25.542^{b} ± 2.467

Crude fibre contents of irrigated and non-irrigated had not been showing any statistical difference (P=0.573) Table-3. Furthermore, Lucerne of the irrigated areas was containing maximum crude fibre average 29.5%. While Lani the non-irrigated was containing minimum average 21 .*75%.*

Ash contents of non-legume was slightly higher than in legume Forages arid grasses there was not much difference between the legume and non- legume, (P=0. 169) Table-4. Furthermore Goon the non-legume was contained

maximum ash content average. 22.87% of Ash, while the Pan the non irrigated had minimum 9.38% average.

Tahle-4 Ash contents of legume and non-legume forages and *grasses* of Karachi Division (%).

Irrigated	Non-irrigated
13.049[a]	14.724[a]
± 3.152	± 4.525
14.458[a]	13.908[a]
± 4.093	± 5.512

The Ash contents in irrigated forages and grasses was slightly rich in non-irrigated forages and grasses. there was not much difference between irrigated and non-irrigated (P<=068) Tahle-4. Furthermore, Barseem the irrigated, contained maximum 17.15% average of Ash, while Pan, the non-irrigated, had minimum Ash content of 10.50% average.

The level of Ether Extract for legumes was higher than that of non-legume forages and grasses (P<0.000) Table-5). Furthermore, Methi legume was containing maximum average *5%* of Ether extract while Goon the. non-legume containing maximum average 1.8% of Ether extract.

Table-5 Ether Extract of legume and non-legume forages and grasses of Karachi Division *(%)*

Irrigated	Non-irrigated
4.322[a]	2.442[a]
± 0.669	± 0.430
3.699[a]	2.442[a]
± 0.669	± 0.430

The level of Ether extract in irrigated was higher than that of non-irrigated forages and grasses (PO.OOO). Furthermore Methi the irrigated containing maximum average 5% of Ether extract, while Goon the non-irrigated containing minimum 1.81% of Ether extract.

The nitrogen free extract (percent) contents in legumes posses slightly more than that of non-legume forages and grasses (P<0.365) Table-6. Furthermore there was not more difference between nitrogen free extract of legume and non- legume. However, Sinjhi the legume containing maximum average 30.66% of nitrogen free extract while Sara, the non-legume containing minimum 329% nitrogen free extract.

Table-6 Nitrogen Free Extract of legume and non-legume forages and grasses of Karachi Division *(%)*.

Legume	Non-Legume
26.892[a]	25.150[a]
± 3.435	± 7.414
26.272[a]	21.468[b]
± 5.896	± 9.698

The nitrogen free extract (percent) contents in irrigated area was higher than that of non-irrigated forages and grasses (P0.023) Table-6. Furthermore, the irrigated containing more nitrogen free extract 40.22% while Sara the non-irrigated contains minimum average 4.29% of nitrogen free extract.

The calcium content was significantly higher in **legume forages** and grasses than non-legumes (P=0.00l) Table-7. furthermore B3erseem legume grasses containing maximum calcium average 65.14%, while Kandero the non-legume was minimum average 1 6.18% of calcium.

Table-7 Calcium of legume and non-legume forages and grasses of Karachi Division (%).

Irrigated	Non-irrigated
61.523^{a}	30.340^{b}
± 2.213	± 9.975
40.11^{a}	19.83^{b}
± 14.88	± 3.31

The calcium contents was lowest in **non-legume** than legume forages and grasses (P=0.000) Table-7. Furthermore, Beseem the irrigated containing maximum calcium contents average 65.14%, while Kandero, the non-irrigated contained minimum 16A8% of calcium, respectively.

The phosphorus content *was higher* in **legume** than in **non-legume forages** and grasses (P=0.000) Table-8. Furthermore, Berseem containing maximum average 6.99% while Puchhir the non-legume containing *minimum* phosphorus average 0, 1 65 % of phosphorus.

Table- 8 Phosphorus of legume and non-legume forages and grasses of Karachi Division (%).

Legume	Non-Legume
6.602^{a}	1.196^{b}
± 0.548	± 1.671
2.727^{a}	0.238^{b}
± 2.748	± 0.027

The phosphorus content was higher in **irrigated** than **non-irrigated** forages and grasses (P=0.003) Tahle-8. Furthermore, Berseem the irrigated containing maximum average 6.99%, while Sara the non-irrigated containing minimum average 0.20% of phosphorus respectively.

DISCUSSION

It was found that non-legume forages arid grasses were slightly richer in their dry matter contents than the legumes, but these differences were statistically non-significant (P>0.05). Similar results have also been reported by Ralique and Akhtar (1995) who recorded different dry matter values in legumes and non-legume forages, while Denek aid Denz (2004) reported different) M

values in various targets samples. Dry matter contents were significantly (P<0.0 1) in non-irrigated forages and grasses than irrigated forages and grasses and similar DM contents have also been recorded by Awan *(p995)* who were of the experience that irrigated and non-irrigated forages have different DM contents, while Hugh (1996) assessed no effect on the quality of forages under irrigated and non-irrigated conditions. These results are almost in agreement with the results of Leghari (1992), who reported. The results of Hyderabad division Rabi frages and grasses ranges 1 *0* to 45%.

The non-legume forages and grasses contained less crude protein than the legumes forages and grasses of Karachi (P<0.0l) and Lucerne and Berseem legumes contained more crude protein as compared to other forages and grasses. In this concerned Channa (1997) reported similar results that *Mucilage sativa* (Lucerne) contained higher crude protein in comparison to concentrates and subsequent performance of feeding animal in case of irrigated and non-irrigated conditions, dry matter of forages and grasses was higher in its crude protein contents than non-irrigated grasses and forages of Karachi (P<0.01) and these results have been supported partially by Bugti (1996) who also obtained different crude protein contents in forages and grasses under irrigated and non-irrigated conditions.

Crude fibre contents el legume and non-legume were not of any statistically significant difference (P>1.05). Comparative results on crude fibre in different legumes and non-legumes obtained by Mwavu (2001) who reported that crude protein in different forages and grasses was significantly different (P<0.05). Crude fibre contents of irrigated and non-irrigated did not *show* any statistically significant difference (P>0.05) and these results are in similarity to those of Kiebaniuk *el a*. (2003) who also have reported that crude fibre content in forages were not different under irrigated and non-irrigated conditions.

Ash contents in non-legume was slightly higher than in legume forages and grasses hut the differences were non-significant (P>0.05) statistically between the legume and non-legume. These findings have partially supported by Channa (1997) and Verbi (1999) whose consolidated experience lead to state that ash contents in different legume and non-legume forages and grasses were significantly different. Moreover, Ash contents in irrigated forages and grasses was slightly rich in non-irrigated forages and grasses, but these differences were not so pronounced (P2>0.05) and further Verbi (1999) who advocated that ash content in different forages and grasses will not differ significantly under irrigated and non-irrigated conditions.

Ether Extract level in legumes was significantly higher than that of non-legume forages and grasses (P<OM1), which further supported by the findings of Channa (1 997), who was of the experience that Ether extract level in leguminous forages was higher as compared to non-leguminous forages and grasses. Similarly, the level of Ether extract in irrigated and non—irrigated forages and grasses was significantly different (P<0.05) and it was irrigated in irrigated than those of non- irrigated forages and grasses. These results are in accordance with those of (Channa (1997) and Singh *et al.* (2004) who reported

significantly higher Ether extract level in irrigated forages as compared to non-irrigated forages.

Nitrgei free extract contents in legumes posses slightly more than those of non-legume forages and grasses. However, the differences were not statistically significant (P>0.*005).* Such experience in the present study has also been further supported by Yu *et al* (2004) who recorded differences in nitrogen free extract in legumes and non-legume forages but these differences were not so appreciable (P>0.05). However, the differences in nitrogen free extract contents in irrigated and non-irrigated forages were significant (P<0.05) and it was higher in irrigated forages as compared to non-irrigated ones.

Calcium content was significantly higher in legume forages and grasses as compared to non-legumes (P<0.01), which might be the morphological characteristics of these forages. Varied calcium content in different forages and grasses including Berseem and Lucerne has also been reported by Tamm at *al.* (2002), who recorded significantly different results regarding calcium content in various forages and grasses and subsequent effect on calcium contents in feeding animals. Furthermore, the calcium contents were significantly lower in non-legume forages as compared to legume forages and grasses (P<0.0l) and such results have also been reported by Singh *et al.* (2004).

Phosphorus content was significantly higher in legumes than those of non-legume forages and grasses (P<0.01) which might be the natural qualitative character of legumes aid similar opinion has been reported by Tamm et *al. (2002)* and Singh et *al.* (2004), whose consolidated experience led to say that leguminous forages always possess greater phosphorus values than non-legumes. Moreover, comparative phosphorus content was higher in irrigated than non-irrigated forages and grasses (P<0.01) and such results a; e also supported by Mwavu et *al.* (2001) and Tamm el *al.* (2002).

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NUTRITIVE EVALUATION *OF ACAC1A NILOTICA INDCA* FORAGE FOR GROWING KIDS

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ABSTRACT

Sixteen weaned male goat kids were initially weighed and randomly divided into *A,* B, C and D groups, offered basal diet contained wheat straw with wheat bran for maintenance requirements to II groups and a supplement of dry *Acacia nilottca indica* leaves, dry *Acacia nilotica indica* pods and fresh *Sesbania aculeata* and basal diet to each group, respectively. Kids, after two week's adaptation period were fed experimental diets for a period of seven-weeks. Dry matter intake of Group was 0.26 g and Group-B consumed significantly smaller quantity of basal diet (0.04 g) than Group-A (0.19 g) and Group-C (0.14 g). The intake of supplements was significantly higher in group B (0.50g than Group-C (0.24 g) and Group-A (0.21 g) also, total dry matter intake was significantly higher in Group-B (0.54 g) than A (0.40g), C (0.38g) and D (0 per kid. Average daily weight gain was significantly higher in group B (20.78 ± 2.27g) than A *(12.35g ± l.55g)* and C (12.35 ± 1.35 g) whereas, group D maintained their initial weight up to the termination of experimental period. The apparent digestibility of kids fed basal diet with or without supplements determined was higher in B (73.94%) than A (65.44%), C 58.15%) and D (56.38%) groups. The *Acacia niloticci indica* leaves contained DM, CP, CF. FE, NFF and ash, 14.20, 9.20, 3.90, 66.40, and 6.30 percent; the pods, 11.90, 17.00, 1.90, 62.50, and 6.70 percent; *Sesbaizia aculcata,* 21 .00, 14.00, *3.50,* 50.40, and 10.10; wheat straw, 2.00, 37.60, 0.50, 47.60, and 12.20 and wheat bran 15.41, 10.76, 3.45, 64.79 and 5.59 percent, respectively. The d.egra1dability parameters for wheat straw were 57.4% degradability of water insoluble fractions, with. 66.1% measured degradability at 96 hours and 68.8% calculated potential degradability. The values for fitted degradability curve were calculated a: " 3.0, 'b' 65.7 and 'c' 0.030. The degradability parameters of wheat bran were: 73. *1%* degradability of water insoluble fractions, with 72.2% measured degradability at 96 hours and 86.8% calculated potential degradability. The values for fitted degradability curve were calculated as: 'a' 14.6, 'b' 72.2 and 'c' 0.050. The degradability parameters of *Acacia nilolicu md/ca* leaves recorded were: 75.8 % degradability of water insoluble fractions, with 80.l0/ measured degradability at 96 hours and 95.8 % calculated potential degradability. The values, for fitted degradability curve were calculated as: 'a' *15.7,* 'b' 80.1 and 'c' 0.050. The degradability parameters of *Acacia nilotica indica* pods observed were: 61 .1 % degradability of water insoluble fractions, with 76.4 % measured degradability at 96 hours. The values for fitted degradability curve were calculated as: 'a' 6.3, 'b' 76.4 and 'c' 0.050.

Key words: Animal nutrition, growing kids, Acacia Nilotica Indca, Sindh, Pakistan.

INTRODUCTION

Most of the animals in Pakistan are producing below their inherent capacity, mainly due to deficient nutrition. Though livestock population has been increasing at mediocre rate, the fodder area is seen reduced by 2-3 percent of the total cropped area, over a period of 10-12 years (Bhatti and Khan, 1996). In Sindh province, the land under **fodder crops** is only 11.89% and which has decreased by 47.06% during the period from 1985-86 to 2002-03. (Anonymous 2004). Furthermore, low soil fertility and lack of water on one hand and

increasing salinity and water-logging, brought by artificial irrigation system on the other hand make the conditions more difficult for cropping. The productivity and nutritive value of the forages from rangelands, which constitute about two-thirds of the total area of the country. Due to under-nutrition and very low productivity of livestock are common, especially during the dry season when palatability and quality of the forages is poor. It is estimated that if the feed and fodder intake of animals is raised by the missing 30 percent to a satisfactory year round improvement in nutritional level of the feed, production can be increased by more than 100 percent (Anonymous, 1988).

There has been long established tradition of agro-forestry in southern province of Pakistan, Sindh a wide assortment of species of trees have repeatedly been tried by government agencies but no other species, except *Acacia nilotica indica,* could survive the adverse local conditions, specially high soil salinity (Khattak, 1976; Singh *et* at. 1994; Nabil and Coudret, 1995). As pointed out by Atsedu *et at.* (1994), *Acacia nilotica indica* warrants attention in research and development, given its strategic value as forage resource, specially, in pastoral systems and its ability in variable, environments. Sotohy *et al.* (1997) reported that chemical analysis of *A. nilotica* leaves reveled its contents of crude protein, crude fibre and ash were 12.1%, 30.5% and 13.2%, respectively, while the total soluble tannins were *34%.* According to Khan *(1965)* and Gohi (1981) *Acacia nilotica* leaves contain upto 19.7% crude protein and *Acacia nilotica* pods contain 8.8-14.30% crude protein on dry matter basis. Ebong *(1965)* concluded that differences in intake between sheep and goat could be attributed to differences in retention times and hence digestibility of DM and VDF.

Differences between browse species are attributed to types and levels of tannin and related polyphenols in the leaves and their effects on metabolism in the rumen. Use of the faecal N fractionating technique as a non-invasive method of determining N degradability in ruminants may not be applicable to high tannin feeds. Haimoglu *et al.* (1982) analyzed the feeds of Sindh and found that the *Acacia nilotica* leaves, *Acacia nilotica* pods contain 51.20% dry matter, 11.9% crude protein, 17.0% crude fibre. 62.5% nitrogen free extract, 1.9% ether extract and 6.7% Ash. The Sesbania aculeate leaves, were found to contain 71.98% dry matter, 12.9% crude protein, 13.8 crude fibre, 50.7% nitrogen free extract, 3.5% ether extract and 10.1% Ash. Malik and Chughtai (.1979) reported that the digestion coefficients of dry matter and crude fibre of the leaves of *Desi keeker,* which they classified as *Acacia Arabica,* the tern1 generally used for *Acacia nilotica* were 73.06 and 47.66 in cattle and 80.10 and 69.73 in buffalo calves, respectively.

The moisture was found to be 64.73 percent, dry matter 35.20 percent, crude protein 15.62 percent, ether extract 7.36 percent, crude zibre 10.41 percent, mineral matter *7.95* percent and nitrogen free extract *59.02* percent on dry matter basis. Under this situation it is a need of the time to explore the trees as potential feed source for feeding livestock specially, *Acacia nilotica indica,* which has been fOund to grow very well on dry as well as saline lands. Goats

also need special attention not only because it is the source of income to the poor farmers but also because of very high demand for its meat.

Material and Methods

Kids

a. The 16 weaned healthy **goat kids** were purchased from local market (Hyderabad). They were initially weighed and randomly divided into four equal groups A, B, *C* and D. Kids were drenched (Niizan) against endo parasitic diseases. Ivomec injection was given as ectoparasitic control and vaccinated against Enterotoxaeniia curn Lamb dysentery. All kids were castrated with Burdizo castrator. Each group of Kids was housed in separate compartment under single shed at the Student Farm of the SAU Tandojam. Kids were offered three different diets and one group was kept as control. They were given two weeks adaptation period before start of the experiment.

b. **A basal diet** was prepared by-mixing wheat straw with wheat bran so as to provide maintenance requirements. Addition to basal diet to kids, a supplement of dry *Acacia nilotica indica* leaves (A), dry *Acc'cia nilotica indica* pods (B) fresh *Sesbania aculeata* (C) were provided and one group was fed basal diet (D) only, allocated as T1, T2, T3 and T4, respectively. Both basal diet and the supplements were individually fed to kids in separate buckets as free choice, in their respective groups. All kids, after two weeks' adaptation period were fed experimental diets during the seven-week experimental period. Feed samples were collected from each diet, every day, for Proximate Analysis.

c. **Feeding and management** each group of four kids was individually tied up by using rope in separate well ventilated square pan. Each kid was provided feeds, after initial weighing in a separate feeding bucket, twice daily and fed *ad. libituin* basis, allowing proportional refusals of about 0.20 of the offered. Fresh water was made available for each kid over 24 hours in a separate trough. The refusals of basal diet and supplements were collected and weighed next day morning, for each of the kids and recorded daily.

d. **Intake and sampling** representative samples of each feed and samples from the refusals were taken once a week for dry matter and chemical analyses. Before each meal, refusals from previous meals were removed from the utensils and weighed. Daily refusals by individual animal were recorded separately. The difference between amount offered and amount left (uneaten) were taken as the quantity consumed. Dry Matter Intake was measured daily .during the experimental period for each individual animal. Dry Matter Intake was calculated as intake per kg metabolic weight ($M^{0.75}$). Average daily intake of kids of each group was calculated using formula:

e. **Weighing** all of the goat kids were initially weighed individually and later kids were weighed after completion of each week, at morning, before feeding and recorded. Average live-body-weight-gain per day, was calculated for each kid by using formula. Growth rate calculated from the difference in body weight of kids, before and after experimental period divided by number of days.

f. **In-vivo apparent digestibility** apparent digestibility for each feed was measured by putting one animal from each treatment; into metabolic crates for one week on turn, after two weeks of experimental period to assess in Vivo apparent digestibility Total collection of faeces was done for seven days .Collected faeces were thoroughly mixed and bulked and representative samples were obtained for the determination of the apparent digestibility of dry matter and organic matter

g. **Dry matter (DM)** the feed samples initially were collected into polythene bags and taken to laboratory of Animal Nutrition, then samples were shifted on flat-bottom Aluminum basin and weighed by using top loaded weighing scale and kept in hot air oven at 60°C temperature over 24 hours for pr-drying and then at 105°C for drying over further 24 hours: later dried samples were allowed to cool by switching off oven followed by shifting of samples to desiccators for one hour and finally weighed. The calculation has been made by using standard formulae (AOAC, 2000):

h. **Crude protein (CP)** dried feed samples were grinded in electric grinding machine at 1 mm sieve and stored in air-tight plastic bag samples of 2 mg feed was weighed and taken into Kjeldahl flask 5 gm catalyst was added while 30 ml concentrated H_2S0_4. The neck of Kjeldahl flask was washed with a jet of 15 m H_2O from wash bottle and whirled the flask for thorough mixing of the contents. The flask was placed on the digestion assembly and turning on the heater for digestion. The digestion was continued for further 30 minutes after oxidization of organic matters and the solution in flask turned clear. Later, after cooling of flask the digest was transferred into 100 ml volumetric flask with washings to make the volume up to mark and then mixed well. Five (5) ml of digest from volumetric flask was pipetted and introduced it to Markam Still apparatus where 5 ml of NaOH (40 percent w/w) solution was added through funnel by twisting the funnel stopper and the funnel was plugged firmly. The solution was distilled for 5 minutes and collected the distillate into a conical flask containing 5 ml of 2 percent boric acid. The solution was titrated against standardized H_2S0_4. A blank was also run through all the steps of the procedure. Calculations were made as per instruction of AOAC (2000):

i. **Ether Extract (EE).** Four grams of dry sample was placed in extraction thimble and plugged it with absorbent cotton wool. After placing the thimble in an extractor and fixing under the condenser of extraction apparatus, 150 ml of Diethyl ether anhydrous solvent was added to the receiving flask and flask was then connected to the apparatus. Latter water and the heater were turned on and extraction was made for 10 hours at a rate of condensation of 3-4 drops / second. Just before drying of solvent in the flask, the extraction was disconnected and flask was reinoved. The extract was then transferred into a clean tarred evaporating basin with ether washings. After evaporating the solvent on water, bath; the basin was placed in oven at 105°C for 2 hours. The extract was then cooled in desiccators for 30 minutes and weighed. The ether extract was calculated as per formulae given (AOAC, 2000):

j. **Crude fibre (CE).** 2.0 gram of dried and ether extracted sample was placed in a tall form beaker in which 200 ml boiling H2S04 was added. The sample was digested for 30 minutes on crude fibre extraction apparatus and then filtered through sintered glass Buchner funnel with the aid of suction air pump. Sample was washed with hot water until it was acid free which was confirmed by collecting 15 ml filtrate in which one point of 0.1N NaOH and one point phenolphthalein indicator was added to obtain pink colouring. The sample was then transferred to tall form beaker again and 200 ml of boiling NaOH was added to digest it for 30 minutes. The sample was then filtered through sintered glass buchner funnel with an aid of suction air pump. It was then first washed with 10 ml hot dilute .11,504 and then with hot water until acid free. The sample was transferred in gooch crucible and was washed with 10 ml ethanol. It was suck dried and further dried in oven at 135°C for 2 hours. The samples were then cooled in desiccators for 30 minutes and weighed. The samples were then ignited in muffle furnace at 600°C for 30 minutes and cooled in desiccators for 1 hour and were weighed. The crude fibre percentage was calculated by using following the formulae, detailed in (AOAC, 2000):

k. **Ash.** Dried feed samples after grinding were taken into Petri dishes (4.0 g) and shifted in muffle furnace or heating at 600°C for 2 hours, later furnace was shut off and allowed samples to cool. Samples were shifted to desiccators for one hour and finally samples were weighed and recorded. The calculation for the determination of ash was made by using the formulae given by (AOAC, 2000):

l. **Nitrogen Free Extract (NFE).** Nitrogen Free Extract (NFE) *was* calculated by difference after analysis of other items and putting their values in the formulae (AOAC, 2000): NFE % 100 - (Moisture % + Crude Protein % ÷ EE % ÷ CF % + Ash %).

m. **Rumen degradability of feeds.** Degradability measurements for *Acacia nilotica indica* leaves, *Acacia nilotica indica* pods, wheat bran and wheat straw, were made using the nylon bag technique (Mehrez and Orskov, I997 in the rumen of three castrated male kids fitted with permanent rumen canulae. The kids were offered leguminous grass and had free access to water. For each food, 4-5g dry ample ground through hammer mill, with 2 mm sieve was weighed in triplicate into labeled nylon bags and subjected to rumen incubating for 6, 12, 24, 48 72 and 96 hours. After each incubation time, the bags were removed from rumen and hand washed in cold water for 15 minutes. Also two bags containing 4-5g each food was soaked in warm water for one hour and then washed, to determine washing losses. The residues in the bags were then dried for 48 hours at 60°C to calculate the DM.

n. **Degradability calculation.** Three castrated male kids were fitted with permanent rumen canulae while 23 nylon bags per sample were incubated, i.e. 7 incubation times, *3* animals, plus 2 bags for measuring zero time washing losses except for wheat straw for which 20 nylon bags per sample were incubated, i.e. 6 incubation times, 3 animals, plus 2 bags for measuring zero time washing losses.

o. **Bags.** The bags measured about 75 x 15 cm with pores of about 30-50 microns (pt) in diameter received from International Feed Resources Unit at Rowett Research Institute. Each of the bags was numbered with permanent ink for identification.

Rods the bags are attached to a **'rod'** which was a thick walled PVC plastic tube of about 32 cm long. Each tube was fitted with a nylon loop and identification tag at the top end and had three to four slits, cut, through the tube.

These were about 2-3 cm long starting 2-3 cm from the end, and about 2-3 cm apart. 7 PVC rods per animal were prepared with 3-4 bags, one rod for each incubation time (7 times), plus 2 rods for zero time washing losses. 3- 4 rods were put per goat at a time.

Sample preparation was done by grinding through a 2'/2 mm screen.

Procedure

Weighing on samples

i. Weighed on about 4-6 grams of sample into each bag (depending on the bulkiness of the material)

ii. The end of the bag was inserted through the slit, folded over the end of bag and fixed by winding a rubber band over the bag and the tube. The rubber band used was # 27 (3 3mm long x 3mm wide)

iii. **Programming incubation times.** Seven incubation times were use': 4, 8, 16, 24, 48, 72 and 96 hours except for wheat straw for which 4 hours time was skipped. Initially, rods for 4, 8 and 16 hours were put together and latter, for remaining times. Extra two bags per sample (on one rod) were weighed on, for the determination of zero time washing losses.

iv. **Placing of rods with sample into rumen.** Rods with the attached bags were put into a bucket of warm water for 10 minutes before putting them into the rumen to exclude any air from the bag, and soak the material in water at approximately rumen temperature. The bags were lightly squeezed and inserted into the rumen using a stick to push them into the rumen digesta. The nylon loops at the top of the rod was slipped round the hook on the canulae cap. The tags were used on the rods to identify which rod needs to be removed at which time.

v. **Removal of bags from the rumen** was so operated that the rods were withdrawn with a firm but careful pulling of the rods. A welding rod bent into the shape of a hook and covered by a plastic tube was used to ease the bags out. When the plastic rod with the attached bags was out of the rumen, the bags were quickly rinsed in a bucket of cold water. When all the rods from all the kids were taken out, they were rinsed more thoroughly by shaking vigorously in a bucket of cold water.

vi. **Final washing of bags** was done in water by hand under a tap until the washing water became clear. The bags were then dried in an oven at 60°C until dry and weighed again.

vii. **Zero time washing losses** were determined that two rods with bags containing samples were soaked in water for 10-20 minutes, then washed without incubation in the rumen along with rods taken out from rumen to determine zero time washing losses measurements

viii. **Dry matter content.** The dry matter content the original samples was also determined to calculate degradability and washing losses on dry matter basis.

ix. **The degradation curve equations were fitted** by computer program neway.

Statistical data analysis

The collected data was tabulated and fed in computer by using SPSS software statistical package for analysis of variance (ANOVA) and mean averages for graphics presentation (SPSS 13.00, USA, 2004) and degradability calculations were made by using Neway Excel. V.5.00 (1997), software of Rowett Research Institute, UK.

Results

Dry matter intake

Average dry matter intake by growing kids offered basal diet (Wheat Straw + Wheat bran) *ad libitum* as well as supplements and total dry matter intake results behaved differently for each group (Table-1).

Table-I Dry matter intake of feeds by goat kids.

Treatments	Dry Matter intake (g/kg$^{0.75}$ Body weight)		
	`Basal diet	Supplement	Total
	Mean	Mean	Mean
A. (*A. nilotica indica* leaves)	0.19 ± 0.035	0.21 ± 0.033	0.40 ± 0.057
B. (*A. nilotica* pods)	0.04 ± 0.018	0.50 ± 0.107*	0.54 ± 0.120
C. (*Sesbania aculeate*)	0.14 ± 0.026	0.24 ± 0.037	0.38 ± 0.048
D. (Control)	0.26 ± 0.026	0.00	0.26± 0M26

* The kids regurgitated the seeds or excreted in the faucal material.

The basal diet dry matter intake (Table-2) of kids kept in group D control, with basal diet of wheat straw and wheat bran for maintenance (0.26 g) was significantly higher than group A (0.19 g) having *Acacia nilotica indica* leaves, C (0.14 g) having Sesbci,zia aculeata and B (0.04 g) having *Acacia nilotica indica* pods.

The intake of supplement *was* significantly higher in group B (0.50 g) than C (0.24 g) and A (0.21 g) but total dry matter intake was significantly higher in group B *(054* g) than A (0.40 g), C (038 g) and D (0.26 g), respectively.

Daily weight gain

Average Daily Weight Gain by growing kids offered with choice of basal diet (Wheat Straw + Wheat bran) as well as supplements is as under:

Table-2 Daily weight gain of goat kids.

Treatments	Average weight gain (g/day)
A. (A. nilotica indica leaves)	12.35 ±1.55
b. (A. nilotica pods)	20.78 ± 2.27 *
C. (Sesbania aculeate)	12.35 ± 1.35
D. (Control)	0.00 ± 1.07

The kids regurgitated the seeds or excreted in the faucal material Average Daily Weight Gain was significantly higher in group B (20.7 g/day) than A (2.35 g/day) and C (2.35 g/day) where as group D maintained their initial weight up to the termination of experimental period.

Table-3 Apparent digestibility of feed consumed by goat kids.

Treatments	Average weight gain (g/day)
A. (A. nilotica indica leaves)	66.44 ± 1.76
b. (A. nilotica pods)	73.94 ± 1.95
C. (Sesbania aculeate)	58.15 ± 2.25
D. (Control)	56.38 ± 1.70

* The kinds regurgitated the seeds or excreted in the faucal material.

The apparent digestibility of kids fed basal diet with or without supplements determined was significantly higher in B (73.94%) than A *(65.44%),* C (58.15%) and D *(56.38%)* groups.

Table-4 Chemical composition of feeds fed to goat kids (percent).

Nutrients	A. nilotica leaves	A. nilotica pods	Sesbania	Wheat straw	Wheat bran
DM	98.46 ± 0.035	97.45 ± *0.854*	72.00 ± 4,000	97.98 ± *0,525*	97.81 ± *1.530*
CP (DM basis)	14.20 ± *0.529*	11.90 ± 0.794	2100± *2.646*	2.00 ± 0.200	*15.41*± 1.044
CV (DM basis)	9.20 ± 0.700	17.00 ± 2.598	14.00± 2.000	37.60 ± 0.900	10.76± 1.212
EE (DM basis)	3.90 ± 0.3 00	1.90 ± *0.265*	*3.50* ± 0.200	0.50 ± 0.050	*3.45* ± 0.250
NFE (DM basis)	66.40 ± 0.755	62.50 ± 1.998	51.40 ± .1.572	47.70 ± 1.126	64.79 ± 1.400
Ash (DM basis)	6.30 ± 0.200	6.70 ± 0.436	10.10 ± 0.380	12.20 ± 1.800	5.59 ± 0.690

out flow rate 0.02 fraction/hr (72.9%), 0.05 fraction/hr (55.8%) and 0.08 fraction/hr (46.7%).

Table-5 b Degradability parameters

Parameters	Wheat straw	Wheat bran	Acacia Leaves	Acacia gods
Washing loss (%)	11.4	13.1	19.9	21.6
Degradability of water insoluble (%)	57.4	73.7	75.8	61.1
Potential degradability (%)	68.8	86.8	95.8	28.7
Rate constant (fraction/h)	0.03 0	0.050	0.050	0.050
Lag time(h)	*4.5*	0.0	1.1	*4.5*
Fitted parameters				
A	3.0	14.6	15.7	6.3
B	65.7	72.2	80.1	76.4
C	0.030	0.050	0.050	0.050
Sum of square	36.67	2057.12	1616.38	487.68
No. of observations	6	7	7	7
RSD	36.67	22.68	20.10	11.04

Degradability of Wheat straw

The degradability of wheat straw was calculated for 6 times 8, 16, 24, 72 and 96 hours. Table-5c shows the degradability parameters of wheat straw fed to the kids. There were 11.4% washing losses, 57.4% degradability. of water insoluble fractions, with 66.1% measured degradability at 96 hours and 68.8 % calculated potential degradability. The lag time was 4.5. hours which, was the highest. The effective degradability at outflow rate of 0.05 fractions per hour was recorded to be 28.6%. The values for fitted degradability curve were calculated as: 'a' 3.0, 'b' 65.7 and 'c' 0.030.

Table-5 c Effective degradability.

Outflow rate (fraction/h)	Effective degradability(%)			
0.02	42.9	66.2	72.9	61.4
0.05	28.6	*50.7*	*55.8*	*45.9*
0.08	22.3	42.4	46.7	*37.9*

Degradability of wheat bran

The degradability parameters of' wheat bran fed to the kids are at the parameters were recorded for 7 times i.e. 4, 8, 16, 24, 48, 72, and 96 hours. There were 13.1 % washing losses, 73.7% degradability ity of water insoluble fractions, with 72.2% measured degradability at 96 hours and 86.8 % calculated potential degradability. The lag time was 0 hours. The effective degradability at

outflow rate of 0.05 fractions per hour was recorded to be *50.7%*. The values for fitted degradability curve were calculated as: 'a' 14.6, 'b' 72.2 and 'c' *0.050.*

Degradability *of Acacia nilolica indica* leaves

The degradability parameters *of Acaci nilotica indica* leaves fed to the kids. The parameters were recorded for 7 times i.e. 4, 8, 16, 24, 48, 72, and 96 hours. There were 19.9% washing losses, *75.8%* degradability of water insoluble fractions, with 80.1% measured degradability at 96 hours and 95.8 .% calculated potential degradability. The lag time was 1.1 hour. The effective degradability at outflow rate of 0.05 fractions per hour was recorded to be *55.8%.* The values for fitted degradability curve were calculated as: 'a' *15.7,'b'* 80.1 and 'c' 0.050.

Degradability *of Acacia nilotica indica* Pods

The degradability parameters *of Acacia nilotica indica* pods fed to the kids. The parameters were recorded for 7 times i.e. 4, 8, 16, 24, 48, 72, and 96 hours. There were 21.6% washing losses, 6.1.1% degradability of water insoluble fractions, with 76:4 % measured degradability at 96 hcurs and 82.7% calculated potential degradability. The lag time was *4.5* hours. The effective de.gradability at outflow rate of 0.05 fractions per hour was recorded to be 45.9%. The values for fitted degradability curve were calculated as: 'a' 6.3, '1' 76.4 and 'c' 0.050.

DISCUSSION

Dry matter intake: The basal diet dry matter intake of kids offered *Acacia nilotjca indica* pods and leaves was high.r than *Sesbaina aculeata* (Phyllodes and small stems) confirming Acacia to be a better choice supplement for growing goat kids. The *Acacia nilotica indica* pods were significantly preferred by the kids with *0.5* g for intake than both *Acacia nllotica indica* leaves as well as *Sesbaina acitleara* (phyllodes and small stems). .Degen *et al.* (2000), also reported that when the animals were offered wilted or fresh material, the DM1 of *Acacia saligna* (Phyllodes and small stems) was statistically higher in goals. than controls. Yahya (2000) also reported the mean DM1 of *Ziziphus spinochrist,* wild, and *Acacia albida,* Del. to be similar but higher than for *Sterculia satigera'* Guill and *Anogeissus licocarpus* Guill.

Daily weight gain: Average daily weight gain by growing kids offered ad jib choice of basal diet (Wheat straw ÷ Wheat bran) as well as supplements *A. nilotica indica* pods was significantly higher i.e. 20.78 g per (lay than *A. nilotica indica* leaves and *Sesbania aculeata* (phyllod;s and small stems), 12.35÷1.55 and *12.35+1.35 g* per day, respectively. Dègen *et al* (2000), reported that goats and sheep consuming fresh *Acacia saligna* gained more body mass than their respective controls; the difference was significantly greater in goats. The *Acacia* leaves are as good a supplement as *Sesbania aculeate.* However the Acacia pods were significantly better supplement for growing kid goats. The better growth rate in goat kids fed *Acacia* pods and leaves can be attributed to the tannins which may be helping in making the availability of rumen un-degradable

protein for gut digestion and free tannin may be digested by some tannin consuming bacteria which need to be explored.

Apparent digestibility: Highest apparent digestibility of dry matter was recorded when *Acacia nilotica indica* pods (73.94÷1.95%) as well as leaves (65.44÷1.76%) used as supplements than *Sesbania aculeata* supplement (58.15±2.25%) as well as the control diet (56.3 ÷1.70%) indicating *Acacia nilotica indica* pods to be a better choice as well as leaves for supplementing the diet for the growing goat kids. Siddhuraju *et* a!. (1996) while investigating nutritional and anti- nutritional characteristics and biological value of *Acaci nilotica* (L.) 1)el. seeds reported that the in vitro protein digestibilities of raw, dry heat-treated and autoclaved seeds were 61.2%, 77.4% and 80.2%, respectively which is in conformity with the digestibility of pods However, Tanner *et al.* (199O) reported low growth rate, reduced N and NDF digestibility in sheep fed *Acacia nilotica* (pods) due to presence of Condensed Tannins. But Malik. and Chughtai (1979) reported the digestion coefficients of dry matter and crude fibre of the leaves of Desi Keeker' which they classified as *Acacia arabica* the term generally used for *Acacia nilotica* were 73.06 and 47.66 in cattle and 80.10 and 69.73 in buffalo calves, respectively, which are in conformity with the present study.

Chemical composition: *Acacia nilolica indica* leaves contained DM, CP, CF, EE, NFE and ash, 14.20, 9.20, 3.90, 66.40, and 6.30 percent, respectively where as *Acacia nilotica indica* pods contained DM, CP, CF, EE, NFE and ash, 11.90, 17.00,. 1.90, *62.50,* and 6.70. percent, respctively. *Sesbania aculeata* contained DM, CP, CF, EE, NFE and ash 21.00, 14.00, *3.50,* 50.40 and 10.10 percent, respectively, the wheat straw composed of DM, CP, CF. EE, NFE and ash, 2.00, 37.60, 0.50, 47.60, and 12.20 percent, respectively and wheat bran had DM, CP, CF, FE, NFE and ash, 15.41, 10.76, *3.45,* 64.'79 nd *5.59* percent, respectively. The results of this study are in conformity with those reported by Gohi (1981), Hasimoglu (1982), Sotohy *et al.* (1997), Nyangito (1997) ant, Gowda *et al.* (2004).

Rumen degradability: *Acacia niitica* indica leaves higher measured degradability (80.1%) than *Acacia nilotica indica* pods (76.4%) as well as Wheat bran (72.2%) but calculated rumen degradability of *Accicia indica* pods (82.0%) was lower than wheat bran (86.2%) which can be attributed to higher levels of tannins in it which can be confirmed by using tannin-complexion binding agents like, polyethylene glycol (PEG 6000), as Getachew *et al.* (2000) have reported positive effects. The degradability of water insoluble too was better in *Acacia ni/otica indica* leaves *(75.8%)* and wheat bran (73.7%) than pods (6 1.1%). Similar were the results for potential rumen degradability percentages due to similar cause. The results are in conformity with those of Van Milgen *et al.* (1997), Nsahlai *et al. (1995),* Kaitho *et al.* (1998) and Ngwa *et al.* (2001). The 'a' value for *Acacia nilotica indica* pods *(6.3)* was significantly lower than for leaves (80.1) and wheat bran (72.2) due to higher lag time.

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COMPARATIVE STUDY ON CHEMICAL COMPOSITION OF KHARIF FORAGES AND GRASSES OF LARKANA AND SUKKUR DIVISIONS

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ABSTRACT

Forages and grasses are mostly used in feeding of ruminants and their availability and quality is highly important. An experiment was designed to study the winter grasses i.e. legumes and non-legume from irrigated and non-irrigated areas of Karachi Larkana & Sukkur Divisions. Fresh plant samples were collected at pre-flowering stage, then identified, weighed and kept in polythene bags. After air drying, samples were dried into hot air oven at 105 °C for determination of dry matter (DM), crude protein *(CP),* crude fibre (CF), Ether extract (E.E), Ash, Calcium (Ca), Phosphorus (P) and Nitrogen free extract (N.F.E). The crude protein (%) of legume and non-legume, irrigated and non-irrigated forages and grasses of Larkana was calculated as 13.822 ± 1.554, 8.034 ± 1.721, 9.723 ± 2.923 and 6.97 ± 1.368 respectively. These calculations for Sukkur were 13.826 ± 1.494, 8.033 ± 1.711, 9.723 ± 2.912 arid 6.973 ± 1.372 respectively. CP was significantly higher (P<0.0l) in legumes than non-legumes, followed by irrigated than non-irrigated plants of Larkana and Sukkur diviions. Dry matter (%) of legume, non-legume, irrigated and non-irrigated forages and grasses of Larkana was 19.199, 1*8.659,* 22.75 1 9.076, 20.66 ± 7.849 and 28.51 ± 11076 respectively and Sukkur was 19.301 ± *8.395,* 22.97 ± 9.167, 20.847 ± 7.836 and 28.766 ± 11.843 respectively. Non-irrigated plants contained significantly higher (P<0.Ol) in DM than irrigated but no significant difference was observed between legume and non-legume of Larkana and Sukkur divisions. Crude fibre (%) of legume, non-legume, irrigated and non- irrigated forages and grasses of Larkana was 26.881 ± 1.618,25.765 ± 2.797, 26.039 ± 2.561 and 25.80 ± 3.17 respectively and for Sukkur these were 27.062 ± 1.068, 25.80 ± 2.763, 26.082 ± 2.562 and 25.992 ± 2.974 respectively. Ash (%) of legume, non-legume, irrigated and non-irrigated foragcs arid grasses of Larkana was 13.426 ± 3.263, 14.693 ± 4.53, 14.918 ± 4.809 and 30.32 ± 1.096 respectively. These figers for Sukkur *were* 13.701 ± 3.282, 14.781 ± 4.484, 15.055 ± 7.77 and 30.51 ± 10.96 respectively. C F and ash content of plants were not significantly different between legumes and non-legumes followed by irrigated and non-irrigated plants of Larkana and Sukkur divisions. Ether extract *(%)* of legume, non-legume, irrigated and non-irrigated forages and grasses of Larkana was 4.288 ± 0.358, 3.281 ± 0.724, 3.660 ± 0.673 and 2.682 ± 0.776 respectively. The data for Sukkur was 4.353 ± 0.384, 3.340 1 0.735, 3.724 1 0.691 and 2.729 ± 0.749 respectively. The E.E. was significantly higher (P<0.Ol) in legumes than non-legumes and irrigated and non-irrigated plants of Larkana and Sukkur divisions. Nitrogen free extract (%) of legume, non-legume, irrigated and non-irrigated forages and grasses of. Larkana. was 26.783 ±3.068, 24.704 ± 7.602, 25.807±6.114 and 2l.9l8 ± 9.681 respectively. The EE data for Sukkur was 27.83 ± 2.628, 24.81 ± 7.6 12, 26.49 ± 6.323 and 22.099± 7.668 respectively. N.F.E. determined, showed little difference between legumes and non-legumes, but it was higher in irrigated and non-irrigated plants of Larkana and Sukkur divisions. Calcium (%) of legume, non-legume, irrigated and non-irrigated forages and grasses of Larkana was 61.668 ± 2.152, 31.046 ± *9.815,* 40.283 .1 14.92 and 22.61 ± 6.14 respectively and these figers for Sukkur were 61.803 ± 2.132, 31.13 ± 9.763, 40.35 ± 14.94 and 22.87 ± *6.025* respectively. Phosphorus (%) of legume, non-legume, irrigated and non-irrigated forages and grasses of Larkana was 6.598 ± *0.547,* 1.208 ± 1.667,2.544 ± 2.739 and 1.36 ± 2.14 respectively and Sukkur was 6.723 ± 0.547,1.212 ± 1.680, 2.576 ± 0.791 and 1.303 ± 0.170 respectively. Calcium and phosphorus were

significantly higher (P<0.01) in legumes than non-legumes and in irrigated than non-irrigated of Larkana and Sukkur divisions. Comparison of contents of legumes, non-legumes, irrigated and non-irrigated of Larkana and legumes, non- legumes, irrigated and non-irrigated of Sukkur division did not shown significant difference respectively. It is thus concluded that non-legume forages and grasses can be used for preparation of least cost ration for improvement of livestock productivity. And that knowledge chemical and composition of grasses both legumes and non-legumes must pass on to farmers.

Key words: Legumes, non-legumes, grasses, forages, chemical composition, CP, CF, EE and minerals, Sindh, Pakistan.

INTRODUCTION

Pakistan is basically an agricultural country, with livestock being the source of livelihood not only for small farmers in rural areas but also a major source of income of large number of people residing in the peri-urban areas of Pakistan (Leghari et *al.,* 1996). Agriculture is the hub of economic activity in Pakistan. It lays down foundation for economic development and growth. It directly contributes 25 percent to Gross Domestic Products (GDP) and provides employment to 44 percent of the total labour force of the country (Anonymous, 2000). In the export earnings, direct as well as indirect share of agriculture is very high. Thus, it is prudent to call agriculture as the backbone of Pakistan's economy. The livestock sector, which contributes 34 percent of the agricultural GDP is one of the most important source of earnings of small farmers and land less stock producers in Sindh province of Pakistan. The balanced ration is more essential for proper growth and development of animals because of their economical and physical reasons. The high quality forages provides high level of production at minimal feed cost per animal as compared to concentrate. The farming of livestock, on small scale, in rural areas, generally depends on the grazing of natural grasses, especially in the green fodder scarce areas. Because presently cattle holders have been well known to the common feed stuff values, fed to their animals, almost based on the traditional experience

Unfortunately the farmers of Sindh province especially rural areas know little about the chemical composition of forages and grasses, for that farmers are not interested to sow the forages and grasses on commercial basis. One must have in mind that for the improvement of milk and meat production. It is necessary to improve their feed quality. Grasses and forages have dominancy to all over the ration ingredients, because grasses contain all important nutrients, which are essential for the animal body. Forages and grasses improve, not only meat and milk production but these are also important for draught animals, like buffaloes, horses and camels, and those are eaten or grazed by animals with great interest. Similarity Klebaniuk *et al.* (2003) also have reported that crude fibre content in forages were not different under irrigated and non-irrigated conditions. Verbi (1999) observed that ash content in different forages and grasses will not differ significantly under irrigated and non-irrigated conditions. Yu *et al.* (2004) recorded differences in nitrogen free extract in legumes and non-legume forages but these differences were not so

appreciable (P>0.05). Tamm *et al.* (2002) and high *et al.* (2004) consolidated their experience that leguminous forages always possess greater phosphorus values than non-legumes. Moreover, comparative phosphorus content was higher in irrigated than non-irrigated forages and grasses (P<0.OI), such results are also supported by Mwavu et *al.* (2001) and Tamm *et al.* (2002). From the above facts. it is understood that such steps must be taken to fulfill the feedings requirements of animals, sc as to get more and more production. Along with some conventional fodder crops that can be used for animals, we have lot of varieties of forages and grasses can be used for that purpose. It is proposed to work out the chemical composition of different identified and unidentified forage crops, so as to make them more useful to fulfill the shortage of feed supply to livestock. Many factors such as type of soil, climate, plant age, plant species etc., affect the chemical composition of plants and their ultimate feed quality. At present, no reliable information is available about the chemical composition of the natural grasses and ladder commonly available in the Larkana and Sukkur Divisions. Therefore, it was imperative to determine the chemical composition of forages elsewhere and we selected Larkana and Sukkur divisions to facilitate the ration formation for the purpose of scientific and balanced feed of livestock.

MATERIAL AND METHODS

Experimental area

Sukkur and Larkana division were selected for this study and all districts like Shikarpur, Jacobabad, Larkana, Sukkur, Khairpur, Nawabshah, Dadu and Naushahro Feroze were included for the collection of samples of forages and grasses grown in these areas. Three samples were collected randomly from each selected area for comparing the legumes and non-legumes during Kharif season.

Samples collection

The samples of selected winter forages and grasses were harvested by hand cutting, and weight up to 500 grams at pre-flowering stage, partially air dried and packed in the polythene bags were labelled for proper identification till taken to the hot air oven for drying.. However, during over night stay, samples were shortly taken out of bags.

For determination of Dry Matter (DM), Crude Proteins (CP), Crude Fiber (CF), ether extract/fat (EE), Nitrogen Free Extract (NFE), Ash calcium (Ca) and Phosphorus (P) was done in a accordance with the methodology detailed in AOAC- (2000)

Data Analysis

The data for each sample determined for forages and grasses collected from Sukkur and Larkana Divisions were tabulated and Minitab Statistical package was used for analysis of variance (M.T.J3., USA, I992).

i. Results ii. Dry matter iii. Legume and Non-legume

Dry matter contents of legume and non-legume had not been showing any statistical difference (Table-I). Similarly there was no difference for the two divisional areas and its interaction with legume and non-legume, respectively Non-legume forages and grasses were slightly more in dry matter contents than the legumes. Furthermore Sara (non-legume) contained maximum average *50.63 %,* while Barseem (the legume) had minimum average 9.20% dry matter content.

Table-1 Dry matter (%) of legume and non-legume forages and grasses of Sukkur and Larkana Divisions in irrigated and non-irrigated areas.

Divisions	Legume	Non-legume
Larkana	19.99±8.659	22.75±9.076
Sukkur	*19.30±8.395*	22.97±9.167
Larkana	20.663± 7.849	28.11± 110766
Sukkur	*20.847 ± 7.856*	28.766 ± 11.83

Forages and grasses from non-irrigated areas of Larkana and Sukkur Divisions were significantly higher (P<0.01) in dry matter contents than irrigated area forages and grasses (Table-1). Irrigated forages and grasses of Larkana division had not shown statistically difference with irrigated forages and grasses of Sukkur division. Similarly, non-irrigated forages and grasses of Larkana division had not shown difference with non-irrigated forages and grasses of Sukkur division. Further more sara grown in non-irrigated areas contained maximum average 5 *0.63%* and Berseem belongs to the irrigated areas had minimum average 9.20 % dry matter respectively.

Crude Protein
Legume and non-legume

The non-legume forages and grasses contained less (P<0.01) crude protein than the legumes forages and grasses of Larkana and Sukkur divisions (Table-2). Legumes forages and grasses of Larkana division were statistically not different from legume forages and grasses of Sukkur division. Similarly, non-legume forages and grasses of Larkana division had not shown statistical difference with non- legume forages and grasses of Sukkur division. Both Lucerne and Berseem contained more crude protein average 15.62%, whereas Chhabar. Bhatar. Kamoo. Kandero. Patatir. Sara. Goon. Qalam. Kamandri. Dinohi and Pan. Non-legume were contained less crude protein average *6.25%.*

Table-2 Crude protein (%) of legume and non-legume forages and grasses of Larkana and Sukkur Divisions in irrigated and non-irrigated areas.

Divisions	Legume	Non-legume
Larkana	13.822 ± 1.54	0.034 ± 1.721
Sukkur	*13.826 ± 1.494*	0.033 ± 1.711
Larkana	26.81 ± 1.618	25.765 ± 2.797
Sukkur	*27.062 ± 1.687*	25.801 ± 2.763

Dry matter of forages and grasses was significantly (P<0.0 1) higher in crude protein contents than non-irrigated grasses and forages of Larkana and Sukkur divisions (Table-2). Irrigated forages and grasses of Larkana division was statistically not different from irrigated Corsages and grasses of Sukkur division. Similarly, non-irrigated forages and grasses of Larkana division had not shown statistical different from non-irrigated forages and grasses of Sukur division. Furthermore Kanak of irrigated areas contained the maximum crude. protein average 12.50% whereas Naro, Kasni, Kamo, Bhatar, Dinohi and Chhabar were contain less crude protein level. Non- irrigated areas looni contained 7.81% of C, but rest of non--irrigated forages and grasses contained less CP average *6.25%*.

Crude Fibre
Legume and Non-legume

Crude fibre contents of legume and non-legume had not been showing any statistical difference Table-3. Similarly there was no difference for district areas, and its interaction with legume and non-legume, respectively. Jawa non-legume was containing maximum crude fibre average 20.83%.

Table-3 Crude fibre (%) of legume and non-legume forages and grasses of Larkana and Sukkur Divisions in irrigated and non-irrigated areas.

Divisions	Legume	Non-legume
Larkana	26.1 ± 1.618	25.765 ± 2.797
Sukkur	*27.062 ± 1.687*	25.801 ± 2.763
Larkana	26.039 ± 2.561	25.807 ± 3.17
Sukkur	*26.082 ± 2.562*	25.992 ± 2.974

Crude fibre contents of irrigated and non-irrigated had not been showing any statistical difference Table-3. Furthermore, Lucerne of the irrigated areas was containing maximum crude fibre average 29.5%, while Lani the non-irrigated was containing minimum average 21.7%.

Ash
Legume and non-legume

The ash contents in non-legume was slightly higher than in legume forages and grasses there was not much difference between the legume and non- legume Table-4. Furthermore Goon the non-legume was contained maximum ash average, 22.87% of Ash, while Kooramoth the legume had minimum 9.38% average.

Table-4 Ash (%) of legume and non-legume forages and grasses of Larkana and Sukkur Divisions.

Divisions	Legume	Non-legume
Larkana	13.426 ± 3.263	14.663 ± 4.53
Sukkur	*13.701 ± 3.282*	14.781 ± 4.484
Larkana	14.91 ± 4.809	30.32 ± 10.962
Sukkur	*15.055 ± 4.777*	30.51 ± 10.9625

The level of ash contents in irrigated was higher than that of irrigated forages and grasses of Larkana and Sukkur divisions (Table-4). Irrigated forages and grasses of Larkana division had not shown statistically difference with irrigated forages and grasses of Sukkur division. Similarly, non-irrigated forages and grasses of Larkana division had not showing statistically difference with non-irrigated forages and grasses of Sukkur division. Furthermore, Berseem the irrigated containing maximum 17.15% average of Ash, while the Pan the non-irrigated had minimum Ash 10.50% average.

Ether extract
Legume and non-legume

The level of Ether Extract for legume was statistically higher ($P<0.01$) than that of non-legume forages and grasses (Table-5). Legume forages and grasses of Larkana division had not showing statistically difference with legume forages and grasses of Sukkur division. Similarly non-legume forages and grasses of Larkana division had not showing statistically difference with non-legume forages and grasses of Sukkur division. Furthermore, Methi legum' was containing maximum average *5%* of Ether extract while Goon the non-legume containing minimum average 1 .8% of Ether extract.

Table-5 Ether Extract (%) of legume and non-legume forages and grasses of Larkana and Sukkur Divisions.

Divisions	Legume	Non-legume
Larkana	4.288±0.358	3.281±0.724
Sukkur	*4.353±0.384*	3.340±0735
Larkana	3.660±0.673	2.682±0.776
Sukkur	*3.724*±0.691	2.729 ± 0.749

The level of Ether extract in irrigated was higher than that of non-irrigated forages and grasses of Larkana and Sukkur divisions (Table-5). Irrigated forages and grasses of Larkana division had not showing statistically difference with irrigated forages and grasses of Sukkur division respectively. Similarly, non-irrigated forages and grasses of Larkana division had not shown statistical difference with non- irrigated forages and grasses of Sukkur division. Furthermore Methi the irrigated containing maximum average *5%* of Ether extract, while Goon the non-irrigated containing maximum 1.81% of Ether extract.

Nitrogen Free Extract
Legume and non-legume

The nitrogen free extract (percent contents of legume and non-legume forages and grasses of Larkana and Sukkur divisions had not been showing any statistical difference (Table-6). The nitrogen free extract (percent) contents in legume possess slightly more than that of non-legume forages and grasses. furthermore there was not more difference between nitrogen free extract of legume and non-legume. However, Sinjhi the legume containing maximum

average 30.66% of nitrogen free extract while Sara, the non-legume containing minimum 3.29% nitrogen free extract.

Table-6 Nitrogen Free Extract (%) of legume and non-legume forages and grasses of Larkana and Sukkur Divisions.

Divisions	Legume	Non-legume
Larkana	6.783±3.068	24.704±7.602
Sukkur	*27.83±2.628*	24.811±7.612
Larkana	25.807±6.114	21.918±9.681
Sukkur	*26.49 6.323*	22.099 ± 7.668

Irrigated and non-irrigated

The nitrogen free extract (percept) contents in irrigated was slightly higher than that of non-irrigated forages and grasses of Larkana and Sukkur divisions (Table-6). But analysis of variance did not showing any statistical difference with irrigated and non-irrigated forages and grasses of Larkana division had not showing statistically difference with non-irrigated forages and grasses of Sukkur division. Furthermore, the Bhatar irrigated containing more nitrogen free extract 40.22% while Sara the non-irrigated contains minimum average 4.29% of nitrogen free extract.

Calcium

Legume and non-legume

The calcium content was significantly higher (P<0.01) in legume forages and grasses than non-legumes (Table-7). Legume forages and grasses of Larkana and Sukkur divisions. Legume forages and grasses of Larkana division had not showing statistically difference with legume forage and grasses of Sukkur division. Similarly non-legume forages of Larkana division had not showing statistically different with non-legume forages and grasses of Sukkur division. Furthermore Berseem legume grasses containing maximum calcium average *65.* 14%, while Kandero the non-legume was minimum average 16.18% of calcium.

Table- 7 Calcium (%) of legume and non-legume forages and grasses of Larkana and Sukkur Divisions.

Divisions	Legume	Non-irrigated
Larkana	61.668±2.152	31.046±9.815
Sukkur	*61.803*±2.132	31.13 ± 9.763
Larkana	40.23±14.929	22.61±6.148
Sukkur	*40.35*±14.944	22.87 ± 6.0255

Irrigated and non-irrigated

The calcium contents was significantly lowest (P<O.01) in non-legume than legume forages and grasses• of Larkana and Sukkur divisions (Table-7). Irrigated forages and grasses of Larkana division had not showing statistically difference with irrigated forages and grasses of Sukkur division. Similarly **non-**

irrigated forages and grasses of Larkana division had not showing statistically difference with non-irrigated forages and grasses of Sukkur division. Furthermore, Berseem the irrigated containing maximum calcium contents average *65.14%,* while Kandero, the non-irrigated contained minimum 16.18% of calcium, respectively.

Phosphorus

Legume and non-legume

The phosphorus content was higher in legume than non-legume forages and grasses of Larkana and Sukkur, divisions (Table-8*)*. Legume forages and grasses of Larkana division had not showing statistically difference with legume forages and grasses of Sukkur division. Similarly, non-legume forages and grasses of Larkana division had not showing statistically difference with non-legume forages and grasses of Sukkur division. Furthermore, Brseem containing maximum average 6.99% while Puchhir the non-legume containing minimum phosphorus average 0.165% of phosphorus.

Table-8 Phosphorus (%) of legume and non-legume forages and grasses of Larkana and Sukkur Divisions, in irrigated and non-irrigated areas.

Divisions	Irrigated	Non-irrigated
Larkana	6.598±0.547	1.208±1.667
Sukkur	6.723±0.547	1.212 ± 1.680
Larkana	2.544±2.739	1.365±2.146
Sukkur	2.567±2.79	1.383 ± 2.170

The **phosphorus** content was significantly higher (P<0.05) in **irrigated** than **non-irrigated** forages and grasses of Larkana and Sukkur divisions (Table-8). Irrigated forages and grasses of Larkana Division had not showing statistically difference with irrigated forages and grasses of Sukkur division. Similarly non- irrigated forage and, grasses of Larkana division had not showing statistically difference with non-irrigated forages and grasses of Sukkur division. Furthermore, Berseem (irrigated) contained maximum average 6.99%, while Sara the non-irrigated containing minimum average 0.20% of phosphorus respectively.

DISCUSSION

The dry matter of non-legume forages and grasses were slightly richer in their dry matter content than the legumes, statistically non-significant (P>O.05). Simiar results have also been reported by Rafique and Akhtar *(1995)* who recorded different dry matter values in legumes and non-legume forages, while Denek and Denz (2004) reported different DM values in various forage samples. Dry matter contents were significantly (P<0.0l) in non- irrigated forages and grasses than irrigated forages and grasses and similar DM contents have also been recorded .by Awan (1Y)5) who were of the experience that irrigated and non-irrigated forages have different DM contents, while Bugti

(1996) assessed no effect on the quality of forages under irrigated and non-irrigated conditions.

The non-legume forages and grasses contained less **crude protein** than the legumes forages and grasses of Larkana and Sukkur divisions (P<0.0l) and Lucerne and Berseem legumes contained more crude protein as compared to other forages and grasses. In this concerned Channa (1997) reported similar results that *Medicago sativa* (Lucerne) contained higher crude protein in comparison to concentrates and subsequent performance of feeding animal. In case of irrigated and non-irrigated conditions, dry matter of forages and grasses was higher in its crude protein contents than non-irrigated grasses and forages of Sukkur and Larkana divisions (P<0.0l) and these results have been supported partially by Bugti (1996) who also obtained different crude protein contents in forages and grasses under irrigated and non-irrigated conditions.

The crude fibre content of legume and non-legume were not of any statistically significant difference (P>0.05). Comparative results on crude fibre in different legumes and non-legumes obtained Mwavu (2001) who reported that crude protein in different forages and grasses was significantly different (P<0.05). Crude fibre contents of irrigated and non-irrigated did not show any statistically significant difference (P>0.05) and, these results are in similarity to those of Kiebaniuk *et al.* (2003) who also have reported that crude fibre content in forages were not different under irrigated and non-irrigated conditions.

Ash contents in non-legume was slightly higher than in legume forages and grasses but the differences were non-significant (P>0.05) statistically between the legume and non-legume. These findings have partially supported by Channa (1997) and Verbi (1999) whose consolidated experience lead to state that ash contents in different legume and non-legume forages and grasses were significantly different. Moreover, Ash contents in irrigated forages and grasses was slightly rich in non-irrigated forages and grasses, but these differences were not so pronounced (P>0.05) and further Verbi (1999) who advocated that ash content in different forages and grasses will not differ significantly under irri2ated and non-irrigated conditions.

The Ether Extract 1evel in legumes was significantly higher than that of non-legume forages and grasses (P<0.0l), this was supported by the findings of Channa (1997), who found that Ether extract level in leguminous forages was higher as compared to non-leguminous forages and grasses. Similarly, the level of Ether extract in irrigated and non-irrigated forages and grasses was significantly different (P<0.05) and it vas higher in irrigated than those of non-irrigated forages and grasses. These results are in agreement with those of Channa (1997) and Singh *et al.* (2004) who reported significantly higher Ether extract level in irrigated forages as compared to non-irrigated forages.

The nitrogen free extract contents (in legumes) possessed slightly more values than those of non-legume forages and grasses. However, the differences were not statistically significant (P>0.05). Such experience in this present study has also been further supported by Yu *et al.* (2004) who recorded

differences in nitrogen free extract in legumes and non-legume forages but these differences were not so appreciable (P>0.05). However, the differences in nitrogen free extract contents in irrigated and non-irrigated forages were significant (P<0.05) and it was higher in irrigated forages as compared to non-irrigated ones.

Calcium content was significantly higher in legume forages and grasses as compared to non-legumes (P<0.01), which might be the morphological characteristics of these forages. Varied calcium content in different forages and grasses including Berseem and Lucerne has also been reported by Tamm et *al.* (2002), who recorded significantly different results regarding calcium content in various forages and grasses and subsequent effect on calcium contents in feeding animals. Furthermore, the calcium contents were significantly lower in non-legume forages as compared to legume forages and grasses (P<0.0l) similar results have also been reported by Singh *et al.* (2004).

The Phosphorus content was significantly higher in legumes than those of non-legume forages and grasses (P<0.0l) which might be the natural qualitative character of legumes. Similar opinion has been reported by Tamm *et al.* (2002) and Singh *et al.* (2004), whose consolidated experience led to the statement that leguminous forages always possess greater phosphorus values than non-legumes. Moreover, comparative phosphorus content was higher in irrigated than non-irrigated forages and grasses (P<0.01). Such results are also supported by Mwavu *et al.* (2001) and Tamm *et al.* (2002).

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SHORT COMMUNICATION

THE OBSERVATIONS MADE CONCERN WEIGHT GAIN, LOCATION AND CALVING INTERVALS IN THE RED SINDHI CATTLE-LFRU AT THATTA, SARC, PRIOR TO AUCTION

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ABSTRACT

A total of 32 (thirty two) Red Sindhi Cattle, categorized as Cows 05, Bulls 12, Heifers 07 and Calves 08 were bred at Livestock and Fisheries Research Unit (LFRU) Thatta. These animals were farm produced w.e.f. 2000-2001 except two animals purchased in 2001 and 2004. The book value at the time of auction on 10-11-2010 for whole the lot was estimated at Rs.5,91,120-00. The auction of these animals was announced in the news papers and appeared in the Daily DAWN, The News, The Nation, The Daily Jang, Daily Sindh and others on 4th and 5th of November, 2010. The routine auction methodology was exercised on the DAY OF AUCTION from 10:30 a.m. to 3:30 p.m. when the individual animals were introduced to the bidders. The cumulative amount obtained from this auction was Rs.10,36000/- which was collected from the highest bidders and was deposited in the treasury as an income to the state which was almost double the amount of book volume. Various observations of this herd, as observed have been detailed in this short communication.

Key words: Weight Gain, Lactation, Calving Interval, Red Sindhi Cattle, Thatta, Pakistan.

OBSERVATIONS:

Land of lactation. The lactation duration was from a minimum of 154.67 days and the maximum was 248 days with an average of 187.55 days in form bred cows while in the purchased cow, it was 288 days.

Range of calving interval. The minimum calving interval observed was 334.60 days and the maximum range was 482 days, in the farm bred cows, with an average of 403 days while in the purchased cow it 725 days.

Milk Produced per lactation. The minimum of 574 liters per lactation was observed in the farm bred cows and 647.33 liters as maximum with an average of 581.77 liters this quantity of milk was recorded as 1190 liters in the purchased cows.

Average milk yield per animal. The minimum yield per animal was 2.30 liters per time while the maximum was 4.20 liters, with an average of 3.5 liters per time, as detailed in Table-II.

Average weight Gain (Kgs). The average weight gained in 04 bulls (S. No.20, 22, 23 and 24) with DOB of 2006 was 288 Kgs (Range 260 Kgs – 300 Kgs) while the average weight gained of four bulls (sno: 26, 27, 28, 29 and 30) with

date of birth of 2004 was 380 Kgs (range of 360 Kgs-440Kgs). The bull with date of birth of 2005 weighted 380 Kgs alone, as detailed in Table-I

The **Average Weight** of 05 calves (S.Nos.14, 15, 16, 17 and 18) was 9.6 Kgs with a range of 30 Kgs to 60 Kgs of the calves with date of birth of 2009, 2010, 2010, 2010 and 2010 respectively. (Table-I).

The **apparent health status** was apparently good. These animals had regularly been vaccinated for endemic diseases. Although no extra-ordinary rich diet were provided, these animals were nicely managed but these strains of Red-Sindhi were low producers of milk, hence not deemed worth a stock for further breeding.

This stock of Red Sindhi cattle breed, initially, was started from 05 cows and 03 bulls, as a side issue, at Livestock and Fisheries Research Unit (LFRU) Thatta, SARC, Sindh, were not on special diet but prevailed on crop residues, grasses and sugar cane tops. In-breeding based on natural service of breeding bulls, within this stock, continued. F_1 and F_2 strains were obtained but no out-standing animals could be produced. The average gain was also at the lowest and milk yield was also lowest, as compared to good Red Sindhi Cattle of the selected animals, at Government as well as private farms.

Some of the Farm Young Stock (FYS), pregnant and dry heifers were growing well to become future good cows but due to no future breeding program foreseen, these were subjected to open auction.

Table Showing the name, class, date of birth and weight of animals prior to auction.

Sr. No	Name of animal	Class	DOB	Weight (Kgs)
1	Soomal	Cow	1/7/2000	300
2	Wederi	Cow	1/5/2004	160
3	Soomal	Cow	15-09-2004	240
4	Soomal	Cow	13-08-2005	260
5	Waderi	Cow	29-09-2006	160
6	Soomal	FYS	25-06-2007	150
7	Faiza	FYS	1/11/2007	40
8	Waderi	FYS	24-01-2008	120
9	Waderi	FYS	21-02-2008	130
10	Soomal	FYS	27-05-2008	130
11	Soomal	FYS	27-05-2008	130

--------Table continued on page No.133

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Sr. No	Name of animal	Class	DOB	Weight (Kgs)
12	Soomal	FYS	10/12/2008	90
13	Faiza	FYS	18-12-2008	90
14	Soomal	FYS	4/7/2009	60
15	Faiza	FYS	5/2/2010	36
16	Waderi	FYS	22-02-2010	36
17	Soomal	FYS	16-03-2010	36
18	Soomal	FYS	6/4/2010	30
19	Sindhri	Bull	2/7/2003	360
20	Faiza	Bull	1/4/2004	360
21	Bhambhor	Bull	1/7/2001	480
22	Sindhri	Bull	22-07-2004	360
23	Zeba	Bull	26-07-2004	440
24	Kajal	Bull	17-08-2004	360
25	Faiza	Bull	15-03-2005	380
26	Shabnum	Bull	28-02-2006	300
27	Sindhri	Bull	1/7/2006	320
28	Soomal	Bull	27-07-2006	270
29	Rehana	Bull	26-08-2006	260
30	Faiza	Bull	27-10-2006	260
31	Soomal	MYS	28-04-2009	80
32	Waderi	MYS	15-02-2010	40

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