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Effect of growth promoters on the chemical composition of berseem (*Trifolium alexandrinum*) and tur (*Cajanus cajan*) straw on goat kid

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Abstract
An experiment was conducted to investigate the effect of supplementation of growth promoters with berseem green fodder and tur straw on the performance of goat kids. A sixteen goat kids were selected from the livestock instructional farm, on the basis of nearness to the age and weight. The selected kids were randomly divided in to 4 groups of 4 kids in each treatment. Treatments was control (T_1) with Feed as per the standard, Feed as per standards + 3 g *Lactobacillus acidophillus*per Kg. (T_2), Feed as per standards + 3 g *Saccharomyces cerevisiae* per Kg. (T_3), and Feed as per standards + mixture of 1.5g *Lactobacillus acidophilus* + 1.5g *Saccharomyces cerevisiae* per Kg. (T_4). The chemical composition is therefore one of the index to indicate the nutritive value of feeds. The DM, CP, CF, NFE and Ash content of feed stuff were recorded.

Keywords: *Trifolium alexandrinum*, promoters, goat kid

1. Introduction
The total livestock population is 535.78 million in the country showing an increase of 4.6% over the livestock census 2012. The total bovine population (cattle, buffalo, mithun and yak) is 302.79 in 2019 which shows an increase of 1 per cent over the previous census. The goat population in the country in 2019 is 148.88 million showing an increase of 10.1% over the previous census. About 27.8% of the total livestock is contributed by goats, 35.95% cattle, Buffaloes 20.45% and sheep 13.87% and pig 1.69%. As compare to previous census the percentage share of sheep and goat population has increased whereas the percentage share of cattle, buffaloes pigs as marginally declined. The Maharashtra population of goat 2019 is 10.60 million. In 20 the livestock census 35.94% cattle, 27.80% goat, 20.45% buffaloes, 13.87% sheep, 1.69 pigs as compare to previous census the percentage share of sheep and goat population has increased where as the percentage share of cattle, buffaloes and pigs has marginally declined.

According to the Food and Agriculture Organization of the United Nations (FAO) and the World Health Organization (WHO, 2002) probiotics are defined as live microorganisms which when administered in adequate amounts, confer a health benefit on the host. This definition of probiotics is also adopted by the International Scientific Association for probiotics and prebiotics and is used in most scientific publications. A number of criteria are used to select probiotic strains. The growth promoters in general as reported by different authors have the ability to enhance intestinal health by stimulating the development of a healthy microbial ecosystem (Uyeno *et al.,* 2015; Musa *et al.,* 2009) [20, 9], increase digestive capacity and their bio-availability (Oyetayo and Oyetayo 2005) [14]. Promoters has many benefits such as it prevent enteric pathogens from colonizing the intestine (Casas and Dobrogosz, 2000) [4], restore the gut micro-flora (Musa *et al.,* 2009) [9], also lower pH and improve mucosal immunity and nutrient absorption (Timmerman *et al.,* 2006; Uyeno *et al.,* 2015) [18, 20]. As a result they are supposed to improve the productivity and the general health of ruminants. Growth promoters supplementation improve nutrient intake, digestibility, health and growth performance of ruminant animals. These animals mostly small ruminant thrive on grazing of natural grass as well as the browsing shrubs and tree leaves.

In Maharashtra, mainly Osmanabadi and Sangamneri are important goat breeds. Osmanabadi is reared for meat, while Sangamneri is for meat and milk purpose.

The breeding track of osmanabadi breed comes under scarcity zones *viz* Osmanabad breed, Latur, Solapur, Ahmednager and adjoining parts of these districts of Maharashtra. In the present socio-economic systems, goat is an important source of livelihood for landless labourers. It provides an employment opportunity `and unity to rural masses of economically weaker section of the Indian society. In a developing country like India, goat constitutes valuable and renewable resources across all ecological zones and fulfils an important socio economic role in the traditional and modern farming system. The striking feature about the goats in India is that the activity of goat rearing is sustained in many different kind of environment, dry, hot, wet or cold, high mountains or low laying plains. Their contribution to the economy through production of meat, fibre and skin is quite substantial and constitute about 5.4 percent GDP of agricultural sector (Ulmek, 2003) [19]. The effect of supplementation of the diet with microbial feed additives (growth promoters) for the improvement of health and production of livestock has been studied for many years. Commonly used promoters include *Saccharomyces cerevisiae* for enhancing the activity of beneficial microbes in the gastrointestinal tract, thus improving the digestibility of nutrients and production potential of the animals (Newbold *et al.* 1995; Wohlt *et al.* 1998) [13, 21], and *Lactobacillus spp*. for competitive exclusion of undesirable micro-organisms from the intestine thus improving the health of the animal (Nader *et al.* 2003) [10]. There is a lot of variation in the performance of the same animal fed on different species of promoters or even the same species of probiotic but different strains. Newbold *et al.* (1995) [13] observed that different strains of *S. cerevisiae* had different effects on rumen bacteria *in vitro* and in sheep. The probiotics entering the gastrointestinal tract have to face certain environmental constraints and different strains of probiotic i.e. growth promoters cultures differ in their sensitivity towards them.

2. Materials and methods

2.1 Selection of animals

Sixteen Osmanabadi goat kid ranges from 6.5 to 9 Kg body weight were selected from herd. These kids were randomly divided into four groups, each of four animals on the basis of nearness to body weight and age. The randomly divided group was subjected to four different feeding treatments and the allocation of kids to different treatment. The differences between the groups with regards to body weight were non-significant. Treatments was control (T_1) with Feed as per the standard, Feed as per standards + 3 g *Lactobacillus acidophillus*per Kg.(T_2), Feed as per standards + 3 g *Saccharomyces cerevisiae* per Kg.(T_3), and Feed as per standards + mixture of 1.5g *Lactobacillus acidophillus*+ 1.5g *Saccharomyces cerevisiae* per Kg.(T_4). The experimental animals were housed in well-ventilated stall. The experimental animals were examined for their health before the start of the experiment. The other management practices were followed as and when needed like disinfections of shed with Malathion (1%) before start of experiment. Ticks were controlled by spraying 0.5 % Malathion on animal body. Daily cleaning of shed and washing with water thrice in a week were carried out. Thus maximum care was taken to maintain the cleanliness in the shed. A sufficient quantity of clean drinking water was provided twice a day to all the experimental animals. Animals were fed during trial as per their feeding treatment requirements.

2.2 Analysis of feed and fodder

Feed samples were collected for estimation dry matter content, dried samples were pooled ground and stored in double (A.O.A.C., 1995).

a) Dry matter

The moisture of sample was lost by the evaporation caused due to heat. The amount of material left after the evaporation of moisture was the dry matter calculated as under.

$$\text{DM (\%)} = \frac{\textit{Weight of sample after drying}}{\textit{weight of sample before drying}} \times 100$$

b) Crude protein

The crude protein was estimated by micro kjeldahl method. Nitrogen of protein was converted into ammonium sulphate with sulphuric acid digestion. The acid digest was made strongly basic with sodium hydroxide and ammonia released was distilled into a boric acid solution titrated with standard sulphuric acid solution.

$$\text{Crude protein (\%)} = \frac{V \times 0.0014 \times D \times 100}{W \times A} \times 6.25$$

Where,
V = volume of 0.01 N H_2SO_4 used for titration (ml)
D = Dilution factor [volume made in volumetric flask (ml)]
W = weight of sample (g)
A = Aliquot taken (ml)

c) Ether extract

Ether was continuously volatilized, condensed and allowed to pass through the sample in thimble extracting ether soluble material when the process was completed the loss in the weight of sample was taken as the ether extract.

$$\text{Ether extract (\%)} = \frac{[\textit{Wt of thimble+sample (g)} - \textit{(wt of thimble+sample after extraction)}]}{[\textit{wt of thimble+sample (g)} - \textit{wt of thimble (g)}]} \times 100$$

d) Crude fibre

A moisture and fat free samples was digested successively with dilute weak acid and weak alkali. The organic residues was collected in sintered crucible. The loss in weight of residue after ignition was called as crude fibre.

$$\text{Crude fibre (\%)} = \frac{\textit{loss of weight of ignition}}{\textit{original weight of sample}} \times 100$$

e) Nitrogen free extract

Nitrogen free extract of the feed was determined by subtracting cumulative proportion of ash, crude protein, ether extract and crude fibre from hundred.

NFE (%) = 100 – (% Ash + % CF + % CP + % EE)

f) Total ash

The sample was ignited at 600°c to burn all the organic matter. The inorganic matter that does not burn at this temperature is called ash.

$$\text{Ash (\%)} = \frac{\textit{weight of ash}}{\textit{weight of sample}} \times 100$$

3. Result and discussions

3.1 Chemical composition of feed stuffs

The chemical composition of forages and feed are highly variable and affected by many factors. Type of species, variety, soil composition, climate and season, stage of growth and application of manure are important factors of influence. Leguminous forages are rich in protein and nutritive value in comparison to no-legumes. The growth promoters added was biological entries used in mixture quantity. They are not pure chemical so did not influence the proximate analysis of the feed. The term quality refers to the chemical composition of feed, particularly the concentrate as it has direct impact on supply of different nutrients to animal body. The chemical composition is therefore one of the index to indicate the nutritive value of feeds. In view of this the chemical composition tur straw, berseem green and concentrate mixture (Sugras).

Chemical composition of feed stuff used in experiment period for feeding the goat is tabulated in table 1.

Table 1: Chemical Composition of different feed stuff (%)

Sr. No.	Particulars	D.M.	C.P.	C.F.	E.E.	N.F.E.	Ash
1	Tur straw	92.0	11.80	34.86	2.6	39.40	11.34
2	Berseem (green)	20.50	17.50	25.50	2.5	40.30	14.20
3	Concentrate	89.90	20.80	10.50	2.6	62.33	3.77

Tur Straw

A reference to Table 1 indicates that tur straw a main dry roughage component was containing 92.00 per cent DM with 11.80, 34.86, 2.6, 39.40 and 11.34 percent CP, CF, EE, NFE and ash on dry matter basis respectively. The present C.P. values are comparable with composition finding of Dutta *et al.* (2007) observed that, using different ratios of concentrate (C) in (*Cajanuscajan)* straw the crude protein was 10.0 per cent. Aghajanzadeh *et al.* (2012) [2] observed that the value of proximate nutrients CP content of gram straw ranging from 4.2 to 9.8 per cent, these observations slightly lower than experimental tur straw CP value. Singh *et al.* (2017) conducted an experiment on nutritional evaluation of total mixed ration comprising of pigeon pea (*Cajanus cajan*) straw in cattle and result indicate that, pigeon pea straw contains 94 per cent organic matter O.M. and 11.88 per cent crude protein CP, 2.7 per cent of ether extract (EE) and 48.50 per cent nitrogen free extract (NFE), these values are supporting the experimental results. Reddy (2012) [15] found that red gram straw contain 9.26 per cent crude protein (CP) which appears to be lower and Bhadane *et al.* (2004) [3] conducted experiment having the two treatments of arhar (pigeon pea) straw with crude protein level in treatment T_1 was 12 per cent and treatment T_2 was 14 percent CP, substantially higher than present value. Singh *et al.* (2005) carried out the experiment on females of sonadi sheep and devgarhi goats to check the nutritive value of soybean straw and found that soybean straw contained 10.4 Per cent crude protein. Perhaps the method of harvesting crop and possibility of inclusion of low grade and cut grains in the straw might be the reasons to give variation in the present CP content of straw and past reported values. Perhaps the method of harvesting crop and possibility of inclusion of low grade and cut grains in the straw might be the reasons to give variation in the present CP content of straw and past reported values.

All these references indicates that the chemical composition basis of tur straw roughages seem to be good source for goat having appropriate crude protein range. Shankhpal *et al.* (2016) [16] conducted study to evaluate the effect of feeding bypass fat and yeast (*Saccharomyces cerevisiae*) supplemented total mixed ration comprising of 60:40 concentrate: jowar hay. The total mixed ration (TMR-T_1, i.e.no by pass fat and yeast) (T_2 TMR with 2 per cent yeast) and (T_3 TMR with 2 per cent bypass fat) and (T_4 combination of 2 per cent each yeast and bypass fat) contain 10.64, 10.52, 10.62 and 10.48 per cent crude protein respectively, which is comparable to the present experimental value. Ibrahim *et al.* (1998) [6] studied, the chemical composition of different processed sorghum straw on DM basis i.e. chopped, soaked ground, palliated sorghum straw containing CP 4.03, 4.04 and 3.91 per cent which is lower than present tur straw CP content.

Reddy (2012) [15] conducted study using Osmanabadi goat male kids by feeding complete diets and result showed that on dry basis, red gram (*Cajanus cajan*) straw contain 42.44 per cent CF, 1.24 per cent EE, 8.42 per cent ash, 1.06 per cent calcium and 0.23 per cent phosphorus, in which CF was higher and ether extract and ash values reported lower than present results.

Berseem

The berseem green contained 20.50 per cent DM along with 17.50, 2.5, 25.50, 40.30 and 14.20 per cent CP, EE, CF, NFE and ash on dry matter basis respectively. A wide variation in CP content of berseem green is reported in past literature. Mandal and Banerjee (2009) [8] studied the nutritive value of berseem at ages using Garole sheeps as an experimental material and found that, berseem contained CP 14.5, CF 19.7, and EE 1.2, NFE 51.9 and total ash 12.7 per cent respectively. Values of present experiment in comparison with Mandal and Banerjee (2009) [8] showed that CP, CF content was slightly higher in present experiment and lower in NFE and ash content.

Srivastava *et al.* (2017) reported that berseem contained CP 15.12, DM 17.88, CF 24.96, EE 2.20, NFE 44.54 and total ash content 13.18 per cent respectively. The values of CP, CF, EE, and total ash are appearing to be slightly lower than present experimental values. While NFE content reported higher than present findings. Gupta *et al.* (2002) [5], Khumbar *et al.* (2003) reported that, the proximate values of some legume fodders like lucerne, berseem, cowpea, stylo, anjan, glyricidia, subabul and groundnut haulms and non-legumes like maize, jowar, hybrid napier and sugar cane with the average values of DM, CP, EE, CF, NFE and total ash are 89.20, 17.30, 1.30, 35.10, 26.60 and 8.70; 92.30, 8.30, 1.10, 39.10, 33.40 and 9.50 per cent, respectively.

Concentrate

The chemical composition of concentrate on the basis of dry matter estimated was DM was 89.90, 20.80 crude protein, 10.50 and 2.6 crude fiber and ether extract and NFE and Ash content is 62.33, 3.77 per cent respectively. The promoters are used in the treatment are biological entries use in mixture quantity. As they are not pure chemical they did not influence the chemical proximate composition of feed concentrate mixture used in the treatment was same. Adangale *et al.* (2009) he observed 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. Which are comparable with the observation of Nemade and Padalkar (2000) [12] concentrate mixture was containing 90.05, 20.71, 9.50, 2.6, 62.07 and total ash 6.81 per cent DM, CP, CF, EE, NFE and total ash respectively.

4. Conclusions

The chemical composition of the forages an feeds are highly variable and affected by many factors, the type of species, variety, soil composition and climate an season, stages of growth and application of manure are important factor of influences the chemical composition of the feed is one of the index to indicate the nutritive value affected. The experimental result shows that C.P content of concentrate mixture, berssem green and tur straw were 20.80,17.50,and11.80 respectively. C.F percentage of concentrate mixture was lower i.e. 10.50 percent while that of berssem green and tur straw content were 25.50 and 34.86 percent the E.E content of concentrate mixture was 2.6 percent and berseem green content was 2.5. NFE content of concentrate mixture was 62.33 and berseem green content 40.30 and 39.40 tur straw NFE content. The ash content percent of concentrate mixture and berseem green 3.77 and 14.20 tur straw content was 11.34 percent respectively.

From the experimental value it may be concluded that NFE content of concentrate was 62.33 more than bereem green which was 40.30 and tur straw having less NFE than both i.e was 39.40 respectively. The DM,CP,CF,EE NFE and ash content in tur straw was 92.00,11.80,34.86,2.6, 39.40and 11.34percent respectively. berseem green values are found on the basis of dry matter CP and CF value of the bereem green was 17.50,20.25 respectively and EE content was 2.5 and NFE content was 49.30 and ash content was 14.20 percent respectively.

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