

**COMPARATIVE STUDIES ON GROWTH
PERFORMANCE OF INDIGENOUS CALVES BY
USING READYMADE AND HOMEMADE
CONCENTRATE**

THESIS

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DECLARATION OF STUDENT

I hereby declare that the experimental work and its interpretation in the thesis entitled "**Comparative Studies on Growth Performance of Indigenous Calves by Using Readymade and Homemade Concentrate**" or part thereof has neither been submitted for any other degree or diploma of any University, nor the data have been derived from any thesis / publication of any University or scientific organization. The source of materials used and all assistance received during the course of investigation have been duly acknowledged.

Place : Akola

Date : / /2017

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“Achievement is of no mean, without the sense of gratefulness and the recognition of this is the beginning of wisdom”

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(D) List of Abbreviations

%	:	Per cent
@	:	At the rate of
⁰ C	:	Degree Celsius
⁻¹ /	:	Per
Ad. Lib.	:	Ad libitum
ADG	:	Average daily gain
B. W.	:	Body weight
C. D.	:	Critical difference
C F	:	Crude fibre
C P	:	Crude protein
D C P	:	Digestible crude protein
T D N	:	Total digestible nutrient
D M	:	Dry matter
D M I	:	Dry matter intake
E E	:	Ether extract
et al.	:	et alia (and others)
Fig.	:	Figure
G	:	Gram
i.e.	:	That is
lit.	:	Litre
ml	:	Millilitre
N F E	:	Nitrogen free extract
No.	:	Number
N R C	:	National Research Council
N S	:	Non significant
O. M.	:	Organic matter
SE (m)+	:	Standard error of means

Sig. : Significant
Viz. : Namely
Qty. : Quantity

(E)

THESIS ABSTRACT

- a. Title of the thesis : **COMPARATIVE STUDIES ON GROWTH PERFORMANCE OF INDIGENOUS CALVES BY USING READYMADE AND HOMEMADE CONCENTRATE**
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ABSTRACT

The study entitled "Comparative Studies on Growth Performance of Indigenous Calves by Using Readymade and Homemade Concentrate". was conducted for period of 90 days. Fifteen Indigenous calves were divided into three groups on the nearness of the age and body weight. Three feeding treatment were studies namely T₁ Dry fodder

(Soybean straw) with green fodder (Hybrid Napier) + Readymade concentrate (Sugras) mixture as per requirement, T₂ Dry fodder (Soybean straw) with green fodder (Hybrid Napier) and Homemade concentrate-I mixture as per requirement, and T₃ Dry fodder (Soybean straw) with green fodder (Hybrid Napier) + Homemade concentrate - II was fulfil requirement of Indigenous calves in all treatments.

The soybean straw, Hybrid Napier and readymade concentrate, homemade concentrate-I, homemade concentrate-II mixture were containing on an average 90.51, 24.16, 90.12, 90.10, 90.14 per cent DM, respectively. The CP content (7.0, 7.70, 17.70, 19.28, 17.94) per cent respectively. The CF content (38.32, 35.76, 11.68, 10.64, 12.24) per cent respectively. The EE content (1.65, 2.40, 2.72, 4.05, 3.98) per cent respectively. The NFE content (41.17, 43.98, 64.01, 60.19, 60.49) per cent respectively. The total ash content (11.86, 10.16, 3.89, 5.84, 5.35) per cent respectively.

On an average the indigenous calves consumed 5.35, 6.80 and 6.01 kg of feed per day under T₁, T₂ and T₃. Daily DMI differed significantly between the treatments. The calves from T₂ groups need more DM than that of T₃, and T₁ groups. The average daily intake was 2.52, 2.98 and 2.73 kg/day/calves in T₁, T₂ and T₃ groups respectively. Higher intake of DM per 100 kg body weight was noticed in treatment T₂ and lowest in T₁ and T₃.

The daily water intake of the calves was differ significant among the feeding group, the calves from T₂ group drunk more (9.7) than that T₃ (8.9), and T₁ (8.5). This trend indicated that the water in treatment T₁, T₂, T₃, were differ significantly, indicating, that level of concentrates mixture had effect on the water consumption of calves. The feeding trial was conducted during early months of winter therefore the water intake seems to be lower. When the water intake was converted to unit body size. The average water intake per 100 kg body weight was 11.0, 13.13 and 12.01 litre per calves per day in T₁, T₂ and T₃ respectively. As a result of this solution dry matter to water intake ratio was more or less similar in all

the groups and it was 1:4, 1:4.4 and 1:4.3 under T₁, T₂ and T₃ groups respectively.

All the indigenous calves exhibited satisfactory growth rate 313 to 392 (g) per day and differences were significant. The per kg of body weight gain was higher in T₂ treatment. Body measurement (chest girth, body length and body height) of the Indigenous calves under treatment T₂ proved statistically significant effect. It was observed over experimental result, the treatment T₂ showed better and desirable result as compared with T₁ and T₃ treatment. The cost of feeding per kg body weight gain has found decreasing trend from T₂ and T₃. Total cost / kg BW gain / calves is less in T₂ groups of treatments.

CHAPTER I

INTRODUCTION

1.1 Background information substantiated with relevant review of literature

India is a country endowed with the largest livestock population in the world. It accounts for 57 percent of the world buffalo population and 15 percent cattle population. According to livestock census (2012), the country has about 275.9 million cattle and 165.3 million buffaloes and total livestock population is 512.1 million (NDDB Report 2012).

Feeding is the important aspect in rearing of these animals as part of nutrition for their various physiological growths. But due to some constraints on voluntary intake of feed it is a well-known fact that the growing animal is unable to meet out the nutrients for metabolic and physiological development which causes underfeeding of animals.

Cattle reach maturity early as compared to buffalo which depends on genetic, environmental factors and nutritional management. Environmental factors may affect directly or indirectly on reproductive and productive performance of indigenous calves. Among these, nutritional factors affect significantly on the age of maturity, conception, and first calving so to overcome these constraints it needs to be change the feeding management. In cattle it has been observed that age at puberty is significantly correlated with weight gain from birth to puberty. It was through that concentrate feeding to animal will improve growth and reproductive performance.

Proper animal nutrition could play an important role in addressing ongoing and emerging challenges imposed by increasing human population, global warming, land degradation, water shortage and pollution, biodiversity erosion and increasing energy prices.

Feed cost generally accounts for more than 50 percent of the animal rearing costs. Inadequate feed resources are recognized as a major constraint to the productivity of mixed crop–livestock systems. Without

proper technologies, feed production and disposal of animal wastes will impose further stress on already degraded natural resources. This will result in fewer opportunities to enhance the livelihoods of small nutrients returned to the soil and those fed to livestock.

1.2 Importance and need of study

Growth is fundamental and common feature of all living being. Every animal is endowed at birth with certain capacity for growth and production and these inherited characters can be exploited to the fullest extent only with proper feeding and management to obtain adequate growth.

To improve the productivity and health of various species of livestock in a sustainable manner while reducing the negative effects on environment, there is need for greater focus on research and development particularly to address problems faced by farmers. The efforts for basic and applied research to generate new knowledge, technology, strategies and application procedures related to the various problems of the livestock sector and farmers would be strengthened.

The research and development activities would focus on various issues related to livestock genetics, breeding, feeding, management, therapeutics, disease prevention, control and eradication, development of thermostable vaccines, biosecurity, environmental pollution and green house gas emission, livestock product diversification and quality control, marketing and business management and extension strategies etc.

Research management will be improved for effectiveness and efficiency. Demand driven and farmer-oriented issues will be searched on priority with close co-operation among researchers, industry and the customers.

Technology, modulated as per needs and suitability to various livestock production systems, plays an important role in improving efficiency and exploitation of production potential of that system. Therefore, research for development and adaptation of technology for various aspects

of different production systems prevailing in the country would be promoted. Focus would be on developing area and system specific low cost technologies using locally available resources and knowledge.

Growth depends upon the genetic make up to the extent of only 30 per cent and feeding and management contribute remaining 70 per cent. Concentrate feeding plays an important role in growth, age at maturity, first conception and first calving in heifers.

There is continuous growth of animal from birth to young stage. Concentrate feeding plays an important role in growth, age of maturity first conception first calving in growing calves. The concentrates are less bulky and have higher digestibility, they are concentrated source of nutrients and therefore they have higher nutritive value. The concentrate is good source of energy and higher nutrient density. They are palatable and easy to digest. Low productivity of animals is accounted with underfeeding, lack of quality feeds and poor management these adverse nutritional condition lead ultimately to stunted growth.

Animal Scientific feeding, breeding and care and management practices these are essential throughout the life of animal the period from calf hood to maturity is most critical. Animal husbandry and dairying industry is particularly depending on their vital factors.

Our success depends on the success of the industry as a whole and that is why we make it our mission to address current industry issues such as raw feed material costs and nutritional quality, emerging diseases, animal products and pollution. We should learn more about Dairy, Beef, Poultry, Pig, Equine, Aquaculture or Pet.

The nutritional requirement of feed for growth is more than that for maintenance. Since growth consists of an increase in the size of muscles, other soft tissue and skeleton. Large and also it is important that, dairy farmer should raise heifers of higher producing cows. Most of recent researche are diverted towards economical rearing of the calves with different feeding pattern the aim of this to have heifer which develop to a

cow of optimum age and give maximum returns in respect of milk in her life time without utilizing traditional methods.

There are many firms in India which sell compounded livestock ration. However, due to lack of an efficient quality control system, it is difficult to say that this ration contains the required nutrients as per BIS or any other specified standard. There appears to be relationship between the effectiveness of different homemade and readymade feeding in eliciting a response, and the diet and nutritional demands of the animal. Therefore, taking into consideration different homemade and readymade concentrate feedings, important role in growth of heifers, it was felt necessary to conduct investigation to study the effect and cost structure of different homemade and readymade concentrate feeding on growth performance of heifers. Intake of colostrums by neonatal calves and early transition to calf starter are two important factors in successful calf rearing programmed (Franklin et al., 2003). Calf starter ration is a mixture of grains, protein feeds, minerals, vitamins and antibiotics.

The good calf starter should be nutritious, highly digestible, palatable enough, rich in energy contents and should contain approximate 18–20% crude protein and less than 7% fiber because low level of fibrous material benefits starter intake and calf growth and high quality calf starter is critical to successful early weaning of calves. Calf starter ration improves the health of calves and reduces the stress of weaning and also reduces the growth depressing factors. It reduces the chances of diarrhea in calves as conventional ration causes mostly digestive problems due to high fiber contents.

Productivity is largely determined within a particular environment by genotype, health and nutrition. For most of the extensive pastoral areas we are concerned with there exist no potentially better breeds than the present well adapted zebu-based cattle and the local strains of sheep and goats; but ILCA's systems studies have shown, even in these adapted animals, the occurrence of serious losses associated with disease. The nature of arid and semi-arid grazing lands, with short and

unreliable periods of rainfall, necessarily means that animals and their keepers undergo long periods of nutritional hardship.

The most useful record for nutritional purposes is live weight since this is an integrated measure of the nutritional response of the animal, and live weight gains or losses give a sensitive indication of nutritional adequacy or inadequacy. Weighing is possible, given a weighing scale or tripod and clock face balance and necessary assistance, during both initial and continued surveys, as described by Wilson and Semenyé in this workshop, and yields very useful information. Where weighing facilities are not available, a very useful approximation may be made by measuring chest girth of cattle and estimating the live weight from these by means of one of the published formulae. The relationship between chest girth and weight depends on breed and to some extent on condition and sex.

Infrequent watering of cattle is likely to superimpose a two or three day cycle on live weights, as also on visual estimates of condition. Since individual cattle may take in up to 30 liters of water (30 kg of live weight) in five minutes one may question the interpretation of measurements made either before or after watering. In these conditions heart girth may be a more reliable measure.

1.3 Objective of the study

Therefore, taking into consideration different homemade and readymade concentrate feeding plays important role in growth of growing calves, it was felt necessary to conduct investigation entitled **“Comparative Studies on Growth Performance of Indigenous Calves by Using Readymade and Homemade Concentrate”** With the following objectives.

1. To record the feed intake.
2. To study the effect of different homemade and readymade concentrate.
3. To estimate cost of structure.

1.4 Scope and limitations of the study

Livestock production in developing countries is largely dependent on fibrous feeds mainly crop residues and low quality pasture that are deficient in nitrogen, minerals and vitamins. As protein supplements such as oil cakes are only available at a very high price in developing countries, if available at all, this has led to the use of non-protein-nitrogen sources, such as urea, to compensate for the nitrogen deficiency in fibrous feeds, thus enhancing their digestibility, intake and nutrient availability through optimization of rumen fermentation.

The use of solid feed supplementation blocks, i.e. urea-molasses blocks or multinutrient blocks, to provide the nitrogen, minerals and vitamins lacking in fibrous feeds offers several advantages: ease of transport, storage and use, and reduced risks compared with other approaches, such as giving a small amount of urea in drinking water, sprinkling of urea solution on fibrous feeds before feeding, or urea-ammonization of crop residues.

These advantages, together with enhanced productivity in terms of increased milk and meat production and higher reproductive efficiency in ruminant animal species that include cattle, buffalo, sheep, goats and yak, as a result of supplementation with the blocks have resulted in their adoption in over 60 countries. Many international organizations, including the Joint FAO/ IAEA Division (Vienna), FAO, UNDP, ACIAR and SAREC-SIDA, have played important roles in dissemination of this technology to such a large number of countries.

The projected growth in annual income, urbanization and of the human population in developing countries suggests that the future demand for milk and meat in these countries will increase substantially. By 2050 the global demand for dairy and meat is projected to increase by 74% and 58% respectively, and a large part of this demand will originate from developing countries.

The global population of cattle in 2000 was 1.5 billion and that of goats and sheep was 1.7 billion. Models project that by 2050, the numbers will be 2.7 and 2.6 billion respectively. Annual demand for coarse grains for animal feed is also projected to increase over the period by 553 million tones, corresponding to approximately half of the total increase in demand (FAO, 2009).

To meet the future demand, production of milk and meat, including milk production per lactating cow and daily weight gains for meat animals would need to be increased significantly if the available feed resources are to be sufficient. Feed shortages notwithstanding, considerable potential exists to increase production levels across the range of growing, milch and beef animals by addressing the problem of imbalanced nutrition.

The limited data on improving milk production efficiency in dairy animals through balanced feeding suggests that there is considerable scope for the enhancement of milk production with the existing feed and animal resources. This can be made possible through the transfer of scientific knowledge, in an easy to use and easy to implement manner to rural milk producers.

The aim should be to promote feeding of a balanced ration in sufficient quantities and containing all essential nutrients to promote this, various initiatives taken by the Dairy Board of India are described, many of which are relevant beyond India. Most of recent researchers are diverted towards economical rearing of the calves with different feeding pattern the aim of this to have growing calves which develop to cow of optimum age and give maximum returns in respect of growth, production, reproduction and work in his life time without utilizing traditional methods. There are many firms in India which sell compounded livestock ration. However, due to lack of an efficient quality control system it is difficult to say that this ration contains the required nutrients as per BIS or any other specified standard.

Many reports are available on concentrate feeding however information showing the effect of concentrate on performance of animals is scanty under Indian condition. The work was undertaken up to make comparative study of feeding concentrate mixture.

1.5 Hypothesis

India has a very large livestock population but that population does not get a balance diet. Therefore we are not in position to satisfy the daily requirement of an animal. In India there are only use of dry fodder and green fodder and straw as a feed that get only carbohydrates but the concentrates which have a high nutritional value mixture of grains and oilseed cakes but in rural areas they are fed the livestock only dry and green fodder basis, though only roughages not fulfill the nutritional requirement of the livestock.

There appears to be relationship between the effectiveness of **“Comparative Studies on Growth Performance of Indigenous Calves by Using Readymade and Homemade Concentrate”** in eliciting a response, and the diet and nutritional demands of the animals.

CHAPTER II

REVIEW OF LITERATURE

The aim of scientific management of growing calves is to obtain optimum growth rate as per genetic potential, so that they can attain body weight early. Growing calves show optimum growth rate under proper feeding and management packages.

During recent years cost of rearing has been assigned more importance than any other consideration. Hence raising of growing calves on high concentrate to roughages leads important role in effective feeding system.

2.1 Chemical composition of feed stuffs

Nemade (2000) studied the performance of calves on complete diet with concentrates. It was compared with conventional feeding prepared complete feed with 45% wheat straw and conventional feed. The chemical composition of concentrate mixture feed as 90.04%, 93.19%, 20.71%, 9.50%, 2.06%, 62.07%, and 6.81% as DM, OM, CP, CF, EE, NFE and total ash respectively.

Tripathi and Sharma (2002) conducted the feeding trial on 12 crossbred heifers divided into three groups. Maize Stover was treated with 4 per cent urea dissolved in 64 liters of water and the solution was sprayed over 100 kg chaffed maize stover. The untreated and treated straw was containing 93.10 and 82.87, 2.90 and 8.75, 67.20 and 66.20, 43.20 and 48.50, 8.40 and 7.30 per cent DM, CP, and lignin, respectively on DM basis.

Choudhary *et al.* (2004) observed that Millet stalks (jowar and bajra) treated 0 per cent (T₁), 2 per cent (T₂), 4 per cent (T₃), and 6 per cent (T₄) with urea treatment at 40 per cent moisture for 20 days. Increased the CP content from 5.1 to 7.1, 10.3 and 12.2 per cent in jowar stalk and from 4.1 to 6.6, 9.6 and 10.8 per cent in bajra stalk, respectively.

Bandeswaran *et al.* (2004) studied the nutritive value of soybean straw by formulating the complete feed for feeding to lactating buffaloes. The proximate composition and fibrous fractions were not affected by processing of mash in to pellets either by expander or by steam. The soybean straw was containing 93.7, 7.30, 2.7, 26.6, 57.0, 6.4, 59.6, 35.5, 24.1, and 29.4 per cent DM, CP, EE, CF, NFE, TA, NDF, ADF, hemicelluloses and cellulose, respectively on DM basis.

Shelar (2004) studied the effect of feeding of soybean straw on growth performance of crossbred heifers. The average chemical composition of SBS was 91.02 per cent DM and 7.04, 41.20, 38.29, 1.52 and 11.80 per cent CP, CF, NFE, EE, and TA on DM basis respectively.

Kamble (2006) compared the chemical composition of soybean straw with jowar straw and concentrate. The nutrient contents of different feed stuffs on DM basis were as follows.

Name of feeds	DM	CP	EE	NFE	CF	TA
Jowar straw	86.40	2.15	1.62	46.63	41.40	8.20
Soybean straw	88.60	5.12	2.36	39.08	42.19	10.98
Concentrate (Sugras)	90.10	17.34	8.62	55.20	11.84	3.91

Baswade *et al.* (2007) reported that the soybean straw contained 89.15, 7.75, 38.30, 1.19, 39.82 and 12.97 per cent DM, CP, CF, EE, NFE and total ash, respectively on DM basis. Whereas, the Bajra straw contained 92.52, 3.90, 38.10, 1.70, 50.08 and 6.22 per cent DM, CP, CF, EE, NFE and ash, respectively.

Bansod (2008) offered soybean straw to Gaolao cows found that the chemical composition of soybean straw and other feed stuffs on dry matter basis was as follows.

Name of feeds	DM	CP	EE	NFE	CF	TA
Jowar straw	89.25	3.70	2.89	52.46	32.45	8.50
Soybean straw	87.70	5.30	2.60	36.70	45.42	9.98
Hybrid Napier	29.23	5.77	2.50	49.22	27.25	15.26
Concentrate (Sugars)	90.13	17.32	5.25	61.69	11.84	3.90

Mule *et al.* (2008) reported that values of soybean straw as 88.45, 7.88, 38.10, 1.25, 38.99 and 13.78 per cent DM, CP, CF, EE, NFE and total ash, respectively.

Tambhale and Dhawale (2009) studies that the response in growth performance to compound v/s homemade concentrates by Osmanabadi kids. The difference between the treatments for final feed intake of feed was significant including superior palatability of homemade over MADIC feeds. The digestibility coefficient for MADIC concentrates CP on percent DM basis was DM (50.20), CP (75.76), CF (74.81), EE (86.71). And NFE (65.01) and the corresponding values for homemade concentrate were DM (58.42) CP (72.72), CF (74.42) EE (82.60) NFE (66.57) respectively.

Kale (2009) studied the utilization of various combinations of Soybean and Jowar straw based complete feed in Osmanabadi kids. The chemical composition of concentrate mixture on percent DM basis was DM (89.88), CP (21.00), CF (10.20), EE(4.14), NFE(54.52) and total ash(10.14). The chemical composition of Jowar straw on the percent DM basis was DM (91.16), CP (2.79), CF (34.30), EE (1.79), NFE (51.41) and total ash (9.71) and chemical composition of Soybean straw on percent DM basis was DM (90.28), CP (42.10), EE (1.58), NFE (40.49) and the total ash(8.90).

Adangale *et al.* (2009) studied the chemical composition of concentrate DM, CP, CF, EE, NEF and ash as 90.18, 19.17, 10.46, 3.42, 51.55 and 5.58 percent respectively and the chemical composition of Jowar straw and Soybean straw used. Was DM, CP, CF, EE, NEF and ash as

90.82, 90.74, 2.72, 6.68, 35.04, 41.70, 2.42, 1.51, 38.96, 28.03 and 12.26, 11.68 percent respectively.

Chopade *et al.* (2010) reported that the chemical composition of untreated soybean straw and urea treated Soybean straw were 87.90 and 87.38, 8.75 and 12.13, 39.30 and 36.92, 1.50 and 1.74, 12.10 and 12.62, 37.48 and 37.33, 53.33 and 52.64, 35.67 and 32.12 and 16.24 and 12.55 per cent for OM, CP, CF, EE, TA, NFE, NDF, ADF, and lignin, respectively.

Pachauri *et al.* (2010) reported that reared the female crossbred heifer on wheat straw and concentrate mixture (conventional system, T₁), wheat straw based total mixed ration (WSTMR, T₂) and urea ammoniated wheat straw bases mixed ration (AWSTMR, T₃). The composition of different rations indicated that they were nutritionally sufficient for the feeding of growing crossbred heifer. The chemical composition of rations on DM basis was 11.46, 12.38 and 14.18 CP, 22.78, 21.25 and 20.78 CF with 87.79, 87.70 and 87.42 per cent DM for T₁, T₂ and T₃ rations, respectively.

Naser *et al.* (2011) studied the chemical composition of soybean straw for Dry Matter (DM), Crude Protein (CP), Ether Extract (EE), Organic Matter (OM), Neutral Detergent fiber (NDF), Acid Detergent Fibre (ADF) and Acid Detergent Lignin (ADL) of pooled samples were 89.18, 5.10, 2.85, 96.90, 80.80, 63.20 and 13.00%, respectively.

Jadhav *et al.* (2011) conducted experiment a period of 12 weeks. Twelve heifers were divided into three groups on the nearness of age and weight basis. Three treatments viz., T₁- T₂ Readymade concentrate, - Dry fodder + green fodder + homemade concentrate-I, T₃- Dry fodder +green fodder + homemade concentrate –II were studied. The proximate analysis of concentrate showed higher CP (25.26 per cent) and EE (5.25 per cent) in homemade concentrate-I while, homemade concentrate-II was higher in CF (12.01 per cent).

2.2 Feed intake

Voluntary feed intake is most important factor affecting the performance of animal. The feed intake in cattle and buffaloes is influenced by several factors such as body weight, age, sex, and climate, physical form of ration, level of production production, gastrointestinal factors, health and other management practices.

Rajmane and Deshmukh (2000) observed the DMI of 615.924 and 829 g/d and DMI per 100 kg BW as 2.19, 3.33 and 2.75 kg, respectively for three complete rations containing sorghum straw (CR₁), Soybean straw (CR₂) and corn cobs (CR₃) each at per cent level and concentrate mixture at 40 per cent level in Osmanabadi goats.

Mill and jenny (2003) reported that high concentrate feeding resulted in decrease in the molar proportion of rumen acetate and increase in the molar proportion of propionate. They also conclude fasting caused decrease in plasma glucose and insulin and increase plasma free fatty acids and glucocorticoids with a loss of treatment differences in all cases.

Gupta and Tiwari (2005) showed that the heifers consumed 3.42 + or-0.22, 3.46 + or-0.19, and 3.65 + or-0.21 kg dry matter per day in Groups 1, 2 and 3, respectively. The average dry matter intake (DMI) per 100 kg body weight, dry matter intake per kg metabolic body size, total digestible nutrients (TDN) and digestible crude protein (DCP) intake/W 0.75 kg did not differ significantly among the 3 groups. The digestibility coefficient of organic matter (OM), crude protein (CP) and crude fibre (CF) was significantly ($P<0.05$) higher in Group 3.

Homayoun and Fazaeli (2007) studied to evaluate different levels of energy for optimum growth in Iranian regional buffalo male calves, using 27 yearling buffalo male calves with initial live weight of 201, 214 kg. Three diets were formulated to provide 90 per cent, 100 per cent, and 110 per cent energy level requirements equivalent to those of steers derived from NRC beef cattle recommendations and they were fed ad libitum for 2 consecutive 90 day trial periods where the crude protein was 11.2 per cent

in the first and 10.22 per cent in the second period. DM intake of the high energy diets was significantly ($P < 0.05$) lower than those with lower energy contents in both periods. There were no significant differences between treatments for the carcass traits with exception of abdominal fat, which was significantly affected by the energy levels ($P < 0.05$). It can be concluded that the optimum growth rate of buffalo male calves may be obtained by providing the NRC beef cattle standard dietary metabolizable energy from yearling to 18 months of age.

Bansod (2008) studied the requirement of Gaolao cows by offering Jowar straw, soybean straw, green Hybrid Napier and concentrate mixture (sugras). The treatments were 100 per cent Jowar straw with 5 kg hay Napier and concentrate (T_1) 50 per cent Jowar straw and 50 per cent soybean straw with 5 kg hay Napier and concentrate (T_2) and 100 per cent soybean straw with 5 kg hay. Napier and concentrate (T_3). The average daily intake of DM was 7.492, 8.390 and 8.28 kg/day/cow in T_1 , T_2 and T_3 groups, respectively.. The average per cent BW DM intake was 2.668, 3.089 and 3.089 kg in T_1 , T_2 and T_3 treatments, respectively. The DM intake /100 kg body weight in T_2 and T_3 was found more by 15.78 per cent over that of the intake in T_1 group.

Adangale *et al.* (2009) studied the effect of feeding Jowar straw in combination with soybean straw on the growth performance of crossbred calves. In T_0 control group 100 per cent Jowar straw + concentrate were fed while T_1 group was maintained 50 per cent Jowar + 50 per cent Jowar +50 per cent Soybean straw + concentrate and T_2 group was fed with 100 per cent Soybean straw + concentrate. The average DMI / 100 kg BW was 3.050, 3.262, and 3.178 kg under T_0 T_1 and T_2 group, respectively. The differences among the groups were no significant. It was observed that the calves liked the Soybean straw as dry roughage, hence could be fed alone or in combination with Jowar straw to crossbred calves.

Lascano and Zanton (2009) concluded that high concentrate diets can improve feed efficiency without affecting growth when limit fed to

dairy heifers yeast culture increased dry matter digestibility in high concentrate and low concentrate heifers.

Pachauri *et al.* (2010) observed the TDN and protein intake through both Wheat straw total mixed ration and urea ammoniated WS mixed ration was higher than that recorded in conventional fed group which might be due to higher DM intake. Hence, urea ammonization was found effective in improving the DMI in crossbred calves.

Yadav and Chaudhary (2010) offered the each animal in all the groups were fed standard ration, comprising 5 kg green Berseem (*Trifolium Alexandrina*) and Wheat (*Tritium aestivum*) straw *ad lib.* and in treatment T₁ heifers were given untreated GNC, while in treatment T₂ and T₃ formaldehyde (FA) treated @ 0.5 g FA/100 g CP and FA treated @ 1.0 g FA/100 g CP, respectively, as a source of protein in the concentrate mixtures as per their requirements. The crude protein (CP) intake per 100 kg body weight was significantly ($P<0.05$) higher in T₁ as compared to T₃ group.

Shelke *et al.* (2011) studied the growth performance of cross bred heifers on feeding silage prepared from Sorghum and Gliricidia. The 20 heifers divided into five groups heifer under control T₁ were fed sorghum (jowar)+ Gliricidia (100+0), T₂ Sorghum (jowar)+ Gliricidia (75+25), T₃ Sorghum, (jowar) + Gliricidia (50+50), T₄ Sorghum (Jowar) + Gliricidia (25+75), T₅ Sorghum (Jowar)+Gliricidia (0+ 100). It was shown that the palatability of T₁ Sorghum (Jowar) +Gliricidia (100+0) was higher over other silage combination. The daily dry matter intake per 100 kg body weight of heifers was higher in T₃ followed by T₅ and T₄ treatment respectively.

Abdullah *et al.* (2013) cost to gain ratio was lowest (Rs 156.68) on t milk replacer and whole milk cum milk replacer on dry matter intake, average daily gain, and feed efficiency in Nili Ravi buffalo calves. A (Whole milk), B (50 per cent whole milk & 50 per cent milk replacer) & C (milk replacer). All the calves were offered calf starter (19 per cent CP) .Average daily dry matter intake in treatment A, B and C was

1555.55±221.280, 1488.67±157.65 and 1459.04 ± 172.19 g, respectively, the difference being non significant (P>0.05).

Jamara *et al.* (2014) studied on effect of the fed Shatavari (*asparagusracemosus*) on body weight and puberty of Sahiwal heifers and reported that the dry matter intake of the heifers was more (P < 0.05) in treatment group heifer due to the Saponin contents of Shatavari.

2.3 Water intake

Deshmukh (2000) studied the water intake in crossbred heifers. The water intake was 9.284, 8.546 and 8.046 lit. per day per heifer in control T₁, T₂ and T₃ respectively.

Yazdani and Gupta (2000) studied the difference in voluntary water intake per kg dry matter intake (6.12, 5.39, 4.27 and 4.03 liters) was also significantly (p<0.05) influenced by the dietary treatments.

Tipare (2003) studied the average water intakes over an experimental period was 15.37, 13.14 and 12.14 lit. per day heifer in treatment T₁, T₂ and T₃ respectively.

Shelar (2004) noticed that the daily water intake of the heifers did not differ significantly between the feeding groups. The heifers from T₁ group drunk slightly more water (9.445 liters) than that of T₂ (9.172) T₃ (9.245) and T₄ (9.364 litres). This trend indicated that the feeding of soybean straw slightly lowered the intake of water in treatment T₂, T₃ and T₄. The average water intake per 100 kg body weight was 11.08, 10.72, 10.886 and 11.011 liters per heifer per day in T₁, T₂ T₃ and T₄ respectively.

Tauqir *et al.* (2013) observed that the Urea molasses block supplementation significantly (p<0.05) increased feed and water intake in Sahiwal heifers.

Shelke *et al.* (2014) was conducted to utilize urea treated non- conventional SBS as protein source roughage in the ration of lactating cow of find out it's feeding value in respect to water intake and

digestibility of nutrient, milk yield and quality of milk, blood metabolic profile, feed conversion efficiency and economic.

2.4 Homemade and readymade concentrate

Mesfin *et al.* (2005) crossbred (Sahiwal x Jersey) heifers of about the same age and body weight were randomly divided in to 4 groups of 4 each to study the effect of level of concentrate supplementation (CS: 0, 0.75, 1.5 & 2.0 kg/day/animal), at two stages of growth on the voluntary dry matter intake (DMI) of GSF. Results revealed that whole ration DMI (kg/100kg BW) was significantly improved with of 0.75kg / day. The increased concentrate level of CS led to a significant ($P<0.01$) decrease DMI of GSF. As the concentrate level went from 0 to 2.0kg, voluntary DMI of fodder decreased from 2.68 to 1.92kg /100kg BW. Substitution rates (SR) of sorghum by concentrate was increased with increasing level of concentrate in the ration and it was higher in stage-II (0.4132) than stage-I (0.2473). The cutting stage also significantly ($P<0.01$) affected fodder DMI.

Lohakare *et al.* (2006) studied the effect of different dietary protein levels on the performance, nutrient balances, blood biochemical parameters and thyroid hormones of crossbred calves. Thirty crossbred (Bos taurusxBos indicus) calves aged 3-5 months were divided into 3 equal groups of 10 each and fed graded levels of crude protein, namely 100 (NP), 75 (LP) and 125 (HP) percent of the kearl recommendations for 105 day. Namely 100 (NP), 75 (LP) and 125 (HP) percent of the kearl recommendations for 105 day. The calves had access to ad libitum oat hay as the basal roughage. Average daily gain was 367 ± 21.6 , 347 ± 22.9 and 337 ± 26.4 g in calves fed NP, LP and HP diets, respectively. The digestibility of crude protein, organic matter, crude fiber and nitrogen-free extract was significantly higher ($p<0.05$) on HP diets compared to LP or NP diets. The calves on all 3 diets were in positive nitrogen (N) balance, however the N retention was higher ($p<0.05$) in HP than in LP fed calves. It could be concluded that crossbred calves can be satisfactorily reared on 25 per cent lower protein level as recommended by kearl for developing

countries, which would not only economize the cost of production but also help to reduce environmental pollution attributable to livestock production.

Lyimo *et al.* (2010) studied was carried out in Tanzania to assess the performance of crossbred (Frisian/ Ayrshire x Tanzania Shorthorn Zebu) dairy calves fed on a concentrate. The developed concentrate contained 189 g crude protein (CP) and 13 ME MJ per kg DM and was formulated using locally available feed resources. Twenty seven (27) male calves, with birth weight 32 ± 1.5 kg were randomly allocated to three treatments, whereby Treatment 1 (DC) calves were fed the developed concentrate, Treatment 2 (FC) calves were fed a common homemade dairy cow concentrate (CP 130 g and ME 13 MJ per kg DM) used by farmers in the study area. Treatment 3 (FP) was a control.

Sarkar *et al.* (2010) studied was to evaluate and compare the effect of growth promoter 'Megavit - DB' on growth performance of indigenous Red Chittagong (RC) and Holstein Crossbred (HC) bull calves. The daily DM intake of different treatment groups were found almost similar. The daily average live weight gains were 0.27 ± 0.05 , 0.36 ± 0.01 , 0.36 ± 0.01 and 0.45 ± 0.05 kg/day, feed conversion efficiency were 9.08 ± 0.16 , 7.47 ± 1.07 , 7.13 ± 1.24 and 6.16 ± 0.27 and the average net returns (Tk.) were 1473.33 ± 87 , 2060 ± 76.38 , 1910 ± 86.60 and 2776.67 ± 44.10 for RCT₀, RCT₁, HCT₀ and HCT₁ treatment groups, respectively. The daily average live weight gain and feed conversion efficiency were significantly ($p < 0.05$) higher in HCT₁ than that from RCT₁, HCT₀ and RCT₀. Accordingly, the average net returns were found significantly ($p < 0.05$) higher in HCT₁ than RCT₁, HCT₀ and RCT₀. It may be concluded that Megavit-DB may have the potentials to improve growth performance of both HC and RC and may be used in cattle fattening program.

Malisetty and Jatoth (2013) studied was effect of Supplementation of Mulberry Hay with Sorghum Straw on Nutrient Utilization and Growth in Crossbred Calves. The average daily gains (ADG) were found to be 510.3 and 511.8 g/day, respectively on ration 1 and 2 were non significance. The DM intake per kg live weight gain (kg) was 7.47

and 7.59 recorded with ration 1 and 2, respectively. The voluntary daily feed intake (kg) of 3.25 and 3.43 per 100 kg body weight was observed with ration 1 and 2, respectively. Supplementation of mulberry hay as mixed fodder decreased the digestibility of DM, OM, CF ($P < 0.01$) and an increased digestibility of CP ($P < 0.05$). No significant difference in the digestibility of EE and NFE were observed among the two rations. Based on the results, this studied revealed that mulberry hay was palatable, improved the nutrient utilization of straw rations and could be safely supplemented at 50% level, as leguminous component of the diet and feed cost can be reduced by saving 0.66 kg of concentrate per animal per day in growing crossbred calves.

Gabatwesepe (2013) experiment was designed to assess the cost and the effect of homemade concentrates having various combinations of legume and non legume feed ingredients on the growth performance in weaned Holder calves (HF X Deoni). All the homemade concentrate mixture have better efficiency of feed utilization as compare to the readymade concentrate, thus it can be inferred that homemade concentrates have superior optimum biological value. The cost per kg body weight gain of crossbred calves was lower in the readymade concentrate; however, the efficiency of nutrients utilization was much better in the homemade concentrate.

Das *et al.* (2014) influenced of partial replacement of concentrate mixture with Stylo meal. Fifteen growing crossbred female calves (BW=143.26±8.22 kg; age=12- 15 months) were randomly divided into three groups of five animals. Each to investigate the effect of replacing concentrate mixture with stylo meal on feed intake, nutrient utilization and growth performance. The animals of control group (T₁) were fed wheat straw and concentrate as per requirements while in groups T₂ and T₃, 50 per cent of CP in concentrate mixture was replaced with Stylo meal prepared from Stylo snatches hamata and Stylo snatches seabrana, respectively. All the animals were under this feeding regime for a period of 90 days. Average DM intake was 5.38, 5.06 and 4.86 kg/d in groups T₁, T₂ and T₃, respectively which was similar in all the groups. Digestibility

coefficients of DM, OM and CP were also similar in all 3 groups, however, NDF digestibility was higher ($P < 0.05$) in T_2 and T_3 as compared to T_1 group. DCP and TDN intakes were sufficient for daily gain of 500 g in all the groups. N balance and daily live weight gain was also similar in all the groups. It was concluded that 50% of CP in concentrate mixture could be replaced with stylo meal prepared from either Shamata or seabrana in the rations of growing crossbred heifers.

Singh *et al.* (2015) this studies was conducted to evaluate the growth performance and feed intake of crossbred (Holstein Friesianx Sahiwal) and (Jerseyx Sahiwal) heifer calves fed different feed combinations of concentrate mixture using 24 heifer calves with average initial weight of $55.27 \pm 2.53a$, $57.30 \pm 1.82a$, $60.26 \pm 1.40a$ and $62.00a$ kg at 4 months of age. The calves were assigned into treatments having, T_1 = Control (Farm ration), T_2 = 50% Barley+30% MC+0% AC+8% WB 2% MM, T_3 = 50%Maize+30% MC+10% AC+8% WB 2% MM, T_4 = 50% Sorghum+30% MC+10% AC+8% WB 2% MM. The total DM and DMI (% of body weight) intake for T_3 and T_2 diets were higher ($p < 0.05$) than those fed T_1 and T_4 diets. The overall Average Daily Gain (ADG) was higher (0.55 kg day G_1) in T_3 than of T_2 and T_4 , where as ADG found to be lowest in T_1 (0.40 kg day G_1). The body measurements (Chest girth, length and height) were also higher in T_3 compared to those fed T_1 , T_2 and T_4 diets ($p < 0.05$). It is calculated that 50% Maize+30% MC+10% AC+8% WB 2% MM, enhanced growth parameters, feed utilization and reproductive performance of cross-bred heifer calves in terms of age at puberty was achieved higher.

Sreedhar (2015) trial was conducted on growth performance of indigenous and crossbred calves under field conditions. The average birth weight of indigenous and cross bred calves was 23.39 ± 1.23 and 25.27 ± 1.54 kg respectively. The mean body weight of indigenous calves and cross bred calves at 24 weeks of age was recorded as 87.94 ± 1.31 and 96.89 ± 1.37 kg respectively, which indicated faster growth of cross bred calves. The mean ADG of indigenous and cross bred calves were 314 ± 11.2 and 365 ± 10.2 g/day respectively. The maximum average daily gain

was observed at 22-24 weeks in indigenous calves whereas in cross bred calves, peak ADG obtained at 12-14 weeks during 24 weeks of growth period. It was found that cross bred calves have grown faster as compared to the indigenous calves. Hence it can be concluded that in addition to genetic inheritance of cross bred calves, improved feeding and managerial practices that are being followed by the dairy farmers resulted higher body weight of the calves.

Kumar *et al.* (2015) studied about effect of Phase Feeding on Growth, Body Measurements and Body Condition Score in Growing Crossbred Female Calves (9-12 months age) were divided into 2 equal groups and fed rations in 2 phases. It was concluded that phase feeding with high concentration of energy during later period of growth increases body weight gain when moderate energy ration (58% TDN and 15% CP) was fed during 0-60 days (phase 1) followed by high energy ration (62% TDN and 15% CP) during 60-120 days (phase 2) in crossbred calves.

Yuraz *et al.* (2015) calves were kept in individual hutches with straw bedding. Treatments were four physical forms of starter feed: a) Whole maize grain plus pelleted protein concentrate (WMP); b) Pelleted starter feed (PSF); c) Starter in meal form with coarsely grounded maize (MSF); and d) 95% MSF + 5% Nutrilait (contains 35% whey powder) (MSN) conclusion, the starter with equal ingredient and nutrient composition in coarsely ground or pelleted form, and starter of whole maize plus pelleted protein concentrate ensured equal gain, feed efficiency and health of calves.

Roy *et al.* (2016) an experiment was conducted to observe the effect of substitution of concentrate mixture with *Azollapinnata* on growth performance, feed intake, nutrient digestibility and blood biochemical's of Haryana heifers. The heifers of control group were fed with a basal ration comprised of Jowar fodder, wheat straw and concentrate mixture according to their nutrient requirement. Concentrate mixture was replaced at 5% level (DM basis) by *Azollapinnata* in treatment group. Dry matter intake (DMI) and body weight were recorded fortnightly and blood

samples were collected at monthly intervals for analysis of total blood protein, plasma albumin, total plasma immunoglobulin, blood urea nitrogen, plasma creatinine, alanine amino transferases (ALT) and aspartate amino transferases (AST). In present study, DMI, body weight and body condition score (BCS) were not affected by dietary supplementation of Azollapinnata. Replacing concentrate with Azollapinnata improved ($P < 0.01$) fortnightly weight gain, average daily gain (ADG) and feed conversion efficiency (FCE).

Roy *et al.* (2016) an experiment was conducted to determine the effects of different levels of energy on growth performance of crossbred (Indigenous \times Holstein Friesian) bull calves. Four levels of dietary energy (T_0 , T_1 , T_2 and T_3) were supplied to the experimental animals for this purpose. The level of ME was $T_0 = 17.4$ MJ/d as maintenance ration, $T_1 = 20.22$ MJ/d for 200 g/d targeted LWG, $T_2 = 23.37$ MJ/d for 400 g/d targeted LWG, $T_3 = 27.29$ MJ/d for 600 g/d targeted LWG. It was found that the average daily live weight gain in T_1 (290 g) fulfills against the targeted live weight gain (200 g/d). On the other hand, the expected live weight gain for T_2 and T_3 (400 g/d and 600 g/d) were not fulfill at the end of experiment. The energy requirement for 100 kg body weight of crossbred bull calves was 17.4 MJ d^{-1} as maintenance and 15.44 MJ d^{-1} required for growth of 200g/ day.

2.5 Body weight

Sahu and Agrawal (2000) studied the effect of defaunation and two levels of protein on nutrient utilization and growth of crossbred heifers. Showed that the Average daily gain (g/day) and feed conversion efficiency were higher ($P < 0.05$) in defaunated than in faunated heifers.

Jagginavar *et al.* (2001) showed that the concentrate mixture and rain tree pods were offered in the ratio of 100:0 (Gr I), 75:25 (Gr II), 50:50 (Gr III) and 0:100 (Gr IV). The gain in body weight and balances of N, calcium and phosphorus were higher ($P < 0.05$) in groups I, II and III than in group.

Jagginavar *et al.* (2002) studied the Influence of rain tree (*Samanea saman*) pods with concentrate on nutrients intake and digestibility in HF x Deoni heifers. Intakes of DM, DCP and TDN were significantly ($P<0.05$) higher in treatments 1 and 2 over treatment 4. The digested OM and CP were significantly ($P<0.05$) higher in treatments 1 and 2 over treatment 4. The digestibility of CP was significantly ($P<0.05$) higher in treatments 1, 2 and 3 over treatment 4, whereas, the digestibility of other nutrients was statistically similar in all the treatments. It is concluded that rain tree pods can be incorporated up to 50% level by replacing is caloric and is nitrogenous concentrate mixtures without affecting the intake and digestibility of nutrients in HF x Deoni crossbred heifers.

Obispo *et al.* (2001) showed that the effect on the daily gain of weight (kg) was significantly increased when supplemented with FM (0.59), BG (0.89) and CSM (0.69) compared with the control (0.13). Among these sources, the highest ADG ($P<0.01$) was observed with the BG treatment.

Ahmad *et al.* (2005) conducted on 30 sahiwal heifers of similar age of about one year and similar live weight (155-159 kg) to determine the effect of corn steep liquor on growth rate. The total live weight gain during the trial were 273 + or-9.73, 270 + or-4.86, 268 + or-12.37, 261 + or-7.23 and 260 + or-6.28 in Groups I, II, III, IV and V, respectively.

Gupta *et al.* (2005) studied the effect of herbs as a feed additive on nutrient utilization and growth in crossbred heifers fed paddy straw based rations. The average total live weight gains during the growth trial in groups 1, 2 and 3 were 57.34 + or-1.89, 62.88 + or-0.63 and 70.58 + or-2.35 kg, respectively, and were significantly higher in group 3.

Pathak *et al.* (2005) showed that there was no significant difference among treatments on total DMI, roughages DMI, CPI, DCP and digestible energy intake as per cent body weight. Total energy intake (Kcal/kg/w) T₁ was significantly higher.

Adangale *et al.* (2009) observed the total body weight gain over an experiment period under 100 per cent Jowar, 50:50 per cent combination to Jowar, soybean, 100 per cent soybean were 5.622, 5.889, 5.722 kg respectively. Combination treatment is superior over both but different were non- significant. The combination effect of both the straw was increased the daily body weight gain under treatment were 0.201, 0.210, 0.204.

Das *et al.* (2012) showed that the TDN intake was significantly higher in T₂ than T₁ or T₃. N balance (g/d) and daily live weight gain (g) was non- significantly higher in T₁ and T₂ than T₃.

Jabbar T.N. (2012) observed that weight gain in Sahiwal heifers was not influenced by different dietary energy levels (ME 80, 100 or 120% of NRC). Effect of dietary energy on ADG depicted that growth performance of both *Bos taurus* and *Bos indicus* heifers might be improved by provision of extra energy required for maintenance either through concentrate supplementation or higher concentration of dietary energy. The net energy for maintenance (NEM) of small breed non-pregnant heifers (wt = 100 kg and ADG 500 g/d) is 2.64 Mcal /day and net energy for growth (NEG) is 0.82 M cal/day according to NRC, 2001. Diets having enough energy more than recommended (NEM) might fulfill not only maintenance requirements but also improve growth during pre pubertal period in heifers.

Tauqir *et al.* (2013) studied on effect of supplementing maize fodder with urea molasses block (UMB) on their feed intake and weight gain of sahiwal heifer. Animal in group A were offered maize fodder ad libitum without UMB (control), while the animals in group B, C and D were offered green fodder at 100, 75 and 50 per cent of their requirement with ad libitum UMB, respectively. Daily weight gain was significantly ($p < 0.05$) higher for heifer in group B than those in groups A and C.

Mahesh *et al.* (2013) showed that the significantly ($P < 0.05$) higher average daily gain in body weight (135 vs. 102 g/day).

Jamara *et al.* (2014) investigated the effect of shatavari on growth and puberty; sixteen Sahiwal heifers were selected from the institute herd. The treatment group sahiwal heifers were fed shatavari @150 mg/kg BW/day once in morning. The body weight of the heifers varied ($P < 0.05$) between the group due to more feed intake ($P < 0.05$) and increase in plasma GH levels ($P < 0.05$). The incidence of puberty and age at first service was achieved earlier in the treatment group in comparison to control suggesting that shatavari could be fed to augment growth and puberty in sahiwal heifer.

Anjum *et al.* (2014) studied the effects of compensatory growth on puberty age in sahiwal cattle heifers fed low followed by high energy based total mixed rations. The SSF heifers gained 16 per cent higher ($p \leq 0.05$) daily weight (0.80 vs. 0.70 kg/head) and showed better FCR (7.20 vs. 8.02) than NRC group.

2.6 Body measurement

Belsare (2004) observed that increase in body height and growth of animals due to jowar with Gliricidia silage combination feeding.

Ahmad *et al.* (2004) calf starter and conventional dairy rations with crude protein 18 per cent and total digestible nutrients 75–80 per cent along with green fodder were offered ad libitum to calves of respective groups for a period of 113 days. The average daily feed intakes were 0.95 and 0.57 kg, average daily weight gains were 0.47 and 0.34 kg and feed conversion ratio averaged 2.00 and 1.70 in calf starter and conventional groups respectively. On the overall performance, calf starter group was found better than the conventional ration.

Yadav and Chaudhary (2010) studied the effect of feeding formaldehyde treated groundnut cake on dry matter intake, digestibility of nutrients and body measurements in crossbred heifers. The results revealed that the body measurement parameters were significantly ($p < 0.05$) higher in T_3 group as compared to T_2 and T_1 except height in crossbred heifers.

Shelke *et al.* (2011) reported that the feeding of silage prepared from sorghum and gliricidia increases height, chest girth and length of heifers.

Jadhav *et al.* (2011) the daily dry matter intake per 100 kg body weight of heifers was higher in T₂ followed T₁ and T₃ treatments. Intake of DCP and TDN was higher in T₁ followed by T₃ and lowest in treatment T₂. The highest total body weight gain in body weight of heifers was observed in treatment T₂, followed by T₃ and lowest in treatment T₁. Growth performance viz., height, length and chest girth of heifers was more in T₂ treatment as compared to T₁ and T₃ treatments. The cost/kg body weight gain was lowest in T₂ than T₁ and T₃ treatment. It was concluded from the results that the feeding of homemade concentrates - I was economical for growth performance of heifers.

Jabbar *et al.* (2012) reported the heifers fed dietary level of ME 124 per cent of NRC acquired higher body length, height and heart girth as compared to those fed other dietary energy levels.

Abdullah *et al.* (2013) the average daily weight gain of treatment A, B and C was 457.38 ± 110.13, 426.67 ± 78.70 and 362.22 ± 107.83 g, respectively. There was a significant (P<0.05) difference between the weight gain of treatment A and C while there was non-significant (P>0.05) difference between the weight gain of treatment A&B and B&C. The mean values for FCR in all the three treatments (A, B and C) were 3.49±0.56, 3.56±0.50 and 4.30 ±1.24, respectively. The feed conversion ratio (FCR) of treatment A and B was better than treatment C. Nili Ravi calves without effecting dry matter intake, growth rate and feed efficiency.

Iqbal *et al.* (2014) calves were fed colostrums and whole milk (WM) @ 10 per cent of body weight during first 14 days of age. A, B, C, D, E and F and were offered WM (Control), WM + calf starter (CS), WM + Milk replacer (MR), WM + MR + CS, MR and MR+CS, respectively. Daily milk intake was highest (P<0.05) in calves on treatment WM + CS (2.33 ± 0.21 kg) followed by WM, MR, WM + MR+CS and MR + CS, respectively. Highest daily gain (P<0.05) was observed in the calves on treatment WM +

MR + CS (0.38 ± 0.02 kg). Increased in body height ($P < 0.05$) was 0.70 ± 0.07 , 1.08 ± 0.10 , 0.75 ± 0.09 , 1.14 ± 0.09 , 0.74 ± 0.09 and 1.13 ± 0.10 cm, respectively on WM, WM + CS, WM + MR, WM + MR+CS, MR and MR + CS at fortnightly interval. Increase in body length was highest ($P < 0.05$) on WM + CS diet.

Bhanderi *et al.* (2014) fed calf starter comprising sodium butyrate, calcium propionate, quality protein meal, bypass fat, vitamins A, D3, E, toxin binder, mineral mixture, flavorings' agent and anti-oxidants @ 100 g per day. calf starter formulated scientifically can help in significantly improving the daily weight gain, immune status and reducing parasitic infestation in growing calves, which in turn can help in reducing the age at first calving. The higher DM intake through dry and green fodder had also reported by on feeding calf starter to growing calves.

2.7 Cost of structure

Verma (2001) conducted a trial in crossbred growing heifers fed with complete feed containing crude protein at the level of 12 per cent (Group II) and 14 per cent (Group III) in complete feed I and II, respectively and compared the results with control (Group I). It was found that cost per kg weight gain (Rs.) 39.97, 27.71 and 29.28. Thus, it suggested that the complete feed containing 12 per cent crude protein can be successfully and economically used for feeding.

Tumbare *et al.* (2001) determined cost of complete feed per sheep per day for untreated wheat straw based complete feed Rs. 2.44 and that for treated Wheat straw based complete feed Rs. 2.35.

Kalbande and chainpure (2001) observed costs of feed (concentrate+ roughage) per kg gain in body weight for control ration C and experimental ration T₁ were Rs.39.44 and 32.55 respectively. The cost of experiment ration T₁ was higher (Rs.6.57) due to urea treatment of Jowar kadbi and inclusion of protein sources with high UDP level as compared to C (Rs. 6.18), but the significantly higher growth rate, digestibility of almost

all the nutrients and efficiency of feed conversion contributed substantially to lower the cost of feed per kg gain in body weight in T₁ as compared to C.

Kumar (2002) reported that the cost per kg body weight gain was 100 per cent less in 120 per cent NRC feeding level as compared to heifer fed as per NRC recommendation.

Zanton and Heinrichs (2005) concluded that limit feeding high concentrate diets does not need to be excluded as a management option and may offer an opportunity for heifer growers reduce feed costs.

Adangale *et al.* (2008) observed that the cost per kg body weight gain was highest in treatment T₀ (Rs. 48.99) and followed by T₁ (Rs. 43.09) and T₂ (Rs. 39.11).

Singh *et al.* (2009) determined that the cost of feeding per kg live weight gain was lower in T₄ (Rs 24.90) followed by T₃ (Rs. 29.07), T₂ (Rs. 35.02) and T₁ (Rs.39.53) indicating live weight gain was cheaper by Rs. 14.63 in 15 kg green maize fed group (T₄) then in the control group.

Ikhar *et al.* (2011) observed that the effect of different feeding regimes on economics of feeding in Sahiwal heifers is as follows. Average feed cost per animal per day (Rs.) 31.29, 26.30, 23.39 and economics cost of feed is (Rs. /kg gain) 69.5, 72.0, 88.9.

Anjum *et al.* (2014) observed that the cost per kg of NRC ration fed was rupees (Rs.17.37); stair-step low energy ration was Rs. 13.06 and stair-step high energy ration cost was Rs. 20.12. Overall feed cost incurred on heifers fed on SSF was significantly lower (12%) than the heifers fed as per NRC requirement.

CHAPTER III

MATERIAL AND METHODS

The present investigation entitled “**Comparative Studies on Growth Performance of Indigenous Calves by using Readymade and Homemade Concentrate**” was undertaken at Livestock Instructional Farm, of Department of Animal husbandry and Dairy Science, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola during the year 2016-2017 for a period of 90 days. The material used and methods employed for this investigation is presented in the following pages under appropriate heads.

3.1 Information about place of work

The Livestock Instructional Farm is located at Akola, which is one of the districts of ‘Vidarbha’ region in Maharashtra state. The environmental condition is one of the most dominant factors. It is therefore, necessary to describe the topographical and climatologically situation of the place. Akola is located on the latitude of 22.41 and longitude of 77.02 East with height 307.4 meter above mean sea level.

3.2 Metrological data

Akola comes under hot climatic area of the tropical region. As, it is far away from the sea, it is extreme climate. During the summer season the maximum ambient temperature reaches to 46⁰ C with a humidity ranging from 15 to 19 per cent. The weather in summer is hot during day and warm but pleasant during night. The rainfall data indicates that this region comes under assured rainfall zone.

Table 1: Weekly Weather data for the year 2016-17 recorded at Meteorological Observatory Department of Agronomy Dr. PDKV., Akola

		Actual				2016								Normal				1971-2010		
Weeks	Dates	T MAX (°C)		T MIN (°C)		BSH (hrs)		WS (kmh ⁻¹)		RH I (%)		RH II (%)		Evap (mm)		RF (mm)		CRF (mm)	Rainy Days	
		N	A	N	A	N	A	N	A	N	A	N	A	N	A	N	A		N	A
41	8-14 oct	34.1	31.2	18.7	21.3	4.2	7.6	4.1	3.0	76	89.9	40	59	5.3	4.1	16.0	29.0	853.2	0.9	1.0
42	15-21	33.9	32.9	18.1	16.5	8.4	8.9	4.4	0.4	74	80.4	36	28.9	5.5	4.4	3.1	0.0	853.2	0.4	0.0
43	22-28	33.1	32.4	18.5	15.8	8.4	8.4	4.1	0.9	73	80.4	36	33.7	5.3	4.7	10.0	0.0	853.2	0.6	0.0
44	29-4 Nov	33.0	31.4	15.8	14.3	8.7	8.7	4.7	0.4	72	80.9	31	34.1	5.3	4.4	2.3	0.0	853.2	0.3	0.0
45	5-11	32.4	31.4	14.8	11.2	8.6	8.6	4.5	0.3	70	77.3	30	26.9	5.2	3.8	3.7	0.0	853.2	0.3	0.0
46	12-18	31.7	30.3	13.7	11.9	8.6	8.3	4.6	0.4	70	84.1	30	33.1	4.9	3.7	1.1	0.0	853.2	0.2	0.0
47	19-25	31.0	30.7	13.1	9.7	8.6	8.4	4.4	0.3	71	85.3	30	32.0	4.6	3.6	10.1	0.0	853.2	0.3	0.0
48	26-2 Dec	30.3	31.9	12.4	10.9	8.8	8.9	4.6	0.2	71	85.3	31	31.3	4.3	3.8	6.8	0.0	853.2	0.3	0.0
49	3-9	29.8	30.1	11.2	10.7	8.7	8.0	4.7	0.8	70	87.9	29	35.1	4.3	3.5	1.3	0.0	853.2	0.2	0.0
50	10-16	29.4	30.2	10.3	10.7	8.8	8.0	4.5	1.2	70	79.4	27	32.3	4.2	4.2	1.3	0.0	853.2	0.2	0.0
51	17-23	29.5	29.2	10.6	8.6	8.7	8.5	4.7	0.5	69	84.6	29	35.1	4.3	3.5	0.9	0.0	853.2	0.1	0.0
52	24-31	29.2	29.5	10.7	8.4	8.6	8.5	4.8	0.5	70	83.4	31	29.3	4.3	3.4	2.6	0.0	853.2	0.2	0.0
1	1-7 Jan	29.0	29.5	10.3	9.3	8.7	8.1	4.9	0.5	78	82	30	33	4.2	3.5	1.7	0.0	0.0	0.2	0.0
2	8-14	29.2	27.3	11.3	8.4	8.6	7.6	6.3	0.6	71	84	30	40	4.5	3.3	3.4	0.0	0.0	0.2	0.0

3.3 Selection of Indigenous calves

Fifteen Indigenous (Growing) calves were selected. The calves were divided into 3 groups. Thus each group was consisted of 5 calves for the study. The detail of selected calves is tabulated in table in each treatment.

Table 2 Selection of experimental Indigenous calves

Sr. No.	Group	Tag Number	Body weight at start of expt. (kg)	Average body weight (kg)
1	I	GJ 417	52	99.00
2		DAN205	76	
3		RK316	93	
4		GAO430	118	
5		GIR113	156	
6	II	RK317	70	101.20
7		THA454	91	
8		GIR116	103	
9		RK315	130	
10		KHI358	130	
11	III	DEO504	70	104.80
12		GIR114	81	
13		GIR113	97	
14		RK314	120	
15		GIR115	138	

3.3.1 Allotment of treatments

The present experiment was conducted by Randomized block design with three treatments as detailed below in Table 3.1

Table 3 Details of allotment of treatments in feeding trials

Treatment	Details
T ₁	Dry fodder (Soybean straw) + green fodder + Sugras will on the basis of body weight as per thumb rule
T ₂	Dry fodder + green fodder + Homemade concentrate - I on the basis of body weight as per thumb rule
T ₃	Dry fodder + green fodder + Homemade concentrate – II on the basis of body weight as per thumb rule



T1 Readymade concentrate + Dry fodder (Soybean straw) + Green fodder (Hybrid Napier) as per thumb rule



T2 Homemade concentrate – I + Dry fodder (Soybean straw) + Green fodder (Hybrid Napier) as per thumb rule



T3 Homemade concentrate – II + + Dry fodder (Soybean straw) + Green fodder (Hybrid Napier) as per Thumb rule

Plate 1: Experimental Indigenous calves in different treatments

Table 4 Ingredient of homemade and readymade concentrate

Ingredient T₁	Parts	Ingredient T₂	Parts	Ingredient T₃	Parts
Sugras	100	Maize	30	Sorghum	40
		G.N.C.	20	C.S.C.	20
		Wheat bran	28	Wheat bran	18
		Tur chuni	20	Tur chuni	20
		Minerals mixture	1	Minerals mixture	1
		Common salt	1	Common salt	1
Total	100		100		100

Table 5 Allotment of treatment

Treatment	Replication				
	R₁	R₂	R₃	R₄	R₅
T ₁	GJ417	DAN205	RK316	GAO430	GIR113
T ₂	RK317	THA454	GIR116	RK315	KHI358
T ₃	DEO504	GIR114	GIR113	RK314	GIR115

3.3.2 Preparation of experimental feeds

The ingredients used for feeding of experimental calves were concentrate mixture, green fodder and dry roughages.

Dry fodder (Soybean straw) with green fodder (Hybrid Napier) and readymade concentrate (Sugras) as per requirement were used for feeding in treatment T₁. Dry fodder (Soybean straw) with green fodder (Hybrid Napier) and homemade concentrate- I, mixture as per requirement were used for feeding in treatment T₂. Dry fodder (Soybean straw) with green fodder (Hybrid Napier) and homemade concentrate-II, mixture as per requirement were used for feeding in treatment T₃.



Preparation of homemade concentrates



Checking by Head of Department

Plate 2: Feed stuff



T1 Readymade concentrate (Sugras)
T2 Homemade concentrate – I
T3 Homemade concentrate – II

Plate 3: Feed stuff

3.3.3 Watering of calves

Fresh and clean water was provided to the experimental calves throughout the course of investigation. Animals were offered ad lib drinking water through measuring bucket thrice daily at morning 9.30 a.m. and at noon 2.30 p.m. and at evening 5.30 p.m. daily water intake of each calves was recorded throughout the investigation period.

3.3.4 Management practices

All the three groups of calves were kept under identical standard management practices. The calves were groomed twice daily at 9.30 a. m. and 3.30 p.m. They were washed daily at 9.30 a.m. after watering and grooming, the calves were kept free in open paddock for an hour.

All the experimental animals were dewormed 15 days prior to start of the experiment. The health of the calves was checked periodically.

3.3.5 Health and sanitation

The calves pens where the calves were housed during the period of experiment were cleaned daily. The barn and surrounding area were disinfected with phenyl solution. The help of veterinarian was taken whenever necessary. The calves were kept is open paddock from 8.00 a.m. to 9.30 a.m. daily.

3.4 Records of observation

Following parameters were recorded during the investigation.

3.4.1 Dry matter intake

The intake of feeds and fodder will be quantitatively monitored twice in week to the dry matter consumption by individual animal on the different treatment.



Watering of Animals



Feeding of Animals



Weighing of body weight of calves



Weighing of body weight of calves

Plate 4: Feeding, watering and weighing of experimental Indigenous calves

3.4.2 Water intake

Water intake of individual animal will be recorded twice in a week till the completion of experiment.

3.4.3 Body performance

i) Body weight (kg)

Body weight of the experimental calves will be recorded at the start of experiment on a "Avery weighing balance" before feeding and watering in between 8 to 9 am on three consecutive day.

ii) Body length (cm)

Body length was determined by measuring length from shoulder point to pin bone.

iii) Body height (cm)

The body height was measured from ground levels to wither point.

iv) Chest girth (cm)

Chest girth was estimate by measuring the circumference of chest at wither point.

3.5 Analysis of feed and fodder

Dry matter, crude protein, crude fiber, nitrogen free extract and total ash were determined as per procedure given in Bureaus of Indian standard (1990).

3.5.1 Dry matter

The dry matter percentage was determine as per the procedure recommended by BIS, IS: 7874 (part-I)-1975.

Weighted accurately 100 g of the feed and fodder in to aluminum dish. Heated the dish containing the material in hot air oven

maintained at 100-120 °C for about 3 hours cooled it and weighted with the cover on repeated the process of drying, cooling and weighting at 30 minutes intervals for appropriate reading.

$$\text{Moisture percent by weight} = \frac{100 (W_1 - W_2)}{W_1 - W}$$

Dry matter (%) = Weight of sample - weight of moisture in sample

Where,

W_1 = Weight of gram of the dish with feed before drying

W_2 = Weight in gram of the dish with feed after drying

3.5.2 Crude protein

Nitrogen percentage was estimated by Kjeldahl's method as per the procedure recommended by BIS, IS: 7475 (part I)-1975 and crude protein percentage was calculated by multiplying the percentage of total nitrogen by 6.25. After determining the moisture content, the oven dried sample was ground and further processed for chemical analysis. Weighed 10 g of sample was transferred to the kjeldahl's flask. About 10 g of potassium sulphate and 0.5 g of copper sulphate were added to flask 25 ml of concentrated sulphuric acid was added. The flask was plays on digestion chamber and heated gently to boil until contents were clear and allowed the liquid to cool and diluted with 200 ml of distilled until all ammonia was passed over and was received over standard sulphuric acid which was then back titrated with standard NaOH in order to determine the amount of standard acid used to neutralize the ammonia evolved from digested material. Similarly bland sample was run.

$$\text{Total nitrogen (\%)} = \frac{1.4 (B-A)N}{W}$$

Total protein = total nitrogen X 6.25



Measuring of body length



Measuring of body height



Measuring of body chest girth

Plate 5: Body measurement of Indigenous calves

Where,

B = Volume of N/10 NaOH for blank

A = Volume of N/10 NaOH used for sample

N = Normality of standard NaOH

W = Weight of sample in g.

3.5.3 Crude Fiber

Crude fiber percentage was determined as per the procedure recommended by BIS, IS: 7874(part)-1975.

After determining ether, the oven dried sample was ground 10 g of sample was transferred into a flask and boiled with 1.25% sulphuric acid 1.25% sodium hydroxide for half an hour. Then left residue was dried, weighted and ignited. Loss in weight was taken as fiber contents of the sample.

3.5.4 Ether extract

The ether extracts percentage was determined as per the procedure recommended BIS IS: 7474 (part I) – 1975.

Ten gram of dry sample of field in extraction thimble and placed in extraction unit. Connect the flask containing petroleum ether at 2/3 of total volume to the extractor will heated to boil and adjust heat to obtain about 10 reflexes per hour, when the refluxing will over, evaporated the ether by distillation and recorded the weight of flask containing ether extract.

$$\text{Ether extract content (\%)} = 100 \frac{B(\text{Fat+flask}) - A(\text{Flask})}{C}$$

Where,

A = weight of clean dry flask (g)

B = weight of flask with fat (g)

C = weight of sample (g)



Grinding of the feed sample for Analysis



Weighing of the feed sample for Analysis



Determination of Dry Matter



Determination of Crude Protein



Determination of Ether Extract

Plate 6: Analysis of feed stuffs

3.5.5 Total ash

Total ash was estimated as per the procedure recommended by BIS,IS: 7874 (part I) -1975.

Weighed the empty and dried silica crucible. Accurately 10 g of feed sample was taken. Evaporated the sample to dryness on a hot plate. Placed the crucible in a pre-heated Muffle furnace and heated the contents at 550-600⁰C until ash was free carbon. Cooled the crucible by placing in desiccators.

$$\text{Per cent ash by weight} = B/A \times 100$$

Where,

A = Weight of feed sample

B = Weight of ash

3.5.6 Nitrogen free extract

NFE was estimated as per the BIS, IS: 7874 (part I)-1975.

The sum of all (i.e. Moisture Crude Fiber, Ether Extract and Total Ash) was subtracted from the percentage of total nutrients.

$$\text{Nitrogen free extract (\%)} = 100 - (A + B + C + D + E)$$

Where,

A = Moisture content (%)

B = Crude Protein (%)

C = Ether extract (%)

D = Crude fiber (%)

E = Ash content (%)

Statistical method

The data was subjected to analysis statistically by following the Randomized Block Design for testing the differences between feed intake, body weight, and body measurement as per procedure recommended by Amble (1976).

Economics of feeding

The prices of different constituents of feed stuff approved at the university rates were considered for calculating per kg of feed.

CHAPTER IV

RESULTS AND DISCUSSION

The present experiment entitled “Comparative studies on growth performance of Indigenous calves by using readymade and homemade concentrate”. was completed after 90 days and the observation from the experiment recorded during the experiment were analyzed statistically. The result obtained are discussed in this chapter and presented under the following heads.

4.1 Chemical composition of feed stuff

4.2 Feed intake

4.3 Dry matter intake

4.4 Water intake

4.5 Body weight and weight gain

4.6 Body Measurements

4.7 Cost economics

4.1 Chemical composition of feed stuff

It is essential to include quality feeds in the ration of animals for maintaining their production and productivity. The term quality implies to feed physical texture and chemical composition which has direct impact on its palatability and in turn supply of nutrient to animal body. Therefore chemical composition is one of the most important index of nutritive value of feed. Hence the chemical compositions of different feeds used in the present study of the calves offered readymade concentrate (sugras), homemade concentrate-I and homemade concentrate-II, soybean straw, green Hybrid Napier. It is therefore seems necessary to know the nutritional status of these feed stuffs in order to assess whether they are capable to meet nutritional requirement of animal. With this view the feed stuffs were analyzed for proximate principles and the data were established in table 6.

Table 6 Chemical composition of feed stuffs (% DM) basis

Particulars	Readymade concentrate (sugras)	Homemade concentrate-I	Homemade concentrate - II	Soybean straw	Green hybrid napier
DM	90.12	90.10	90.14	90.51	24.16
CP	17.70	19.28	17.94	7.00	7.70
CF	11.68	10.64	12.24	38.32	35.76
EE	2.72	4.05	3.98	1.65	2.40
NFE	64.01	60.19	60.49	41.17	43.98
Total ash	3.89	5.84	5.35	11.86	10.16

It was observed from the Table 6 that the readymade concentrate, homemade concentrate-I, homemade concentrate-II, soybean straw and green fodder contains 90.12, 90.10, 90.14, 90.51, 24.16 DM, respectively. The homemade concentrate-I containing 19.28, 10.64, 4.05, 60.19, 5.84 per cent, CP, CF, EE, NFE, and total ash respectively. Homemade concentrate- II contains 17.94, 12.24, 3.98, 60.49, 5.35 per cent CP, CF, EE, NFE, and total ash respectively among these NFE content was lower than readymade concentrate but CP, CF, EE and total ash was having higher percentage than that of readymade concentrate. Readymade concentrate mixture lowers CP, CF, EE, and total ash content i.e. 17.70, 11.68, 2.72, 3.89, respectively. Soybean straw contained 7.0, 38.32, 1.65, 41.17 and 11.86 percent CP, CF, EE, NFE and total ash respectively. Green fodder contained 7.70, 35.76, 2.40, 43.98, and readymade concentrate was having higher NFE (64.01 percent) than other 17.70 percent CP, CF, EE, NFE, and total ash respectively.

Chemical composition of homemade concentrate-I has more or less feeding value of CP, CF, EE, NFE and total ash was close to 19.28, CF10.64, EE 4.05, NFE 60.19 and total ash 5.84 percent as determined by Jadhav *et al.* (2011), and Naser *et al.* (2011) for homemade concentrate are in line in present values. They reported protein value from 25.25, 5.10

per cent. The present values falls values are falls between the reported values. The variation in the protein content of the concentrate might to be on account of incorporation of cut and low graded grains during grading and proportion of the grains would used in feeding of the dairy animal influenced the CP content of the by products.

The most significant finding was that homemade concentrate and Soybean straw rich as that of readymade concentrates in respect of CP content. Similarly EE and NFE was higher in homemade concentrate-I than that of homemade concentrate (T₁), whereas CF and DM higher in readymade concentrate, over in homemade concentrates.

Chemical composition of homemade concentrate – II is nearer with that of reported by Adangale *et al.* (2009). They observed that the content of CP, CF, EE, NFE and total ash in homemade concentrate- II as 17.94, 12.24, 3.98, 60.49 and 5.35 per cent respectively, slightly lower value CP but the value of CF, EE, NFE, and total ash are in line higher with present values. The difference in values of CP is due to change of variety, soil climatic condition and harvesting and grains storage condition. Similar observation was also noted by Gabatwesepe (2013), and Singh *et al.* (2015). Moreover Sreedhar (2015) trial was conducted on growth performance of indigenous and crossbred calves under field conditions. The average birth weight of indigenous and cross bred calves was 23.39±1.23 and 25.27±1.54 kg respectively. The mean body weight of indigenous calves and cross bred calves at 24 weeks of age was recorded as 87.94±1.31 and 96.89±1.37 kg respectively, which indicated faster growth of cross bred calves. The mean ADG of indigenous and cross bred calves were 314±11.2 and 365±10.2 g/day respectively. The maximum average daily gain was observed at 22-24 weeks in indigenous calves whereas in cross bred calves, peak ADG obtained at 12-14 weeks during 24 weeks of growth period. It was found that cross bred calves have grown faster as compared to the indigenous calves. Hence it can be concluded that in addition to genetic inheritance of cross bred calves, improved feeding and manage mental practices that are being followed by the dairy farmers resulted higher body weight of the calves.

Soybean straw was containing 90.51, 7.0, 38.32, 1.65, 41.17, 11.86 per cent DM, CP, CF, EE, NFE and ash respectively.. The chemical composition reported by Chopade *et al.* (2010) and Kale (2009) and Baswade *et al.* (2007) for soybean straw are in the line with the present values. They reported protein value from 21.0, 8.75, 7.75. The present value falls between the reported values. The variation in the protein content of the soybean straw might be on account of incorporation of cut and low graded soybean grains during threshing process and the proportion of the grains would influenced the CP content of the by products.

Green Hybrid Napier contained DM, CP, CF, EE, NFE and total ash on DM basis was 24.16, 7.70, 35.76, 2.40, 43.98 and 10.16 respectively. The present CP values are nearer with the composition reported by Bansod (2008) as 5.77 per cent are substantially higher than the present value. Higher and lower CP content in Hybrid Napier as 13.5 percent. This appears nearer than present values. Higher or lower CP content in Hybrid Napier in the variety and stage of harvesting according to Reddy and Reddy (1986). The noted further the increase in the content of DM, CF, Lignin and Silica to the extent of 40 to 46% and decrease in CP level by 60% at 14 to 15 weeks harvest stage in comparison to 8 to 9 weeks harvest stage.

Concentrate mixtures, a product of Maharashtra Agro Industries Development Corporation MAIDC, under the trade name "Sugras" was containing 18.45 and 11.18 % CP and CF on DM basis, respectively. Moreover the past workers like, Puri and Gupta (2001) also suggested feeding of higher CP level concentrates (19.5 to 19.8 %) while rearing animals on ammonia treated paddy and wheat straw. Kamble (2006) and Adangale *et al.* (2009) reported the CP content of Sugras between 17.34 to 19.17 % which is comparable with present results.

Table 7 Average intake of feed stuff under different treatment groups on DM basis (kg/day/calves)

Treatment	Concentrate	Soybean straw	Green fodder	Total
T ₁	0.850 (0.766)	1.50 (1.35)	3.0 (0.725)	5.35 kg (2.84)
T ₂	0.995 (0.896)	2.30 (2.08)	3.5 (0.846)	6.80 kg (3.82)
T ₃	0.910 (0.820)	1.90 (1.71)	3.2 (0.773)	6.01 kg (3.30)

The feed intake of different feed stuff by the calves under different groups are shown in Table 7. The Soybean straw, Hybrid Napier and concentrate mixture were provided to the calves in different groups to meet out the DCP and TDN requirement.

It was observed from Table 7 that on an average the calves consumed 5.35, 6.50, 6.01 kg in T₁, T₂, T₃. It was observed from Table 7 that on an average the calves treatments respectively. The differences in respect of feed intake among the treatments indicating that all the calves consumed adequate quantity of feed and the incorporation of homemade concentrate in the ration of the calves influence on the feed intake. Feed intake was higher in T₂ followed by T₁, T₃ while, lowest was recorded in treatment T₁ (control).

Yadav and Chaudhary (2010) offered the each animal in all the groups were fed standard ration, comprising 5 kg green Berseem (*Trifolium alexandrinum*) and wheat (*Triticum aestivum*) straw ad lib. and in treatment T₁ heifers were given untreated GNC, while in treatment T₂ and T₃ formaldehyde (FA) treated @ 0.5 g FA/100 g CP and FA treated @ 1.0 g FA/100 g CP, respectively, as a source of protein in the concentrate mixtures as per their requirements. The crude protein (CP) intake per 100 kg body weight was significantly ($P < 0.05$) higher in T₁ as compared to T₃.

group. Shelke *et al.* (2011) reported that the growth performance of cross bred heifers on feeding silage prepared from Sorghum and Gliricidia. The 20 heifers divided into five groups heifer under control T₁ were fed sorghum (jowar) + Gliricidia (100+0), Sorghum, (jowar)+Gliricidia (75+25), T₃ Sorghum, (jowar)+Gliricidia (50+50), T₄ Sorghum (Jowar)+ Gliricidia (25+75), T₅ Sorghum (Jowar) + Gliricidia (0+ 100). It was shown that the palatability of T₁ –Sorghum (Jowar) +Gliricidia (100+0) was higher over other silage combination. The daily dry matter intake per 100 kg body weight of heifers was higher in T₃ followed by T₅ and T₄ treatment respectively. In respect of Abdullah *et al.* (2013) observed that cost to gain ratio was lowest (Rs 156.68) on t milk replacer and whole milk cum milk replacer on dry matter intake, average daily gain, and feed efficiency in Nili Ravi buffalo calves. A (Whole milk), B (50% whole milk & 50% milk replacer) & C (milk replacer). All the calves were offered calf starter (19% CP) .Average daily dry matter intake in treatment A, B and C was 1555.55±221.280, 1488.67±157.65 and 1459.04±172.19 g, respectively, the difference being non significant (P>0.05).

4.2 Daily DM intake

Daily DM intake was calculated from intake of different feeds and data as tabulated in Table 8.

It was noted that the daily DM intake was significantly differed among the treatments. The calves from T₂ groups consumed more more DM than T₃, and T₁ calves. The average daily intake was 2.52, 2.98 and 2.73 kg/day/calves in T₁, T₂ and T₃ groups respectively. Higher intake of DM per 100 kg body weight was noticed in treatment T₂ followed by T₃ and T₁ groups, This trend thus indicates that there was increase in the daily DM intake when concentrate mixture was incorporated as food in the rations of calves.

Table 8 Average means of daily dry matter intake per calves over an experimental period (kg)

Treatments	Average body weight (kg)	Requirement of daily DMI / 100 (kg) BW	DMI (kg)	Daily DMI / 100 kg BW (kg)
T ₁	101.0	2.52	2.84	2.81
T ₂	119.4	2.98	3.82	3.19
T ₃	109.2	2.73	3.30	3.02
“F” test	Sig.	-	Sig	Sig
SE (M) ±	2.61	-	0.01	0.01
CD at 5%	8.52	-	0.029	0.027

However, the past research workers reported Shelke *et al.* (2011) and Jamara *et al.* (2014) reported that increase in DM intake of animal on soybean based diet. This observation does agree with the present trend. Thus the inclusion of soybean straw in the ration of calves was beneficial to raise the intake of dry matter

It was evident from the results of Table 8 that daily DM intake per 100 kg body weight was 2.84, 3.82 and 3.30 kg per calves T₁, T₂ and T₃ treatment respectively, and daily dry matter intake per 100 kg body weight was 2.81, 3.19 and 3.02 kg per calves. It was noted that the daily DM intake and daily dry matter intake per 100 kg body weight was significantly different among the treatments, The calves from T₂ groups consumed more DM than T₃ and T₁ treatments, However T₂ (3.19) found to be at par with T₃ is (3.02) kg. This trend was, indicates that there was increase in the daily DM intake when homemade concentrate mixture was incorporated as food in the rations of calves. The excess DMI was higher in T₂ (0.84) followed by T₁ (0.32) and T₃ (0.48). These trends therefore indicate the feeding of homemade concentrate to calves as a source of feed had affected DM intake. The present intake values are nearer to the values reported by past research workers like Adangale *et al.* (2009) reported that the average daily dry matter intake was higher in T₁ and the values being 3.050, 3.262 and 3.178 kg in T₀, T₁ and T₂ respectively.

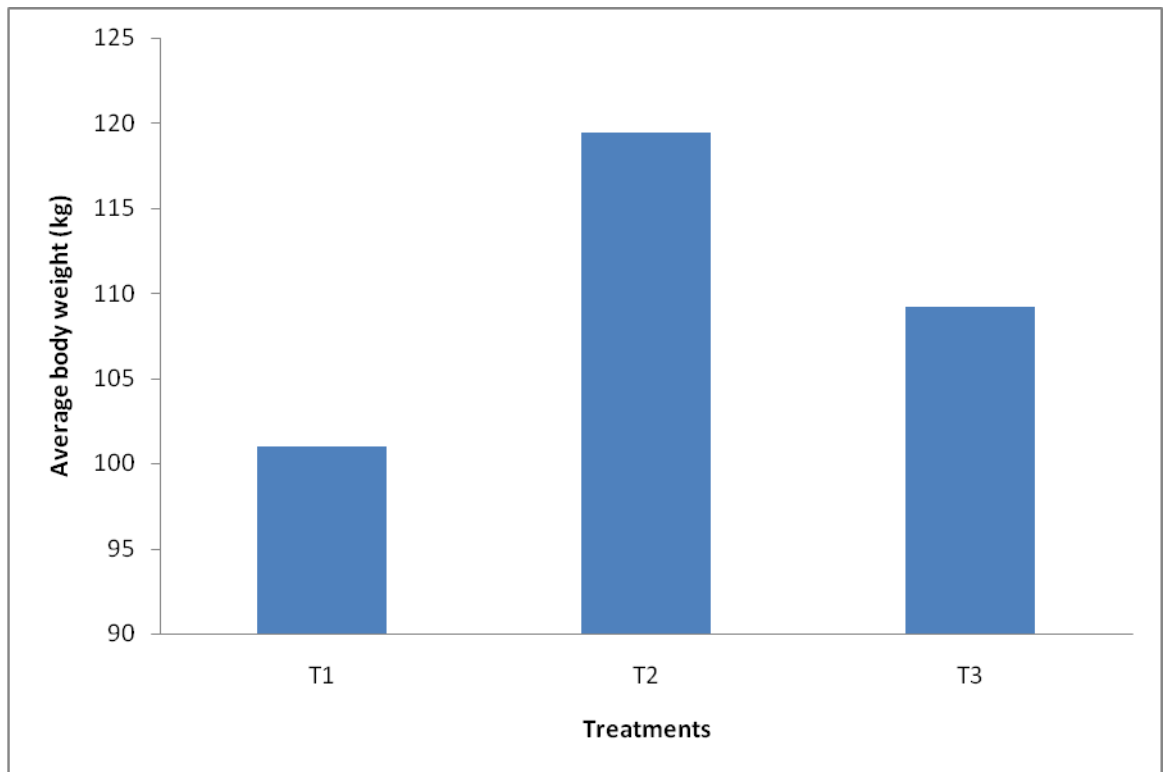


Fig. 1 Average means of daily dry matter intake per calves over an experimental period (kg)

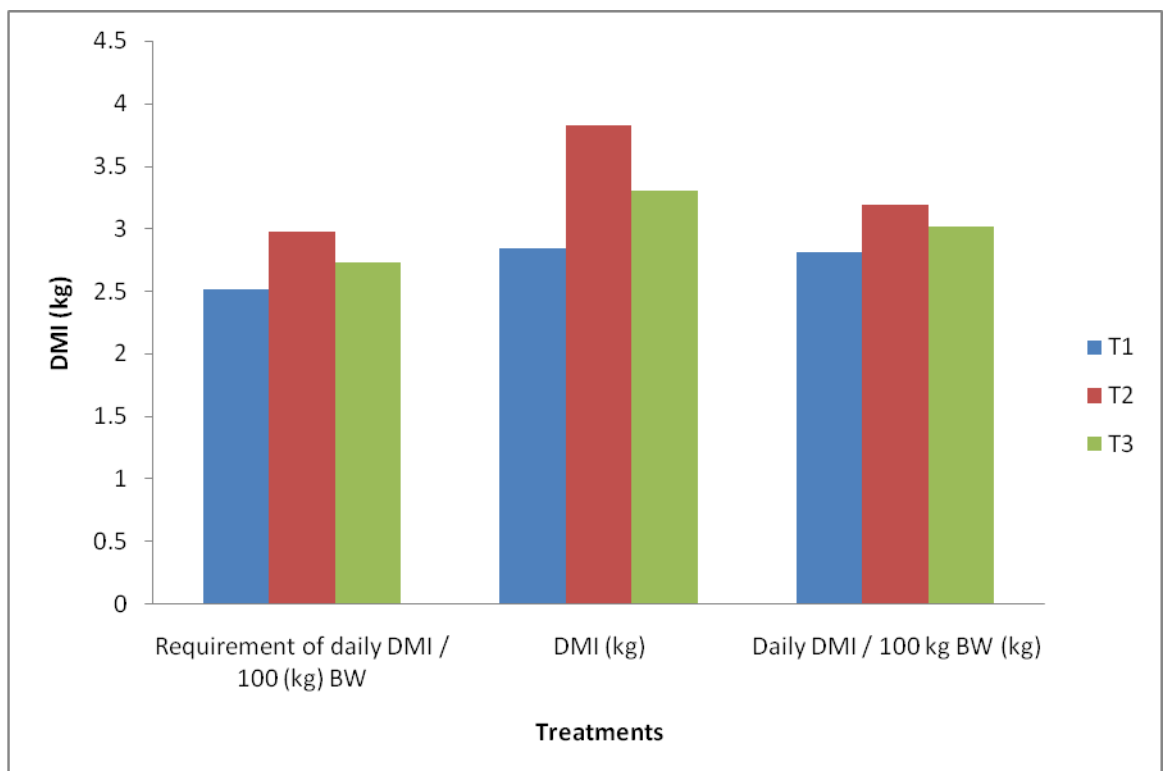


Fig. 2 Average means of daily dry matter intake per calves over an experimental period (kg)

Yadav and Chaudhary (2010) reported that the crude protein (CP) intake per 100 kg body weight was significantly higher in T₁ as compared to T₃ group. Muhammad Sarkar *et al.* (2010) observed that dry matter intake by calves fed fermented wheat straw diets were T₁, T₂, T₃ and T₄ was 3.12, 3.80, 4.23 and 4.26 respectively.

4.3 Water intake

The feeding trial was conducted during early months of the winter; therefore, it was thorough necessary to record the observation on water intake of the calves. Water on daily basis during the period of trial was offered 3 times daily during the period of experiment.

Table 9 Daily water intake of experimental calves under various treatments

Treatment	Water intake/day/calves (lit)	Water intake/day/calves/100kg BW (lit)	Ratio of DM : Water (Kg) : (Lit)
T ₁	8.5	11.00	1:4.0
T ₂	9.7	13.13	1:4.4
T ₃	8.9	12.01	1:4.3
F test	Sig.	Sig.	Sig.
SE (M) ±	0.03	0.06	0.11
C.D at 5%	0.10	0.19	0.35

It is noticed that the daily water intake of the calves were significantly among the feeding groups; the calves from T₂ group drunk more (9.7 lit) than that T₃ (8.9 lit), and T₁ (8.5 lit). This trend indicated that the water intake was highest in treatment T₂ followed by T₃ and T₁ were differ significantly, However it found to be at par with T₃. Indicating, that level of concentrates mixture had effect on the water consumption of calves. The feeding trial was conducted during early months of winter therefore the water intake seems to be lower. Similar trend was observed when the water intake was converted to unit body size. The average water intake per 100 kg body weight was 11.0, 13.13 and 12.01 litre per calves

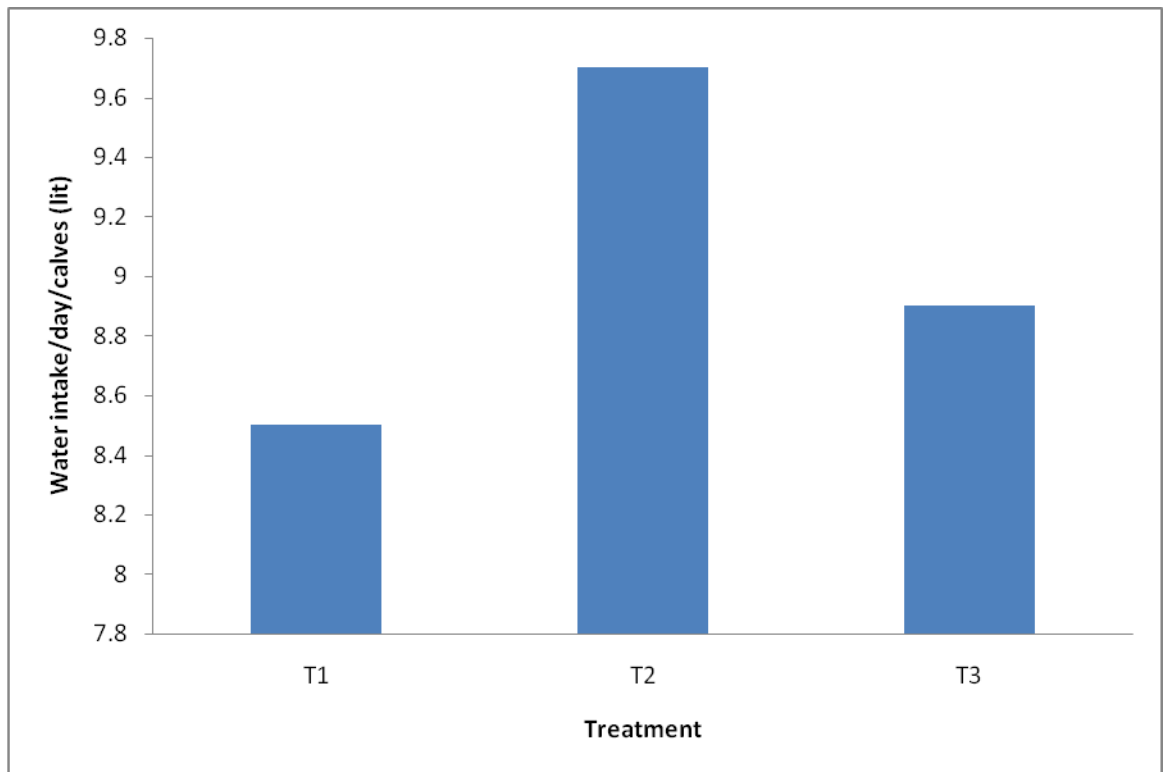


Fig. 3 Daily water intake of experimental calves under various treatments (lit)

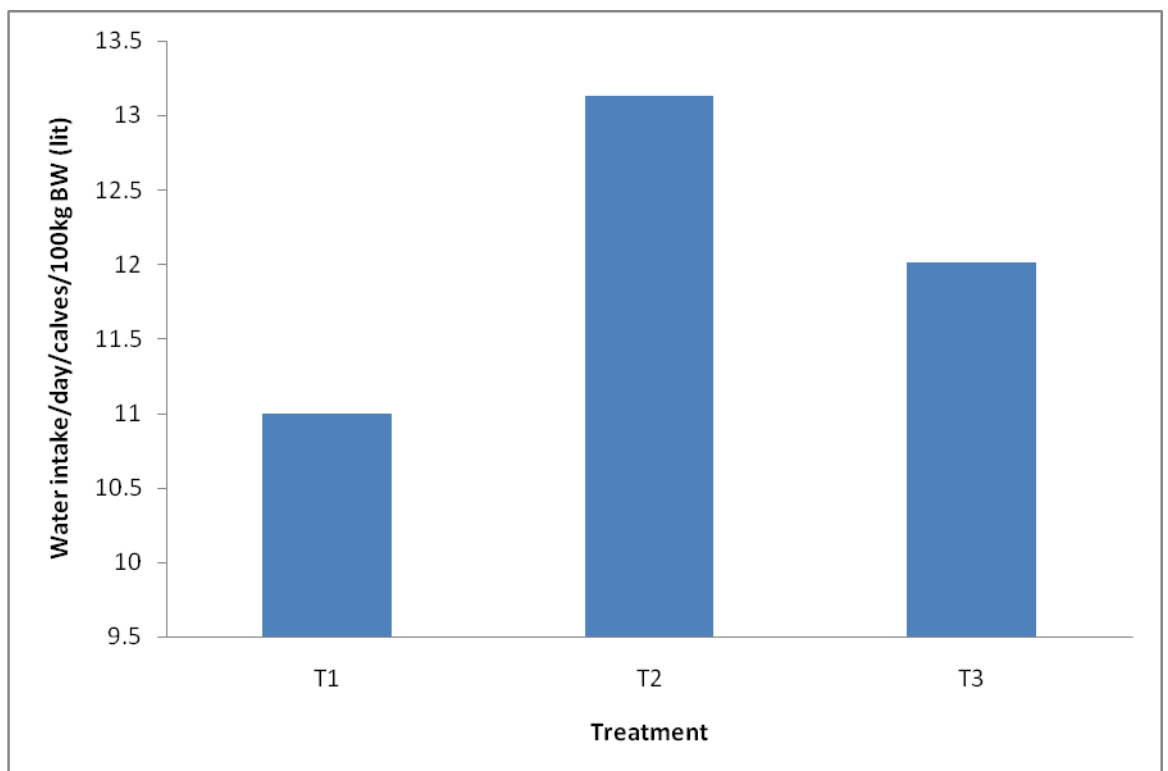


Fig. 4 Daily water intake of experimental calves under various treatments (lit)

per day in T₁, T₂ and T₃ respectively. As a result of this solution dry matter to water intake ratio was more or less similar in all the groups and it was 1:4, 1:4.4 and 1:4.3 under T₁, T₂ and T₃ groups respectively.

The present intake values are nearer to the values reported by past research workers experiment period was 15.37, 13.14 and 12.14 lit per day per animal treatment T₁, T₂, and T₃ respectively. Shelar (2004) and Tauqir *et al.* (2013) and Shelke *et al.* (2014) noticed that the daily water intake of the calves differ significantly among the feeding groups. The heifers from T₂ group drunk slightly more water (11.80 liters) than that of T₂ (13.13) and T₃ (12.01). Same trend was noted by (Tauqir) *et al.* (2013) observed that the Urea molasses block supplementation significantly ($p < 0.05$) increased feed and water intake in Sahiwal heifers.

Shelke *et al.* (2014) was conducted to utilize urea treated non- conventional SBS as protein source roughage in the ration of lactating cow of find out it's feeding value in respect to water intake and digestibility of nutrient, milk yield and quality of milk, blood metabolic profile, feed conversion efficiency and economic.

4.4 Growth performance of Calves

The Growth performance of Indigenous calves on different concentrate feeding was judged on the basis of body weight gain and gain in body measurements. The results obtained in this regard are discussed in the following points was judged on the basis of body weight gain and gain in body measurement. The results obtained in this regard are discussed in the following table 10.

It was observed from the Table 10 that there was differ significantly in weight gained among groups of the treatments. The average final weight gain was highest in T₂ followed by T₃ and T₁ groups. Lowest weight gain was recorded in T₁ treatment group i.e. only homemade concentrate-I (T₂) feeding. Daily intake of DM was highest in the treatment (T₂) which had adequate amount of DCP and TDN to calves. This situation might have favoured the growth of the calves. The weight gain of calves

was differ significantly (Table 10.), however it found to be at par with T₃. The initial body weight were 99.0, 101.20 and 104.800 kg in T₁, T₂, and T₃ groups respectively and final observations of body weight were 127.20, 136.50, 134.80 kg in respective treatments. The total gain in body weight was higher in treatment T₂ (35.30 kg) followed by T₃ (30.32 kg) and T₁ (28.20 kg) treatment. Average daily gain in body weight was higher in T₂ (0.392 g) followed by T₃ (0.336 g) and T₁ (0.313 g) respectively.

Table 10 Effect of different feeding treatment on body weight gain (kg)

Treatments	Average Initial weight (kg)	Weight gain kg/day/calves	Weight gain kg/week/calves	Period weight gain (kg)	Average Final Weight (kg)
T ₁	99.00	0.313	2.16	28.20	127.20
T ₂	101.20	0.392	2.71	35.30	136.50
T ₃	104.80	0.336	2.33	30.32	134.80
"F" test	NS.	Sig.	Sig.	Sig.	Sig.
SE (M) ±	4.29	0.02	0.01	1.63	2.16
C.D at 5%	-	0.054	0.028	5.32	7.05

The present values are nearer to the values reported by past research results of present study was in close agreement with, Adangale (2009) and Jamara *et al.* (2014) and Anjum *et al.* (2014) observed average daily weight gain of 0.201, 0.210 and 0.204 kg per day in calves by feeding Results of present study were in close agreement with Ahmad *et al.* (2005) conducted on 30 Sahiwal heifers of similar age of about one year and similar live weight (155-159 kg) to determine the effect of corn steep liquor on growth rate. The total live weight gain during the trial were 273+or-9.73, 270+or-4.86, 268+or-12.37, 261+or-7.23 and 260+or-6.28 in Groups I, II, III, IV and V, respectively.

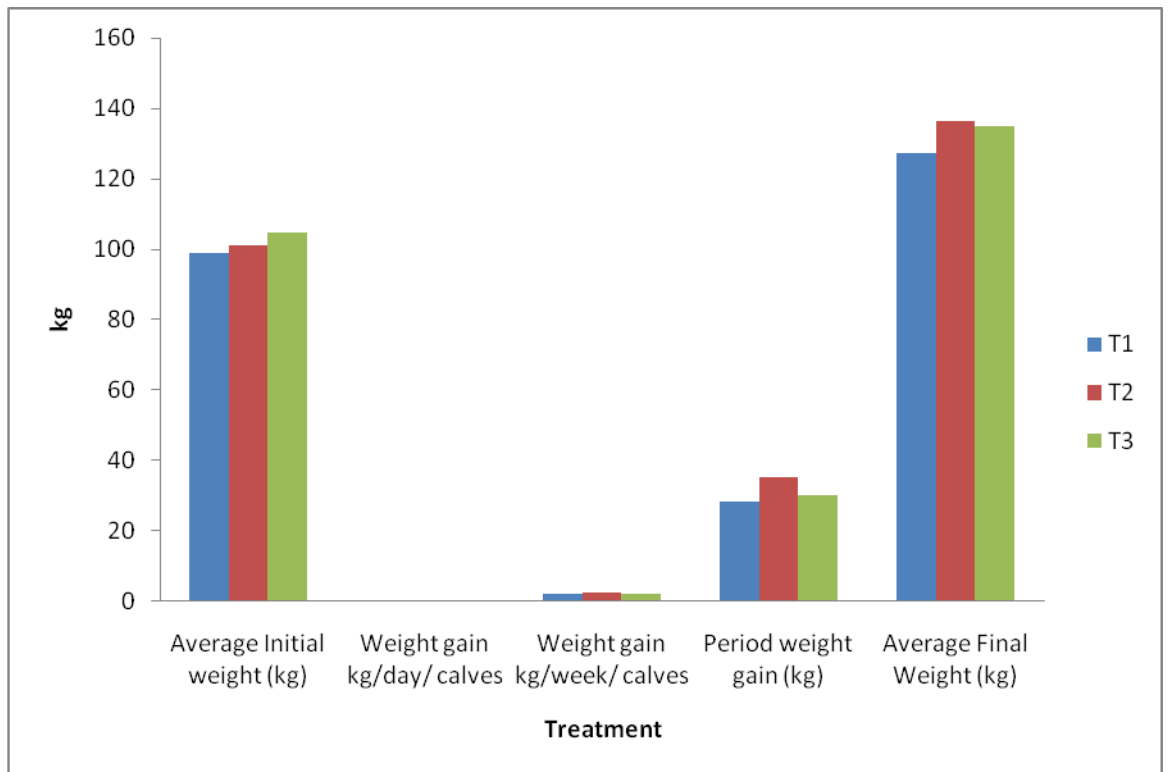


Fig. 5 Effect of different feeding treatment on body weight gain (kg)

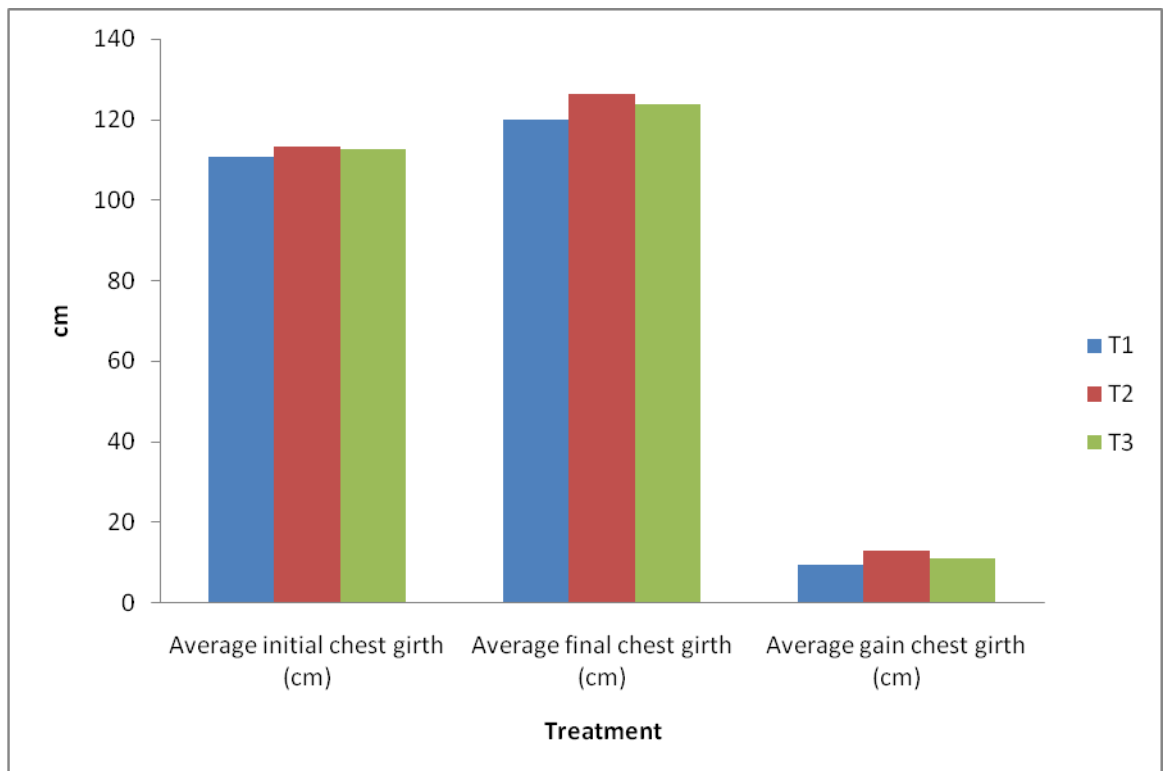


Fig. 6 Effect of different feeding treatment on chest girth (cm)

4.5 Body measurement

Growth performance of Indigenous calves on different concentrate feeding was judged on the basis of body weight gain and gain in body measurements. The average body measurement such as lengths, body height, chest girth and body weight of the growing calves on different feeding treatment are shown in Table 11.

Table 11 Effect of different feeding treatment on chest girth (cm)

Treatment	Average initial chest girth (cm)	Average final chest girth (cm)	Average gain chest girth (cm)
T ₁	110.60	120.10	9.50
T ₂	113.20	126.40	13.20
T ₃	112.60	123.80	11.20
"F" test	NS.	Sig.	Sig.
SE(M)±	2.62	0.40	0.58
CD at 5%	-	1.33	1.88

It was observed that increases in chest girth was 9.50, 13.20 and 11.20 cm in treatments T₁, T₂, and T₃ in experimental calves, however, the differences in chest girth influence significantly. In case of chest girth, it is evident from (Table 11.) that calves of T₂ groups gained higher chest girth followed by T₃ and T₁ treatment groups, However Initial chest girth was 110.60 and 113.20 and 112.60 cm in T₁, T₂ and T₃, respectively, where the final chest girth 120.10, 126.40 and 123.80 cm in T₁, T₂ and T₃, respectively. Average daily gain in chest girth (cm) was higher in treatment T₂ (0.146) followed by T₃ (0.124) and T₁ (0.113).

Gains in chest girth were 7.60 cm, 12.0 cm, and 6.0 cm in T₁, T₂ and T₃, respectively. This shows that treatment T₂ has higher gain in chest girth followed by T₃ and T₁ treatments. The reason for significantly more gain of chest girth might be due to higher nutritional gain in the treatments which were at par with T₃ groups.

The performance of calves fed on different diet showed gradual increase in height, length and chest girth. However, differences were more or less similar in the different combination of diet which may be due to feeding of complete feed in all the treatment as per the equipments.

These trends therefore indicate the feeding of homemade concentrate-I (T₂) with dry and green fodder as a source of concentrate and roughages had affected the gained chest girth of the calves.

The present observation are nearer to the observation reported by past research workers Zanton and Heinrichs (2005) and Shelke *et al.* (2011) and Jadhav *et al.* (2011) Jabbar *et al.* (2012) results indicated that wither height and body length were higher (103 and 111 cm vs. 101 and 108 cm) in heifers fed high concentrate comprising high dietary energy.

Table 12 Effect of different feeding treatment on body length (cm)

Treatment	Average initial length (cm)	Average final body length (cm)	Average gain body length (cm)
T ₁	84.40	90.00	7.60
T ₂	84.80	96.60	11.80
T ₃	85.80	94.60	8.80
“F” test	NS	Sig	Sig
SE (M) ±	2.09	1.08	0.58
C.D at 5%	-	3.51	1.90

The gain in body length was 7.60, 11.80, and 8.80 in T₁, T₂, and T₃ respectively. This revealed that the gain in length was differed significantly among the treatments. Highest in T₂ and lowest in T₃ and T₁ treatments. Initial body length was 84.40, 84.80 and 85.80 cm in treatment T₁, T₂ and T₃ group respectively, while the corresponding final body length was 90.00, 96.60 and 94.60 cm in respective treatments. It is observed from the (Table 12) that calves of T₂ group gained more length than T₃ and T₁ groups. This trend was similar to be, Shelke *et al.* (2011) reported that

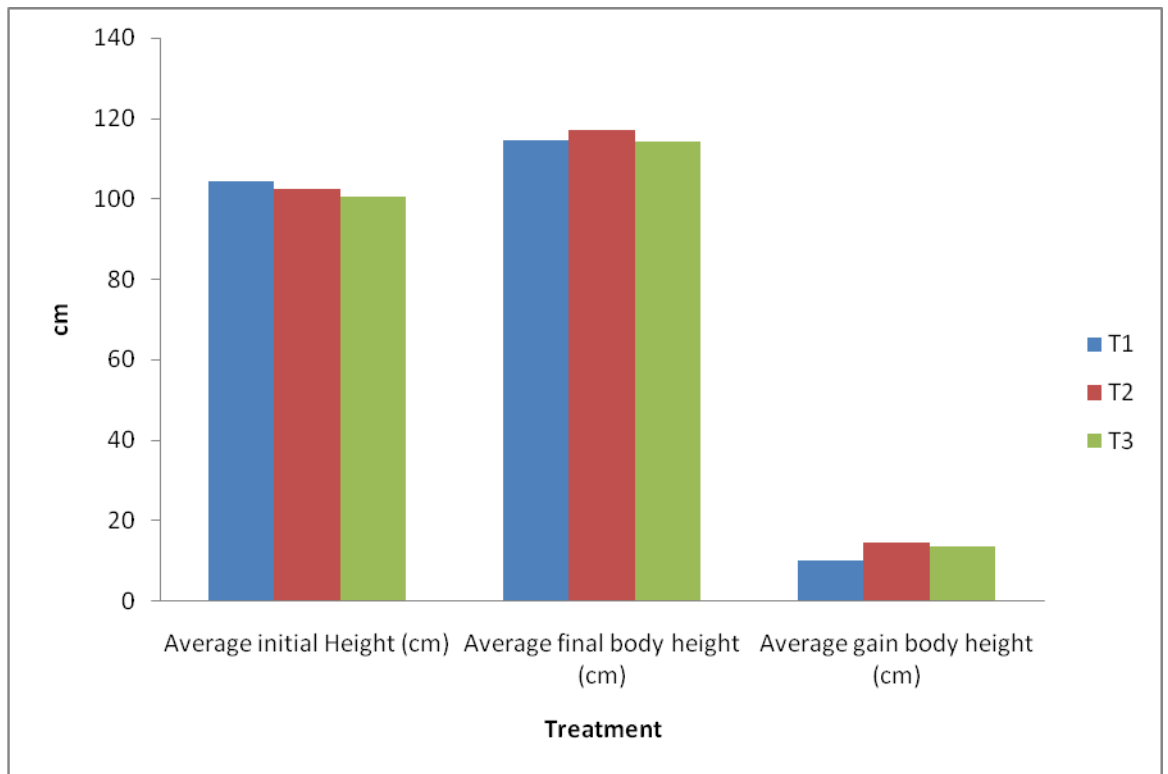


Fig. 7 Effect of different feeding treatment on body height (cm)

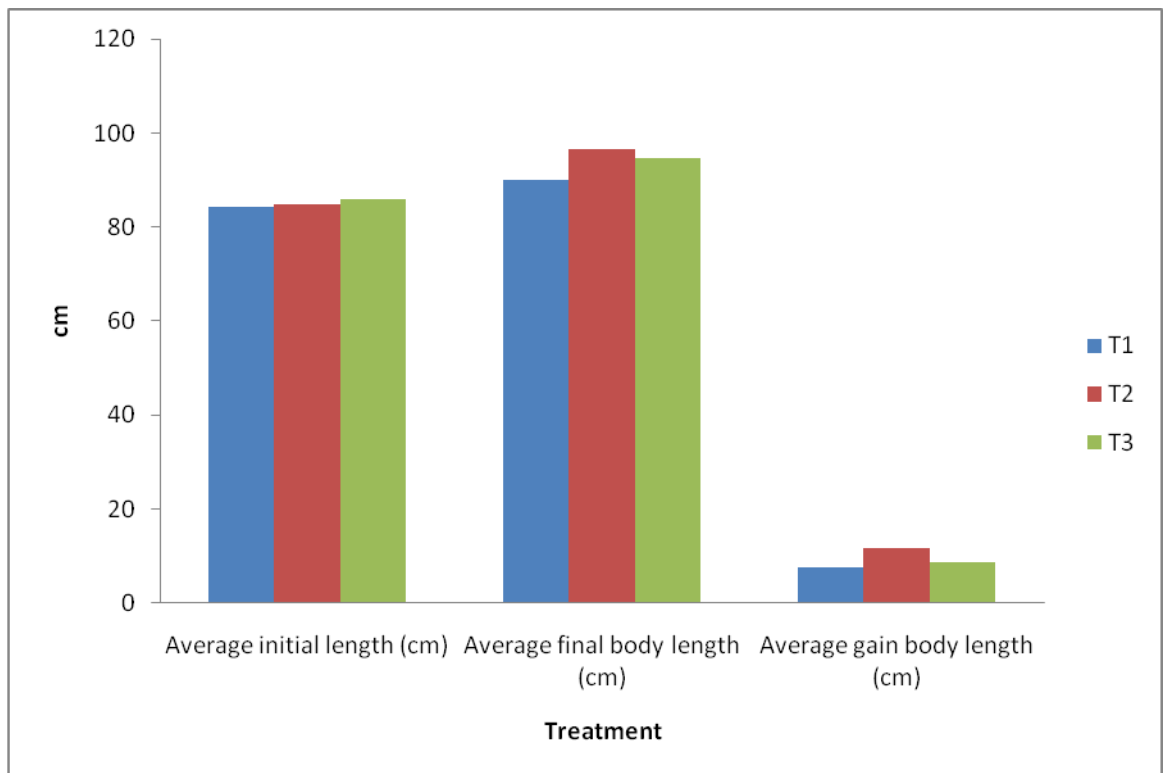


Fig. 8 Effect of different feeding treatment on body length (cm)

the feeding of silage prepared from sorghum and *Gliricidia* increases height, chest girth and length of heifers.

These trends therefore indicate the feeding of homemade concentrate – I (T₂) with dry and green fodder as a source of concentrate and roughages had affected the gained body length of the calves.

The present observation are nearer to the observation reported by past research workers Jabbar *et al.* (2012) and Jadhav *et al.* (2011) and. Reported the heifers fed dietary level of ME 124 per cent of NRC acquired higher body length, height and heart girth as compared to those fed other dietary energy levels. Reported by Jadhav *et al.* (2011) the daily dry matter intake per 100 kg body weight of heifers was higher in T₂ followed T₁ and T₃ treatments. Intake of DCP and TDN was higher in T₁ followed by T₃ and lowest in treatment T₂.

Table 13 Effect of different feeding treatment on body height (cm)

Treatment	Average initial Height (cm)	Average final body height (cm)	Average gain body height (cm)
T ₁	104.40	114.60	10.20
T ₂	102.40	117.00	14.60
T ₃	100.60	114.20	13.60
“F” test	NS	Sig	Sig
SE(M)±	3.96	0.62	0.48
CD at 5%	-	2.028	1.57

It is evident from table (13) that Indigenous calves from T₂ group showed more body height as compared to other treatments T₃ and T₁ groups. The gain in length was differed significantly among the treatments. The body measurements of the calves were influenced by feeding homemade concentrate – I (T₂) mixture. The initial body height were 104.40, 102.40 and 100.60 cm in T₁, T₂, and T₃ groups, respectively, and final observations of height were 114.60, 117.00, 114.20 cm in

respective treatments. The total gain in the height (cm) in treatment T₂ group (14.60) was highest followed by T₃ (13.60) and lower in T₁ (10.20). Average daily gain in height (cm) was higher in treatment T₂ (0.162) followed by T₃ (0.151) and T₁ (0.113), However it found to be at par with T₃ groups. Similar trend was recorded by, Yadav and Chaudhary (2010) studied the effect of feeding formaldehyde treated groundnut cake on dry matter intake, digestibility of nutrients and body measurements in crossbred heifers. The results revealed that the body measurement parameters were significantly ($p < 0.05$) higher in T₃ group as compared to T₂ and T₁ except height in crossbred heifers. Similar trends was reported by, Shelke *et al.* (2011) and Jabbar *et al.* (2012) and Iqbal *et al.* (2014). reported that the feeding of silage prepared from sorghum and gliricidia increases height, chest girth and length of heifers.

These trends therefore indicate the feeding of homemade concentrate – I (T₂) with dry and green fodder as a source of concentrate and roughages had affected the gained body height of the calves.

The present observation are nearer to the observation reported by past research workers Jabbar *et al.* (2012) reported the heifers fed dietary level of ME 124 per cent of NRC acquired higher body length, height and heart girth as compared to those fed other dietary energy levels.

4.6 Economics of feeding

Any feed strategy must be economical so as to make it popular among cattle owners. In view of this feeding economics of the different groups was as certain Observations on economics of feeding are shown in Table 14.

4.7 Economics of different feeding groups of treatments

Rate of feed stuffs as per university norms.

Table 14 Cost of different feeding groups of treatment (Rs.) Per/ Kg)

S/No.	Particulars	Parts mixture	Ingredients Rs. / kg	Feeds (Rs.) / kg
A	Roughages	-	-	-
1.	Soybean straw	100	3.0	3.0
2.	Green hybrid Napier	100	2.0	2.0
B.	Concentrates	-	-	-
1.	T ₁ (Sugras)	100	21.50	21.50
C.	T ₂ Homemade – I	100	-	19.60
1.	Maize	30	10.0	
2.	Groundnut cake	20	28.0	
3.	Wheat bran	28	13.0	
4.	Tur chuni	20	32.0	
5.	Minerals mixture	1	90.0	
6.	Common salt	1	6.0	
D.	T ₃ Homemade- II	100	-	19.30
1.	Sorghum	40	12.0	
2.	Cotton seed cake	20	24.0	
3.	Wheat bran	18	13.0	
4.	Tur chuni	20	32.0	
5.	Minerals mixture	1	90.0	
6.	Common salt	1	6.0	

Table 15 Economics of calves feeding under different treatments during experimental period (Rs.)

Feeds	Treatments					
	T ₁		T ₂		T ₃	
	Qty. (kg)	Amount (Rs)	Qty (kg).	Amount (Rs)	Qty. (kg)	Amount (Rs)
Total Soybean straw required @ (Rs.)300/qtl	675	2025	1035	3105	855	2565
Total napier required @ 200/qt	1350	2700	1575	3150	1440	2880
Readymade Concentrate (sugras) @ (Rs.) 2150/qtl.	382.5	8223	-	-	-	-
Homemade concentrate – I @ (Rs.) 1960/qtl	-	-	447.75	8776	-	-
Homemade concentrate – II @ (Rs.)1930/qtl	-	-	-	-	409.5	7904
Labour & miscellaneous cost (Rs.) @ 180/ day	-	5400	-	5400	-	5400
Total cost of feeding (Rs.)	2407	18348	3058	20431	2704	18749
Total BW gain in calves (Kg.)	-	28.20	-	35.30	-	30.32
Total cost / kg BW gain	-	650.64	-	578.78	-	618.37
Total cost /kg BW gain /calves	-	130.12	-	115.75	-	123.67

It was observed that, total quantity the total quantity of Soybean straw for T₁, T₂ and T₃ group was 675, 1035 and 855 kg and total

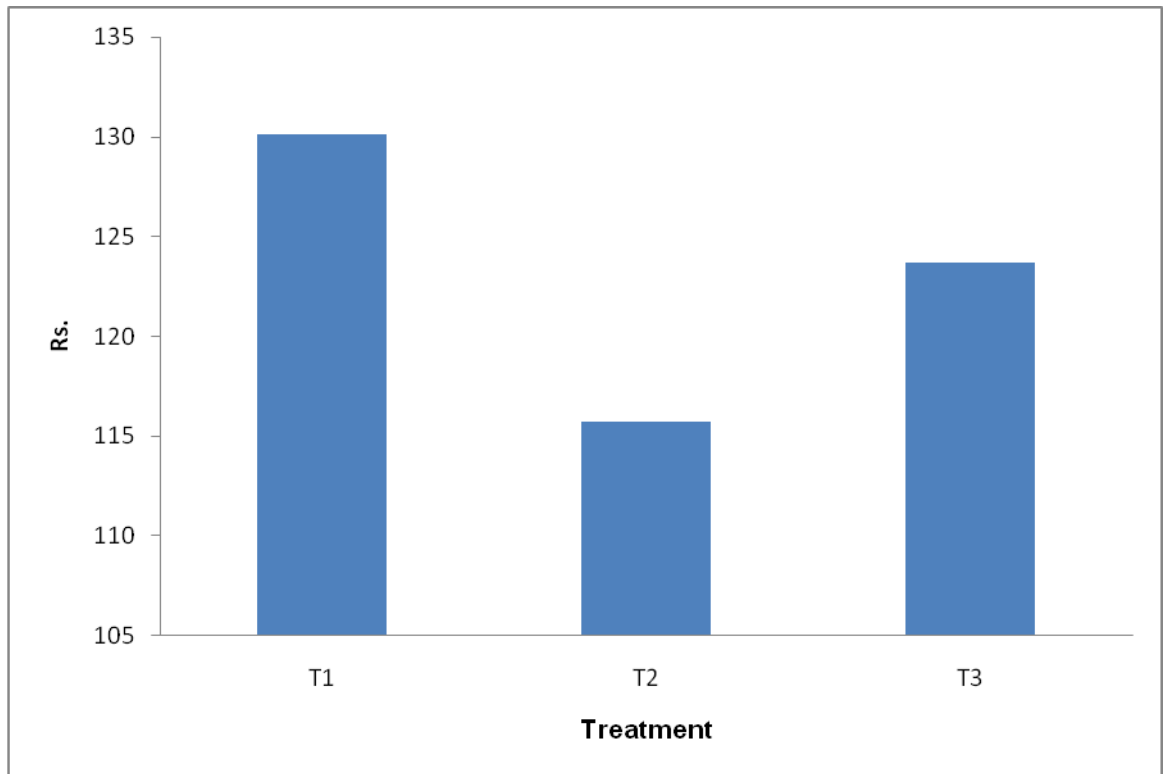


Fig. 9 Economics of calves feeding under different treatments during experimental period (Rs.)

quantity of green fodder was 1350, 1575 and 1440 kg for T₁, T₂ and T₃ group. The quantities of concentrate were not fixed that was in T₁, T₂, and T₃ treatment 382.5, 447.75 and 409.5 kg, respectively.

Total cost of feed observed from table indicated that it was more in T₂ group that is Rs. 20431 where as the feed cost was less in T₁ and T₃ 18348 and 18749 respectively, however total cost/ kg body weight gain (Rs.) was less in T₂ 578.78 group compare to T₁ 650.64 and T₃ 618.35 groups, and total cost/ kg body weight gain / calves (Rs.) is also low in T₂ followed by T₁ and T₃ group of treatments, 115.75, 130.12 and 123.67 respectively.

It was concluded that from above all the above mention discussion over experimental result the treatment T₂ homemade concentrate –I, shows better and desirable result as compare to T₁ and T₃ treatments. In T₁ and T₃ treatments feeding of only readymade concentrate (sugras) and ‘homemade concentrate- II’ hence is not fulfilled to the nutrient requirement and growth of calves but increase the cost of feeding. Feeding cost on the daily basis was highest is observed in T₂.

The present observation are nearer to the observation reported by past research workers Adangale *et al.* (2008) observed that the cost per kg body weight gain was highest in treatment T₀ (Rs. 48.99) and followed by T₁ (Rs. 43.09) and T₂ (Rs. 39.11). The present value is not matched the reported values. The variation in the cost of feeding is higher due to changed the ingredient and not using the very poor quality of grains and trial period is also long, and Singh *et al.* (2009) determined that the cost of feeding per kg live weight gain was lower in T₄ (Rs 24.90) followed by T₃ (Rs. 29.07), T₂ (Rs. 35.02) and T₁ (Rs.39.53) indicating live weight gain was cheaper by Rs. 14.63 in 15 kg green maize fed group (T₄) then in the control group, and Anjum *et al.* (2014) observed that the cost per kg of NRC ration fed was rupees (Rs.17.37); stair-step low energy ration was Rs. 13.06 and stair-step high energy ration cost was Rs. 20.12. Overall feed cost incurred on heifers fed on SSF was significantly lower (12%) than the heifers fed as per NRC requirement.

CHAPTER V

SUMMARY AND CONCLUSIONS

The present study entitled “**Comparative Studies on Growth Performance of Indigenous Calves by Using Readymade and Homemade Concentrate**” was carried out during 2016 at Department of Animal Husbandry and Dairy Science, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola. Fifteen Indigenous calves between 12 to 15 months of age were divided into three groups on the nearness of age and weight. The feeding treatments consisted of according to body requirement (as per thumb rule). T₁ Dry fodder (soybean straw) + green Napier + readymade concentrate, T₂ homemade concentrate – I + soybean straw + green Napier, T₃ homemade concentrate – II + soybean straw + green Napier, The concentrate, soybean straw and green fodder were fed to meet out the DCP and TDN requirement of the Animals in all treatments during 90 days feeding trial. Feeding trial was conducted under “Randomized Block Design”.

The feed stuffs were analyzed for their proximate composition. The DM, CP, CF, NFE, EE, and total ash. The observations were recorded on dry matter intake of feed and intake water. Growth performance was recorded on the basis of gain in body weight, length, height and chest girth. Change in body measurement of the growing calves. The results obtained from the experiment are summarized below.

5.1 proximate principles of feed stuffs

The soybean straw, Hybrid Napier and readymade concentrate, homemade concentrate–I, homemade concentrate-II mixture were containing on an average 90.51, 24.16, 90.12, 90.10, 90.14 per cent DM, respectively. The homemade concentrate-I was higher CP content (19.28%) and EE (4.05%) than homemade-II, and readymade concentrate, respectively. Homemade concentrate-II was higher in CF (12.24%) and NFE (60.49%) and readymade concentrate was higher in NFE (64.04%) content than homemade concentrate- I and II. The CP content (7.0, 7.70,

17.70, 19.28, 17.94) per cent respectively. The chemical composition indicated that homemade concentrate-I contained more protein and ether extract than that of readymade concentrate and homemade-II.

5.2 Intake of feed

The average daily intake of feed was highest in T₂ (6.80), followed by T₃ (6.01), and T₁ (5.35) kg per day under the treatment, respectively. The concentrates provided were according to requirement (as per thumb rule) for all the treatments. Average intake of green fodder was higher in T₂ (3.5), followed by T₃ (3.2) and T₁ (3.0) kg treatments. Intake of soybean straw was highest in T₂ (2.30) followed by T₃ (1.90) and T₁ (1.50) kg treatments. Differences in respect of feed intake among the treatments indicating that all calves consumed adequate quantity of feeds and fodder and the incorporation of the concentrates in ration of the calves did not influence the feed intake.

5.3 Daily dry matter intake

The daily DM intake was differ significantly among the treatments. The calves from T₂ groups consumed more DM than that of T₃ and T₁ groups of calves. The average daily DMI was 3.82, 3.30, and 2.84 kg/day/calves in T₂, T₃ and T₁ groups respectively with 3.19, 3.02 and 2.81 kg per 100 kg body weight in respective treatments. This trend thus indicates that all calves consumed more DM than their expected requirement. There was increase in the daily DM intake when concentrate was incorporated as dry matter in the ration of calves. The intake trend indicated that the entire animal must have received the feed in adequate quantity to fulfil their appetite.

5.4 Daily water intake

It is noticed that the daily water intake of the calves was differ non significantly between the feeding group; the calves from T₂ group drunk more (9.7 lit) than that T₃ (8.9 lit) and T₁ (8.5 lit) treatments, respectively with (13.13), (12.01) and (11.0) per 100 kg body weight in respective treatments. This trend indicated that the water intake in treatment T₁, T₂

and T₃ were differing significant different which indicates that the level of different concentrate feeding had effect on the water consumption of calves. The feeding trial was conducted during early months of winter therefore the water intake seems to be not higher.

Water and dry matter ratio

The water intake of highest (9.70) litre per day per calves water was consumed in T₂ followed by (8.9 lit) and (8.5 lit) in treatment T₃ and T₁, respectively. The consumption of water and DM ratio resulted an intake of 4.40, 4.30 and 4.00 litre water/ kg DM intake in T₁, T₂ and T₃ respectively.

5.5 Body weight and weight gain

The calves from all the treatments not only maintained their body weight but did indicate increase in body weight over the experimental period. This mean the ration provided to them was adequate to fulfil their nutritional demand.

However there was more weight gain under T₂ treatments. The average daily body weight gain was 0.392, 0.336 and 0.313 kg / day in T₂, T₃, and T₁ treatments, respectively. The body weight over an experimental period was 35.30, 30.32 and 28.20 kg in T₂, T₃, and T₁ respectively. This indicated that concentrate homemade- I promote higher growth rate in groups of calves.

5.6 Body measurements

5.6.1 Body chest girth gain

The differences exhibited the significant difference in chest girth among the treatments, while gain in chest girth was higher (13.20) in T₂ treatment and lowest in T₃ (11.20) and T₁ (9.50) cm treatments. There was increase in the daily chest girth when concentrate was incorporated as food in the ration of calves. The intake trend indicated that the entire animal must have received the feed in adequate quantity to fulfil their appetite.

5.6.2 Body length gain

The gain in body length was higher in T₂ (11.80) followed by T₃ (8.80) and T₁ (7.60) cm in groups respectively. This revealed that the gain in length was significantly highest in T₂ and lowest in T₁ and T₃ treatments.

5.6.3 Body height gain

It was observed that increase in height was 10.20, 14.60 and 13.60 cm in treatment T₁, T₂ and T₃ in experimental calves. This revealed that the gain in body height was significantly highest in T₂ and lowest in T₁ and T₃ treatments. It is evident from that calves from T₂ group showed more body height as compared to other treatments.

5.7 Economics of feeding

On an average Rs. 18348, 20431 and 18749 and were incurred on total cost of feeding of groups of calves under T₁, T₂ and T₃ treatments respectively. This indicates that there was increase in the total feeding cost of the calves under the homemade concentrate-I. However, on the basis of gain in body weight it can be said that there was effect of incorporation of homemade concentrate- I in the ration of calves because, the total cost / kg body weight gain (Rs.) is less in T₂ followed by T₃ and T₁ group of treatments, 578.68, 618.35 and 650.64 respectively, however total cost / kg body weight gain / calves (Rs.) was also less in T₂ 115.75 group compare to T₃ 123.67 and T₁ 130.12 groups, Moreover, one can take the measures to reduce the feeding of readymade concentrate so that there would not be excess intake of nutrient on one hand and reduction in the feeding cost on the other hand.

It was concluded that from above all discussion over experimental result the treatment T₂ shows better and desirable result as compare to T₁ and T₃ treatment. Feeding cost on the daily basis was highest is observed in T₂, however average cost / kg body weight gain (Rs.) was less in T₂ groups compare to T₁ and T₃ groups, and average cost /

calves / kg body weight gain (Rs.) is also low in T₂ followed by T₁ and T₃ group of treatments, respectively.

CONCLUSIONS

The following conclusions are drawn.

1. Homemade concentrate- I (T₂) feeding schedule is sufficient to fulfil the appetite and nutritional requirement of indigenous calves.
2. Maximum growth rate (weight gain) was obtained by feeding homemade concentrate- I (T₂), with green fodder and dry fodder.
3. Significantly more DM and water intake was noticed in T₂ followed by T₁ and T₃. It indicates the influence of incorporation of homemade concentrate- I, with green fodder and dry fodder improves the daily DM and water intake of the experimental calves.
4. Body measurement (chest girth, body length and body height) of indigenous calves under treatment T₂ proved to be statistically significant effect.
5. The total cost of feeding (Rs.) group of calves was less in T₂ as compared to T₁ and T₃ groups.
6. Total cost per kg body weight gain (Rs.) was less in T₂ group followed by T₁ and T₃ treatments.
7. Total cost per kg body weight gain per calves (Rs.) was less in T₂ group followed by T₁ and T₃ treatments.
8. Homemade concentrate is having good effect on the body health, body weight and body measurement and also cost effective of the dairy farmers.

CHARTER VI

LITLATURE CITED

- Abdullah, M., M. Zeeshan Iqbal, M. Saadullah, Ahsan-ul-Haque, Khalid Javed, Makhdoom Abdul Jabbar and Aasim Tauseef, (2013). "Comparative Performance of Calves Fed Milk and/or Milk Replacer Supplemented with Calf Starter up to Weaning Age in Nili-Ravi Buffaloes". Buffalo Bulletin Vol.32 (2): 874-877.
- Adangale, S.B., K.R. Mitkari, and S.V. Baswade, (2008). "Observed that the cost per kg body weight gain was highest economics". Indian J. Ani. Res.41 (2): 143-145.
- Adangale, S.B., K.R. Mitkari, and S.V. Baswade, (2009). "Associative effect of feeding jowar straw in combination with soybean straw to crossbred (HF X Deoni) interse heifer on digestibility and economics". Indian J. Ani. Res. 42 (2): 145-147.
- Adangale, S.B., K.R. Mitkari, T.R. Walkunde, and S.V. Baswade, (2009). "Effect of feeding jowar straw in combination with soybean straw on the growth performance of crossbred calves". Indian J. Ani. Res. 43 (2): 142-144.
- Ahmad F., M.A. Jabbar , I. Ahmad and M. Refigure, (2004). "Comparative efficiency of calves starter and conventional ration in buffalo suckling calves". Indian J. Anim. Nutr., 27 (2), 132 – 162.
- Ahmad, F.M. Shakil, and I. Ahmad, (2005). "Replacement of cotton seed meal with corn steep liquor in the ration of sahiwal heifers". JAPS, J. of Ani. and Plant Sci.15 (3/4): 76-78.
- Amble, V.N., (1975). Statistical Method in Animal Science, first Edition published by the Indian Society of Agri Stat, New Delhi, pp.199-219.
- Anjum, M.I., I.H. Mirza and M.S. Saghar, (2014). "Effects of compensatory growth on puberty age in sahiwal cattle heifers fed low followed by high energy based total mixed rations". The J. of Ani. & Plant Sci., 24 (Suppl. 1): Page: 20-23 ISSN: 1018-7081.
- B.I.S., (1975): 7874 Part 1Beauro of Indian standard institute, New delhi.
- Bacchu Singh, J.L., Chudary and C.M. Yadav, (2009). "Effect of different levels of green maize on the performance of heifers". Indian J. Anim. Nutr. 26 (2): 151-155.
- Bandeswaran, C.G.V.N. Reddy and K. Kumar, (2004). "Processed castor stalks and soybean straw based complete rations for lactating buffaloes". Indian J. Anim. Nutr. 21 (4): 232- 235.
- Bansod, P.H., (2008). "Nutritional Requirement of Gaolao Cow". M.Sc. (Agri.) Thesis (Unpub.) Submitted Dr. P. D. K. V. Akola.
- Baswade, S.V.R.P. Barbind, R.S. mule, S.B. Adangale and A.A. Hanmante, (2007). "Nutritive value of soybean and bajra stovers in Osmanabadi kids". Indian J. Small Ruminants 13 (2): 221 -224.

- Belsare, S.M., (2004). "Studies on Gliricidia tree Leaves Silage Fortified with Jaggery". M.Sc. Thesis (Unpub.), Dr. P. D. K. V. Akola.
- Bhanderi B. M., M. R. Garg, and Ajay Goswami, (2014). "Effect of feeding calf starter on daily weight gain, immune status and parasitic load in crossbred HF calves". *Res. J. A.H.D. Sci.* 3 (1&2): 60-68.
- Chopde, S.R., V.H. Kalbande, S.K. Shelke and S.D. Dandage, (2010). "Nutrient utilization and rumen fermentation pattern in kids fed urea treated soybean straw based pelleted complete ration". *Indian J. Anim. Nutr.* 27 (1): 31-35.
- Choudhary, S.O.P. Mathur and A. Singh, (2004). "In Sacco digestibility of urea treated millet stalks". *Indian J. Anim. Nutr.* 21 (3): 142 – 144.
- Das M.M., (2014). "Influenced of partial replacement of concentrate mixture with Stylo meal growing crossbred female calves". *Asian-Aust. J. Livest. Sci.* 125: 50-57.
- Das, R. S. and Ravindra Kumar, (2012). "Effect of niacin supplementation on growth, nutrient utilization and blood biochemical profile in male buffalo calves". *Asian-Aust. J. Anim. Sci.* Vol. 19, No. 10: 1422 – 142.
- Deshmukh, A.K., (2000). "Effect of Partial Feeding of Anjan Tree Leaves on the Growth Performance of Crossbred Heifers". M.Sc. Agri. Thesis (Unpub.) Dr. P.D.K.V. Akola.
- Deshmukh, A.K., M.R. Thokal, V.C. Patil. and S.A. Udar, (2000), "Effect of drinking water frequency on milk yield fat, total solids and snf content in crossbred cows". *Indian J. Anim. Res.* 38 (1): 47 – 49.
- Deshmukh, R.K., A.B. Bhavana, and S.A.W. Udar, (2004). "Effect of feeding of gliricidia tree leaves on performance of growing cross bred heifers". *Anim. Nutri. And Feed Tech.* 4 (2): 197-201.
- Gabatwespe, K.B., (2013). "Studies of homemade concentrate on growth performance in weaned holdeo calves". *Indian J. Anim. Nutr.* 24 (2): 14 – 144.
- Gupta, N., A. Kumar and D.P. Tiwari, (2005). "Effect of herbs as a feed additive and nutrient utilization and growth in cross-bred heifer feed paddy straw base ration". *Indian J. Anim. Sci.* 75 (1): 52-55.
- Homayoun, Mahmoudzadeh and Hassan Fazaeli, (2007). "Growth response of yearling buffalo male calves to different dietary energy levels". *Indian J. Anim. Nutr.* 1; 10 (9): 1398-405.
- Ikhar, U.V., S.K. Singh and Vishal Mudgal, (2011). "Effect of different feeding regimen on growth and reproductive performance of sahiwal heifers". *Indian J. Anim. Nutr.* 28 (2): 181-184.
- Iqbal Z., M. Abdullah, K. Javed, J.A. Bhatti, M.A. Jabbar and N. Ahamd, (2014). "Comparative performance of sahiwal calves fed whole milk and milk replacer with or without calf starter". *The Jour.of Anim. & Plant Sci.* 24 (Suppl. 1): 2014, Page: 48-51 ISSN: 1018-7081.

- Jabbar, L., A.M. Cheema, M.A. Jabbar and S. Riffat, (2012). "Effect of different energy levels, season and age on hematological indices and serum electrolytes in growing buffalo heifers". *The J. of Ani. and Plant Sci.*, 22 (3 Suupl.): Page: 279-283.
- Jabbar, T.N., (2012). "Evaluating varying dietary energy levels for optimum growth and early puberty in sahiwal heifers. *Pakistan Journal of Zoology*". 44 (3): 625-634.
- Jadhav, S.S., R.R. Shelke, S.D. Chavan and N.S. Chore, (2011). "Studied on feeding homemade and readymade concentration on performance of heifers". *Res. J. A.H.D. Sci.* 2 (1&2): 60-64.
- Jadhav, S.S., R.R. Shelke, S.D. Chavan and N.S. Chore, 2011. "Studied on feeding daily dry matter intake per 100 kg body weight of heifers". *Res. J. A.H.D. Sci.* 2 (1&2): 60-64.
- Jagginavar, K.B., (2002). "Studied the Influence of rain tree (*Samanea saman*) pods with concentrate on nutrients intake and digestibility in HF x Deoni heifers". *Indian J. of Anim Sci.* 78 (9): 789-821.
- Jagginavar, K.B., S.V. Hosamani and D.G. Naik, (2001). "Influence of rain tree (*Samanea saman*) pods with concentrate on nutrients intake and digestibility in HF x Deoni heifers". *Indian J. of Anim Sci.* 72 (9): 798-801.
- Jamara M. S., R. K. Mehla, M. Singh, M. M. Ali and N. Chouhan, (2014). "Effect of the fed shatavari (*asparagus racemosus*) on body weight and puberty of sahiwal heifers". *Int. J. agric. sc &vet.med.* Vol. 2, No.1.ISSN: 2320-373.
- Kalbande, V.H. and A.H. Chainpure, (2001). "Effect of feeding bypass protein with urea treated jowar kadbi (*sorghum straw*) on performance of cross bred (HF x Deoni) calves". *Asian-Aust. J. Anim. Sci.* Vol. 14, No. 5 : 651-654.
- Kale, V. A., R. P. Barbind, S.B. Adangale and T. R. Walkunda, (2009). "Effect of feeding soybean straw in combination with jowar straw on the growth performance of weaned Osmanabadi kids". *Indian J. Anim. Nutr.* 22 (3): 15-154.
- Kale, V.A., R.P. Barbind and S.B. Adangale, (2008). "Utilization of various combinations of soybean and jowar straw based complete feed in Osmanabadi kids". *Indian J. Anim. Nutr.* 24 (2): 14-144.
- Kamble, D.M., (2006). "Effect of feeding Soybean Straw on Quality of Milk of Crossbred Cows. M.Sc. (Agri.) Thesis (Unpub.), Dr. P D. K. V. Akola".
- Kolekar, Suhas, (2007). "Effect of Different Concentrate Feeding on Growth Performance of Crossbred Calves. M.Sc. Thesis (unpub.) Dr. PDKV, Akola".
- Kumar, A. (2002). "Effect of Management Regimes on Performance of Lactating Murrah Buffaloes and Their Heifer. Ph.D. Thesis, Department of Livestock Production and Management, CCS HAU., Hisar".

- Kumar, A., (2015). "Studied about effect of phase feeding on growth, body measurements and body condition score in growing crossbred female calves". *Asian-Aust. J. Anim. Sci.* Vol. 19, No. 11: 1588 – 1596.
- Kumar, M., (2002). "Effect of feeding Azolla (*Azolla pinnata*) on the Performance and Carcass Characteristics of Broiler Chicks". M.Sc. Thesis (unpub.) Rajasthan University of Veterinary and Animal Sciences, Bikaner.
- Kumarsan, R. and M. Parthasarthy, (2008). "Utilization of nutrient from bajra napier. *G. N. naulms* or *sibabul* leaves as solr feed by growing sheep". *Indian J. Anim. Nutr.*, 25 (2), 142 – 152.
- Lascano, G.J., and A.J. Heinrichs, (2009). "Rumen fermentation pattern of dairy heifers fed restricted amounts of low, medium, and high concentrate diets without and with yeast culture". *Livest. Sci.* 124: 48-57.
- Lohakare, J.D., A.K. Pattanaik and S. A. Khan, (2006). "Effect of dietary protein levels on the performance, nutrient balances, metabolic profile and thyroid hormones of crossbred calves". *Asian-Aust. J. Anim. Sci.* Vol. 19, No. 11: 1588 – 1596.
- Lyimo, H. L. N., and G. H. Laswai, L. A. Mtenga, A. E. Kimambo, D. M. Mgheni, T. Hvelpund, M. R. Weisbjerg and J. Madsen, (2010). "Studied was carried out in Tanzania to assess the performance of crossbred (Frisian/Ayrshire x Tanzania Shorthorn Zebu) dairy calves fed on a concentrate". *J. of Dairy Science.* 48:1218-1232.
- Lyimo, H.L. N., G.H. Laswai, L.A. Mtenga, A.E. Kimambo, D.M. Mgheni, T. Hvelpund, M.R. Weisbjerg and J. Madsen, (2010). "Performance of crossbred calves raised on different dietary treatments under small holder dairy farm conditions". *J. of Dairy Science.* 48:1215-1223.
- Mahesh, M.S., S.P. Kundu, and R.C. Kuhad, (2013). "nutritional evaluation of wheat straw treated with in sahiwal heifer". *Tropical Animal Health and Production.* *Asian-Aust. J. Anim. Sci.* Vol. 45 (8): 1817-1823.
- Malisetty and Jatoth, (2013). "Studied was effect of supplementation of mulberry hay with sorghum straw on nutrient utilization and growth in crossbred calves". *Asian-Aust. J. Anim. Sci.* Vol. 13, No. 5 : 652-654.
- Mastellone, V.G. Massimini, M.E. Pero, L. Cortese, D. Piantedosi, P. Lombardi, D. Britti and L. Avallone, (2011). "Effects of passive transfer status on growth performance in buffalo calves". *The Jour.of Anim. & Plant Sci*, 25 (Suppl. 3): 2011, Page: 48-51 ISSN: 1018-7082.
- Mesfin Dejene, Ashok Kumar, Ripusudan Kumar, Prason Chand Saxena and Nidhi Garg, (2005). "Effect of level of concentrate supplement on the voluntary intake of sorghum fodder in crossbred heifers".

Intern. J. of Cow Sci., 1(2): 30-32 research article. Cow Therapy Society, Pantnagar, India. 0973-2241.

- Mill S.E. and B.F. Jenny, (2003). "Effect of high concentration feeding and fasting on plasma glucocorticoids in dairy heifers". Indian J. Dairy Sci. Vol. (86): 1690-1706.
- Muhammad Abdullah, Zeeshan Muhammad Iqbala, Muhammad Saadulla Ahsan-ul-Haqueeb, Khalid Javeda, Makhdoom Abdul Jabbar and Aasim Tauseef, (2013). "Comparative performance of calves fed milk and/or milk replacer supplemented with calf starter up to weaning age in Nili-Ravi buffaloes". Indian J. Anim. Nutr. 21 (1): 56-59.
- Mule, R.S., R.P. Barbind, S.V. Baswade, D.T. Camels and S.B. Adangale, (2008). "Nutritive value of soybean straw in Osmanabadi kids". Veterinary World. 1 (70): 314-316.
- Naser, M.S., A.Z. Bayaz, S. Ramin, A. Ahmadzadeh, A.A. Golshani and M. Mohebbizadeh, (2011). "Determining nutritive value of soybean straw for ruminants using nylon bags technique". Pakistan Journal of Nutrition 10 (9): 838-84, ISSN 1680-5194.
- Nemade, P.D. and R.D. Padalkar, (2000). "Studies the performance of buffalo's heifers on complete diet with Wheat straw and concentrates". Indian J. Anim. Prod. Mgmt. 11:139-142.
- Obispo, N.E., P. Pares, C. Hidalgo, J. Palma, and S. Godoy, (2005). "Forage intake and average daily gain of young heifers supplemented with protein sources". Zootecnia Tropical. 19 (3): 423-442.
- Pachauri, S.K., S.K. Singh and V. Mudgal, (2010). "Effect of feeding wheat straw and urea ammoniated straw based total mixed rations on the performance of female crossbred heifers". Indian J. Anim. Nutr. 27 (1): 73-76.
- Pathak, R.S. Jaiswal, T.C. Thakur, Y.P. Joshi and Himanshu Pandey, (2005). "Effect of feeding ammonia (urea) treated baled Wheat straw with different levels of concentrate on nutrients utilization and growth of crossbred heifers". Indian J. of Anim. Sci. Vol. 75, No 8.
- Puri, J.P. and B.N. Gupta, (2001). "Effect of feeding rice straw treated with two levels of urea and moisture on growth and nutrient utilization in crossbred heifers". Indian J. Anim. Nutr. 18 (1): 54-59.
- Rajmane, S. M. and S.V. Deshmukh, (2000). "Nutritional evaluation of complete rations in goats". Indian J. Anim. Nutr. 17 (3): 246-248.
- Reddy, G.V.N., M.R. Reddy and P.B. Reddy, (1986). "Nutrient utilization from sorghum straw obtained from two varieties SPV 351 and SPV 475". Indian J. Anim. Nutr. 10 (3):176.
- Roy, D.V. Kumar, M. Kumar, R. Sirohi, Y. Singh and J.K. Singh, (2016). "Effect of substitution of concentrate mixture with Azollapinnata on growth performance feed intake, nutrient digestibility and blood

- biochemical's of Haryana heifers". *Indian J. Small Ruminants* 13 (2): 221 -224.
- Roy, Prodip Chandra, Md. Azizul Haque, Mst. Fatematuzzohora, Md. Yunus Ali and Zahirul Haque Khandaker, (2015). "Effects of different levels of energy on growth performance of crossbred (Indigenous × Holstein Friesian) bull calves. *Asian Australas. J. Biosci. Biotechnol.* 1 (2):246-254.
- Sahu, D S., and I.S. Agrawal, (2000). *Indian Journal of Animal Nutrition*. 17 (1) : 23-27
- Sarkar M.S.K., S. YKo., S.M Lee, G.M Kim, J.K Choi. and C.J. Yang, (2010). "Effect of different feed additives on growth performance and blood profiles of korean hanwoo calves". *Asian-Aust. J. Anim. Sci.* 23 (1):52-60.
- Shelar, S.S., (2004). "Effect of Feeding Soybean Straw on Growth Performance of Crossbred Heifers". M.Sc. (Agri.) Thesis (Unpub.) Dr. P. D. K. V. Akola.
- Shelke, R.R., Chavan, S.D. and Kahate, P.A., (2015). "Effect of feeding of urea ammoniated soybean straw on intake and digestibility of nutrients in lactating cows". *Asian J. Anim. Sci.*, 10(2):95-101
- Shelke, R.R., A. B. Tad, S.D. Chavan and S. P. Nage, (2011). "Growth performance of crossbred heifers on feeding silage prepared from sorghum and gliricidia". *New Agriculturist*. 22 (2) : 133-137.
- Shelke, R.R., S.D. Chavan and P.A. Kahate, (2014). "Effect of untreated and urea treated soybean straw on feeding value in lactating cow". *Asian. J. Animal Sci*, 9(2):212-214.
- Singh, Vivek Pratap, Mayank Dubey and Rajepndra K. Pandey, (2015). "Effect of different feed combinations on the growth performance of cross-bred heifer calves". *Asian Journal of Animal Sciences* 9 (5):225-232.
- Sreedhar, S., (2015). "Growth performance of indigenous and cross bred calves in coastal region of Andhra Pradesh". *Livestock research international jakarya publications* 3 (4):99-102.
- Tambhale and Dhawale, (2009). "Studies that the response in growth performance to compound v/s homemade concentrates by Osmanabadi kids". *Asian-Aust. J. Anim. Sci.* Vol. 45 (8): 1817-1823.
- Tauqir, N.A., M.A. Shahzad, M. A. Jabbar, M.S. Mahr-un-Nisa Fayyaz Ahmad, (2013). Response of sahiwal heifers receiving maize fodder with supplementation of urea molasis block. *Buffalo Bulletin*. 32 (2): 913-917.
- Tipare, T.S., (2003). "Effect of Protected Proteins on the Growth Rate of Crossbred Heifers. M. Sc. Thesis (Unpub.) Dr. P. D. K. V., Akola".
- Tripathi, V.M. and S.D. Sharma, (2002). "Effect of different levels of concentrate with urea – NH₃ treated maize stover on performance of crossbred heifers". *Indian J. Anim. Nutr.* 19 (3): 210 -214.

- Tumbare, S.M., A.A. Shah and S.V. Deshmukh, (2001). "Urea ammoniated wheat straw as value added straw in complete feed of sheep". *Anim. Nutr. and feed Tech.* 1 (2) : 125-130.
- Verma, D.S., (2001). "Performance of Growing Cross-Bred Heifer on Complete Feeds With Different Protein Levels". Unpublished M. Sc. Thesis (Unpub.) K.K.V. Dapoli.
- Yadav, C.M. and J.L. Chaudhary, (2010). "Effect of feeding formaldehyde treated groundnut cake on dry matter intake, digestibility of nutrients and body measurements in crossbred heifers". *Ani. Nutr. Feed Tech.* Vol. (10) : 107-113.
- Yavuz, E., N A. Todorov, G. Ganchev and K. Nedelkov, (2015). "Effect of physical form of starter feed on intake, growth rate, behavior and health status of female dairy calves". *Bulg. J. Agric. Sci.* Vol.(21): 893–900.
- Yazdani, A.R. and L.R. Gupta, (2000). "Effect of housing and feeding system on feed utilization and physiological responses in crossbred heifers". *Indian J. Dairy Sci.* Vol. (53): 88-92.
- Zanton, G I. and A.J. Heinrichs, (2005). "Feeding high concentrate diets excluded as a management option and an opportunity for heifer growers reduce feed costs". *Asian J. Anim. Sci.*, 10(3): 95-105.
- Zanton, G.I. and A.J. Heinrichs, (2005). "Review limit feeding with altered forage to concentrate levels in dairy heifers diet". *Indian J. Dairy Sci.* 90:5580-5586.

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