EVALUATION OF FORAGE LEGUME *LABLAB PURPUREUS* AS A SUPPLEMENT FOR LACTATING BUNAJI COWS

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Abstract

EVALUATION OF FORAGE LEGUME *LABLAB PURPUREUS* AS A SUPPLEMENT FOR LACTATING BUNAJI COWS.

The effects of forage legume lablab (*Lablab purpureus)* as a supplement for Bunaji cows was investigated both on-station and on-farm. The results of the on-farm trial involving five herds in each of two villages (control and supplemented) showed that supplementation with 3 kg of lablab increased milk off-take significantly ($P < 0.001$) (1.27 ± 0.09 vs. 0.71 ± 0.1 kg per cow/day for supplemented and non-supplemented cows, respectively). Cows in the supplemented group showed a higher gain in body weight compared to non-supplemented animals (411 ± 1.4 vs. 127 ± 1.8 g/day respectively). They also showed a higher ($P < 0.001$) body condition score than those in the non-supplemented group (3.5–4.5 vs. 2.0–3.5). Overall mean weight gain for calves was however, similar for both supplemented and non-supplemented groups (428 ± 5.3 vs. 428 ± 1.5 g/day). Supplementation of suckling Bunaji cows with lablab improved the performance of the animals and the income of the farmers.

1. INTRODUCTION

Domestic milk production is largely dependent on smallholder agro-pastoralists settled in and around large towns and villages, taking advantage of the increasing demand for dairy products from the rapidly urbanizing populations. This group of producers faces various constraints relating to inadequate and poor quality feed especially in the dry season and high incidence of diseases such as gastrointestinal parasites, which limit milk production [1]. The smallholder dairy producers depend largely on range vegetation and cereal crop residues as the major feed resources for their cattle. The availability and quality of these feeds fluctuate due to the seasonal pattern of forage growth. For cattle dependent on such feed resources, supplementary feeding is essential especially during the dry season. However, agro-pastoral cattle farmers seldom practice supplementary feeding in the dry season because of scarcity and high cost of conventional concentrate feeds.

High quality sown forages such as leguminous fodder have been found to provide adequate dry season supplementation and improve the productivity of grazing cattle [2]. It has not been widely adopted mainly because of competition for land and labour resources. This and other factors prompted the introduction of multipurpose legumes into the farming systems to provide feed for animals and food for the farmers. One such legume is lablab (*Lablab purpureus*).

This study was therefore designed to evaluate the effectiveness of lablab as a supplement feed for Bunaji cows under the smallholder agro-pastoral production system.

2. MATERIALS AND METHODS

2.1. Study sites

Two trials, one on-station and the other on-farm, were conducted. The on-station trial was conducted at the National Animal Production Research Institute (NAPRI), Zaria, while the on-farm trial was in smallholder agro-pastoral farms in two villages around Zaria. Zaria lies between latitudes 10 and 11° north and longitude 7 and 8° east, in the northern boundary of the sub-humid zone. Mean annual rainfall for the area is 1100 mm, lasting from May to October, with about 70% falling between July and September. Mean daily temperature during the wet season is 25°C and range from 14 to 36°C during the dry season. Relative humidity during the raining season averages 72% and range between 20 and 37% during the dry season. The dry season commences with a period of cool weather known as "harmattan" which lasts from November to January.

2.2. On-station trial

Fifteen lactating Bunaji cows (5 per treatment) weighing between 240–300 kg and 4–6 years of age were randomly assigned to three treatments. The treatments involved feeding whole cottonseed, lablab or a mixture of 50% lablab and 50% maize offal, as a supplement to cows grazing natural pastures. The animals were fed 2 kg of the respective supplement individually during milking in the morning before going out for grazing. The calves were separated from the dams on return from grazing in the evening and allowed to join the cows after milking the following morning. The daily milk yield from partial milking of the cows and weight changes of both the dams and the calves were recorded. The trial lasted for a period of 18 weeks.

2.3. On-farm trial

Based on the finding on-station, an on-farm trial was designed to evaluate the effectiveness of lablab as a supplement for lactating Bunaji cows under the smallholder agro-pastoral production system. Two villages (Basawa and Hanwa) about 30 km from NAPRI were selected. Five herds were in turn selected from each village. The herds in Basawa received the supplement feed while those in Hanwa served as the control.

2.3.1. Cattle management practices in the study areas

Milk production in the study areas was largely by indigenous Bunaji cattle kept mainly by the Fulani ethnic group who grow cereal crops in addition to their primary cattle herding activities. The food crops commonly grown include sorghum, millet, maize, cowpea, groundnut, rice, pepper and tomatoes. Residues from these crops especially the cereal crops are important animal feed resources especially during the dry season. Cattle are herded in the fields in the morning after milking to graze natural vegetation in the land after the crop harvest. They are returned in the evening and corralled at night. Supplementation with protein rich feed is not a routine management practice by most of the farmers because of the high cost of these feeds.

Milking is done once a day in the morning. Milking often starts between 1–2 months after calving, depending on the farmer. This delayed commencement of milking is to allow the calves to take enough milk from the dams for their sustenance during the first few months of life. Once milking has started, the calves and dams are kept separated overnight. The calves are allowed to suckle the dam in the morning for about 5 minutes before milking by the

farmer. The farmers then partially milk the cows, the remainder of the milk is left for the calves to suckle during the day.

It is only when they observe symptoms of disease that the farmers buy drugs to treat animals. The farmers engage the services of veterinarians to attend to serious medical problems.

2.3.2. Experimental animals

From each herd, a minimum of 6 lactating cows weighing between 220–260 kg and aged between 4–8 years were used. The animals came into the experiment as they calved. At the beginning of the study, all the animals in selected experimental herds were screened to ascertain their general health, nutrition and reproductive status. Where a case of ill health was observed such animal was treated accordingly. All the experimental animals were de-wormed at the beginning and end of the supplementary period, and 1 month after the supplementation.

2.3.3. Supplementation

The experimental animals from the herds in Basawa were fed lablab (*Lablab purpureus*) forage as the supplement. Lablab is a forage legume recommended for the Nigerian savanna. It is a fast growing plant with high foliage and seed production potential, and is capable of maintaining its nutritive value far into the dry season (up to February) [4]. The lablab forage was grown and processed on-station at NAPRI. Each animal was fed 3 kg of lablab forage/day after milking in the morning before going out for grazing. The supplementation lasted for only 45 days beginning from the first day of milking since the feed produced could only last for this time period.

2.3.4. Feed analysis

Samples of the feed were analysed for DM [5], CP and Ash [6], and NDF and ADF [7].

2.3.5. Data collection

The weights of the animals were estimated one month before supplementation, at the beginning of supplementation and a month after the feeding trial using a Dalton weigh-band. Body condition scoring of the dams was done using a 1 to 5 scale.

The milk off-take (quantity of milk available to the farmers) was measured using plastic measuring cylinders starting from 1–2 months after calving. This was carried out weekly up to 30 days after the trial.

2.3.6. Cost-benefit analysis

A cost-benefit analysis was carried out to determine the profitability of the supplementation. Inputs used in the partial budget were costs of feed and de-worming drugs, while the outputs (products) were milk off-take for human consumption and live weight changes in both dams and calves. Both inputs and products were costed at prevailing producers' market prices of the commodities. The cost:benefit ratio was determined by dividing the total cost of inputs (TC) by that of outputs or revenue (TR).

2.3.7 Data management and analysis

All records were stored in Dbase [8]. Analyses of milk and growth performance was carried out using GLM methodology [9]. The model used considered herd, parity, treatment, weekly milk off-take, monthly weight of dam, calf weight and body condition score of dam. The results are presented as a mean ± SE.

3. RESULTS

3.1. On-station trial

Table I shows the chemical composition of the supplements and Table II shows the results of the feeding trial.

The three feeds had similar dry matter content while whole cottonseed and maize offal had slightly higher crude protein but lower neutral detergent fibre and acid detergent fibre than lablab.

Partial milk off-take of Bunaji cows fed whole cottonseed, lablab forage or lablab + maize offal were not significantly ($P > 0.05$) different (Table II) although the yield was slightly higher for cows fed lablab. The cows fed lablab showed higher but non-significant weight gains than those on whole cottonseed or lablab + maize offal. However, live weight gain in calves of dams fed whole cottonseed was higher than those on lablab or lablab+maize offal. The cost of supplement/litre of milk was significantly lower ($P < 0.05$) for cows fed lablab and lablab+maize offal compared to those fed whole cottonseed.

TABLE I. CHEMICAL COMPOSITION OF SUPPLEMENTARY FEEDS

Component	Whole cottonseed	Lablab	Maize offal
Dry matter	94.1	93.0	92.9
Crude protein	19.9	13.5	16.6
Neutral Detergent fibre	53.3	57.0	55.1
Acid detergent fibre	36.9	38.7	30.2

TABLE II. MILK OFF-TAKE (KG/DAY) AND BODY WEIGHT GAIN (G/DAY) OF BUNAJI COWS AND CALVES SUPPLEMENTED WITH WHOLE COTTONSEED, LABLAB OR LABLAB+MAIZE OFFAL

Treatment			
	Whole cottonseed	Lablab	Maize offal
Partial milk off-take	1.14 ± 0.40^{a}	1.43 ± 0.64^{a}	1.29 ± 0.3^{a}
Live weight gains			
Dams	81.4 ± 40.1	83.6 ± 25.7	74.1 ± 15.3
Calves	245.9 ± 90.6^{a}	215.5 ± 71.1^{a}	197.6 ± 17.8^{b}
*Cost of feed/L of milk	12.1 ± 1.1^{a}	7.3 ± 1.1^{b}	7.8 ± 1.2^{b}

[ab] Means (± SE) with different superscripts are statistically different ($P < 0.001$); *Cost in Nira.

3.1. On-farm trial

The mean daily milk off-take in the different herds from the on-farm trial is shown in Table III. The results show that supplementation of grazing agro-pastoral cows with lablab forage resulted in a significant ($P < 0.001$) increase in milk off-take.

The body weight gains of cows and calves are shown in Table IV. The cows supplemented with lablab forage had significantly ($P < 0.001$) higher body weight gains than the non-supplemented cows. However, there was no significant ($P > 0.05$) difference in body weight gain of calves between the supplemented and non-supplemented groups. Body condition score of animals in the supplemented group varied from 1.2–2.5 before supplementation and changed to 3.5–4.5 at the end of the experiment compared to 1.5–2.0 and 2.0–2.5 in the control group.

3.3. Cost-benefit analysis

At the prevailing market prices, the gross benefit of supplementation over non-supplementation was Nira 3457.62 per cow and the cost:benefit ratio was 1:1.5.

TABLE III. MEAN MILK OFFTAKE (kg/COW/DAY) OF LACTATING BUNAJI COWS IN AGRO-PASTORAL HERDS SUPPLEMENTED WITH LABLAB

Treatment		
	Supplemented	Non-supplemented
Day1 (Initial)	0.81 ± 0.12^{a}	0.61 ± 0.10^{b}
End of trial	1.45 ± 0.12^{a}	0.78 ± 0.12^{b}
30 days after the trial	1.55 ± 0.16^{a}	0.75 ± 0.14^{b}

^{abc}: means±SE with different superscripts are statistically different ($P < 0.001$).

TABLE IV. MEAN BODY WEIGHT GAIN (g/DAY) OF LACTATING COWS IN AGRO-PASTORAL HERDS SUPPLEMENTED WITH LABLAB

	Treatment	
Animal	Supplemented	Non-supplemented
Cows	411.0 ± 1.4^{a}	127.1 ± 1.8^{b}
Calf	427.8 ± 5.3^{a}	427.8 ± 1.5^{a}

^{abcd} overall means ± SE within columns with different superscripts are statistically different ($P < 0.001$).

4. DISCUSSION

The partial milk off-take in Bunaji cows fed lablab forage as a supplement in the on-station trial is similar to that reported for the same breed of cows that grazed natural range and received cottonseed cake supplement [10]. Given the fact that cottonseed cake is a more expensive supplement than lablab forage, the results of this trial indicate that lablab has a good potential as a cheap and alternative source of protein for dairy cattle.

The results of the on-farm trial also show that supplementary feeding of lablab to grazing agro-pastoral cattle during the dry season resulted in significant increases in milk off-take for human consumption and live weight changes in cows. Ehoche et. al. [11] reported similar increases in body weight in cows supplemented with legume forages. The similarity in the performance of calves in the supplemented and non-supplemented groups could be attributed to strategic management practices adopted by the farmers. The farmers delayed the commencement of milking their cows for almost 2 months after parturition. Even when the milking started, a reasonable quantity of milk was left for the calf. Nicholson [12] estimated the quantity of milk left for the calves by the traditional herdsmen during milking to be about 60%.

The high milk production trend observed during the trial in the supplemented herds compared to the non-supplemented herds was maintained for 30 days after the feeding had ended. This is an indication that the residual effect of supplementation is carried over for a period of time, at least up to 30 days after the end of supplementation.

5. CONCLUSIONS

From the results it could be concluded that supplementation of lactating Bunaji cows with lablab forage improved the milk off-take, body weight and body condition of the animals and resulted in economic benefit to the farmer. The estimated cost:benefit ratio (1:1.5) indicates that the farmer can benefit by supplementation.

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