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RESEARCH PAPER

Comparative study of the feeding of spathes of three maize varieties (wari, espoir, SR21) and Panicum maximum C1 on the zootechnical performance of cattle

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Abstract

The study was carried out in a peasant community in Niangoloko. This study aims to develop feeding rations incorporating spathes from three varieties of maize (Espoir, SR21, Wari) and straw from Panicum maximumC1 were tested on cattle. To this basic food we added a protein complex. These animals were divided into three (4) lots of three (4) cattle. The animals were thus fed with feed consisting of a basic mixture, three varieties of corn (Espoir, Wari, and SR21) and Panicum maximum C1. Ration1 consists of a mixture of Basic Love and Panicum maximum C1; Ration2: a mixture of Basic Food and Wari; Ration3: a mixture of Basic Food and Espoir, Ration 4 consists of a mixture of Basic and SR21. The results suggest that Lot 2 (wari) and Lot 3 (Espoir) rations with IC 0,73± 0,36 and 0,58± 0,31a respectively; GMQ 271,23± 63,97g/d and 344,69± 67, 65g/d are technically and economically more efficient than Lot 1 rations (Panicum) and lot 4(SR21) or IC 0,97± 0,68 and 0,97± 0,59 respectively, of GMQ 215,28 ±18,89g/j et 209,13± 34,67g/d.

Keywords: blow, Corns, Performances, Economic, zootechnic

Introduction

In recent years, the cultivation of maize has experienced spectacular growth both in Burkina Faso and in West Africa. In Burkina Faso, maize is the third cereal both from the point of view of cultivated area and of production, after sorghum and millet. It occupies 16% of the cultivated areas (DGPSA / MAHRH, 2009). For almost 40 years, fodder corn has been the main fodder for the winter rations of dairy cows (Khan et al., 2014) and fattened bull calves (Arsić et al., 2012). In regions where its cultivation is possible the corn spathe has become the staple food during the dry season for cattle with high production needs (bull calves, dairy cows). The areas devoted to the cultivation of maize have taken a spectacular expansion in Burkina Faso thanks to the use of hybrid varieties. The causes of this extension are certainly multiple but the three main causes seem to be the following: a) the cultivation of maize is fully mechanizable; b) corn is a weed crop capable of providing a high production per hectare (in the form of fodder or grains) provided that varieties well adapted to the region, proper cultivation techniques and manuring are used; c) the uses of corn in animal feed are multiple Demarquilly et al. (1969). According to Sanou (1996) of all field crops, corn has the potential to intensify its cultivation. Indeed, the whole plant can either be used as green fodder. The ear or grain harvested wet or harvested dry or dried after harvest is used for the feeding of domestic animals.

While the nutritional value of the corn kernel is well known, that of the ear and the whole plant is much less. Since the latest work by Barrière et al. (2005), no study has been carried out to analyze the in vivo digestibility of new corn. Barrière et al. (2005) notably mentioned a marked reduction in the digestibility of the plant walls between varieties from the 1950s and current varieties, despite a better specialization of corn for use as fodder or grain. New varieties known as "Stay Green" have appeared on the market for several years, and are characterized by the ability of their stems to remain green for a long time so that the grain part accumulates more slowly the dry matter (Arriola et al., 2012). What are the digestibility and nutritional value of the corn plant or the cob (with its husks), how do they vary with age? At what stage of maturity should the plant be harvested to obtain the maximum nutritional value or the maximum quantity of nutrients per hectare? We do not have data, it is also unclear whether it is more interesting for ruminants to harvest the whole corn plant or simply the ear and what is the acceptability of corn grown in green? It is therefore important to take stock of the factors that vary its nutritional value. To answer these questions. Thus, the intensification of animal production necessarily involves optimizing the use of agricultural by-products, notably corn husks, which are an appreciable source of locally available fodder (Yanra, 2006). Corn husks are modified leaves that wrap and protect the ear of the corn (Zea mays subsp. Mays). These are particular leaves, 10 to 20 in number, with widely spaced veins, which contribute to photosynthesis1. They are born on very short internodes which form the "peduncle" of the female inflorescence, or ear, of the corn, and underlie non-functional buds. At maturity, they dry out around the ear and persist until harvest. The use of corn husks in the food supplementation of animals could be an alternative to overcome the food deficit during the dry season. It is with this in mind that the present study was initiated. We studied, during 4 trials, the feeding and acceptability of the husks of 3 varieties of corn (SR21, Wari, Espoir) compared to Panicum maximum C1 at the mature stage. The objective is to assess the effect of the use of corn husks on the growth performance of young cattle.

Material and Method

Test area

The test was carried out in Niangoloko in a farming environment, located in the west of Burkina Faso in West Africa. The climate is tropical sub humid, with about 1025 mm of rain in single mode from April to October. Average minimum and maximum temperatures vary between 23 ° C in January and 31 ° C in May, respectively.

Biological material

The study involved 12 uncastrated male zebu cattle aged around 3 years. These animals have been rented from breeders. Four batches of three animals were made up. The average weight of the animal at the start of the experiment varied respectively as lot1 (Panicum) 245 ± 5kg, lot2 (Wari) 205 ± 5 kg, lot3 (Hope) 179 ± 8.kg and lot4 (SR21). 246 ± 4.The animals were identified using numbered earrings. They were kept under observation for two weeks. The animals were weighed and dewormed internally and externally and vaccinated against the various diseases of the area at the start of the experiment

Rations tested

Each batch was assigned to one of the four rations of which four iso-proteins were formulated from Panicum maximum C1 straw, three varieties of corn husks (Wari, Espoir, SR21) from soybean haul, seed additional production cotton, molasses, lick stone and water (Table 1).

The plant material consists of: Panicum maximum C1 cut at the ripening stage (straw), Spathes of three varieties of corn (Wari, Espoir and SR21).

We have four (4) lots each comprising three animals. The rations are weighed each morning and kept in nylon bags. On these bags we note the animal number and the lot. We have a total of 8.55 kg of dry matter distributed as follows:

- in the morning, 2.50 kg of basic ration spathe of corn or Panicum maximum C1, 0.5 kg of soya bean, 1 kg of the complex, 1 kg of cotton seed and molasses solution;
- in the evening, 2.50kg of basic ration of corn spathe or panicum and 1kg of cottonseed, molasses solution and water.

We have the 5kg lick stone in each batch.

Table 1: Composition of rations in percentage

Ingredients	Lots%			
	1	2	3	4
Panicum maximum C1	58,82	0	0	0
Spathe Wari	0	58,82	0	0
Spathe Espoir	0	0	58,82	0
Spathe SR21	0	0	0	58,82
Soy Bean	5,88	5,88	5,88	5,88
Cotton seed	23,53	23,53	23,53	23,53
Production complex	11,76	11,76	11,76	11,76
Melasse	--	--	--	---
Lick stone + water	Ad libitum	Ad libitum	Ad libitum	Ad libitum
Totals	100	100	100	100

Complex: 50% priced soybeans and 50% cottonseed meals). Molasses diluted in water, 250ml of water per 600g of corn spathe (Chenost and kayoulit, 1997, Lemoufouet et al., 2014)

Experimental apparatus

After formulating the rations, the treatments were determined. The twelve 3-year-old cattle, with an average live weight (PV) of 218.75 ± 32.66 kg (179 ± 8 to 246 ± 4 kg) were divided into four lots of 4 heads each. Each lot has been assigned to one of four lots. Lot1 corresponds to the base ration (Panicum maximum C1, lot2 corresponds to the base ration (Wari), lot3 corresponds to the base ration (Hope), lot4 corresponds to the base ration (SR21).

The study was carried out using a batch system (Table 2).

Table 2: Experimental setup

Lots	Lot1 (Panicum maximum C1)	Lot2 (Spathe Wari)	Lot3 (Spathe Espoir)	Lot4 (Spathe SR21)
Rations	Soy bean Cotton seed Production Complex	Soy bean Cotton seed Production Complex	Soy bean Cotton seed Production Complex	Soy bean Cotton seed Production Complex
Number of animals	3	3	3	3
Average initial weight Kg)	245±5	205±5	179 ±8	246±4

Food and weight consumption monitoring

A 14-day adaptation period preceded the start of performance measurement to allow the animals to get used to the experimental rations

Food consumption

Food consumption or quantity of food ingested (IAQ) was calculated from the quantities of food distributed and the quantities refused. The food offered was weighed before being distributed in the morning and each animal's refusals were collected and weighed every morning before the daily ration was distributed. Feeders constructed from recovery tires. 10 liter metal buckets for watering. A 2 kg spring scale for weighing food

Live weight (kg)

The live weight (PV) was measured every two weeks using a scale of maximum weight 1000kg. The weighings were done on an empty stomach in the morning before the daily ration was distributed.

Evaluation of the average daily gain (GMQ) and the consumption index (IC)

Daily Average Gain (GMQ) indicates the average speed of growth during a given period. It was calculated according to equation 1. As for the Consumption Index (CI) which is a number without unit, it reflects the efficiency of food use over the period studied. Otherwise, it is the amount of food consumed by the animal during a given period to produce 1 kg of flesh. The CI is calculated using equation 2.

$$GMQ = \frac{\text{Final Weight (PF)} - \text{Initial Weight (PI)}}{\text{Number of days}}$$
(Equation 1)

$$IC = \frac{\text{IAQ (g) over a given period}}{\text{Weight gain (g) over the same period}}$$
(Equation 2)

Determination of chemical composition

They were carried out at the GRN analysis laboratory at Farakobâ station and at the Animal Nutrition Laboratory at the Center for Agricultural Environmental Research and Training (CREAF) at INERA in Kamboinsé. They concerned the samples of soybean corn husks and Panicum maximum C1. On the different samples, we determined:

Dry Matter (MS) obtained by drying at 105 ° C in an oven for 24 hours;
Mineral Matter (MM) or ash by passing the dry sample through an oven at 550 ° C for 3 hours;
the Organic Matter (MO) obtained by difference between the MS and the ashes (MM);
Total Nitrogenous Matter (MAT) by the classic method of KJELDAHL. According to this method, mineralization followed by distillation provides the percentage of nitrogen in the sample. The MAT is then estimated by applying the coefficient 6.25 conventionally used to the percentage of nitrogen (% N)

Statistical analyzes

The data collected were entered in the Excel version 2010 spreadsheet. The analysis of this data was carried out using R software (R-Development-core-team, 2013). Variance analysis (ANOVA) was applied. Bartlett's test or that of Student Newman and Keuls at the 5% threshold were used for the separation of variances when the analysis revealed a difference between the means. Furthermore, when necessary, the Bonferronni method was used for the correction of probabilities as recommended in the event of repeated tests (Rice, 1989). The graphs and tables have been plotted using the Excel version 2010 spreadsheet.

Results

Chemical composition of food

Table 3 gives the average chemical composition of the foods that contributed to the formulation of the rations used in the study. These are Panicum maximum C1 straw, soybeans, corn husks (Espoir, Wari, SR21), cottonseed, production complex.

Table 3: Chemical composition of food

Foods	Food chemical component			
	MS (%MB)	MO (%MS)	MAT (%MS)	MM (%MS)
Panicum maximum C1	94,91	87,84	3,54	7,07
Soy bean	94,3	87,56	7,36	6,74
Spathe(Espoir)	94,65	96,49	2,23	3,51
Spathe(Wari)	94,54	94,79	1,75	5,21
Spathe(SR21)	96,13	96,44	2,24	3,56
cotton seed	96,70	86,39	38,81	5,24
Production complex	95,01	91,2	13,68	3,81

MS: Dry matter; MB: Raw material; MO: Organic matter; MAT: Total nitrogenous matter; MM: Mineral matter

The dry matter content varies according to the nature of the food, legumes, grasses and food production complex. From the observation of these values it appears that the dry matter rate differs very little depending on the food. In fact, it is 94.91% at the level of Panicum maximum C1, the production food and 95%, 96.70%, the soybeans and the cotton seeds respectively 94.3% and 96.70%. Corn husks vary from 94.3 to 96.13%. Dry matter can be divided into ash and organic matter (OM). The MO of the food produced (91.20%) is higher than that of soybean haulm and Panicum maximum C1 by +3 points and +5 for cotton seeds. The OM of the spathes is higher than that of the production food by + 5 points.
Nitrogen is an important element in plant and animal growth. The results of the analysis show that the cotton seeds (38.81%), the production complex (13.68%) and the soybeans (7.36%) are higher than the maximum Panicum C1 (3.54%) and corn husks (Espoir, Wari, SR21) respectively 2.23%, 1.75%, 2.24%. We have a high MM content in soybeans (6.74%), Panicum straw. maximum C1 (7.07%) compared to the production feed (3.81%) and corn husks (5.30%).

Evolution of the biweekly consumption by batch (g / P0.75)

The minimum average food consumption of 118.75 ± 20.58 g / Kgp0.75, of 136.38 ± 31.04 g / Kgp0.75; of 150.99 ± 35.89 g / Kgp0.75 and 118.77 ± 50.58 g / Kgp0.75 was obtained at the start of the experiment respectively for the rations (1,2, 3,4). At the second week of the test, the difference was significant between the consumption of the four food rations ($p < 0.01$). The maximum average values of food consumption for the four rations (1, 2, 3,4) were obtained at the 12th week (Table 4). The difference was not significant between the average bi-weekly food consumption of ration 1 and ration 4 (p> 0.05). On the other hand, this difference was significant between these two rations 2 and 3 and compared to the other two rations1 and 4 (p> 0.05). The difference was significant between the average consumption of the four food rations (p <0.001). Figure 1 and 2 respectively show the evolution and variability of consumption of the four rations consumed. The coefficients of variation of the consumption of rations 1 and 4 were small (0.008 and 0.008) compared to rations 2 and 3 (0.011 and 0.013).

Table 4: Evolution of consumption per batch (g / P0.75) as a function of metabolic weight

	Evolution of weekly cattle consumption				
Weeks	Lot1(P.maximumC1)	Lot2(Wari)	Lot3 (Espoir)	Lot4(SR21)	Pr(>F)
S2	118,75±20,58	136,38±31,04	150,99±35,89	118,77±50,58	0,00191 **
S4	119,09±24,68	137,18±78,23	152,22±38,05	120,50±48,25	0,08394
S6	120,09±34,35	137,71±78,08	152,11±48,89	119,11±35,85	0,08647.
S8	120,58±44,85	138,02±68,98	152,99±35,77	119,53±45,58	0,40811
S10	120,75±58,78	138,41±35,24	153,27±35,28	120,52±78,84	0,40701
S12	121,12±35,92	140,92±45.02	156,89±25,65	121,15±25,45	0,00463 **
Average	120,07±40,95a	138,10±68,55b	153,08±35,03c	119,93±50,93a	2,2e-16 ***
CV	0,008	0,011	0,013	0,008	

On the same line, the letters abc indicate membership in different groups according to the Student Newman and Keuls test at the 5% threshold. CV = coefficient of variation Prob: Probability; Significant. P codes <0.1; *: P <0.05; **: P <0.01; ***: P <0.001.

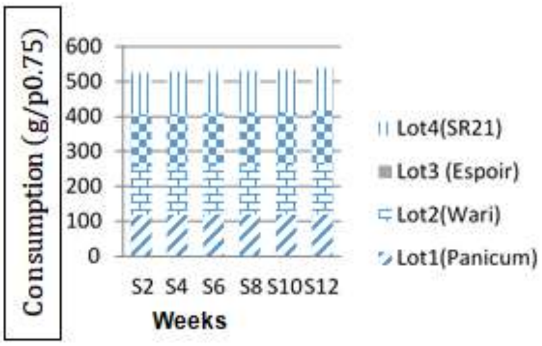

Figure 1: Evolution of biweekly feed consumption of cattle

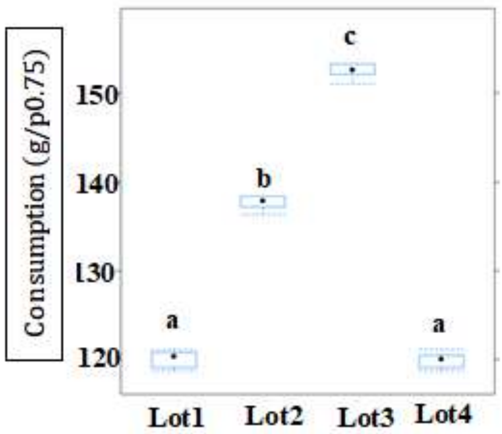

Figure 2: Variability in weekly feed consumption of cattle

Evolution of the biweekly bodyweight of cattle

The average bodyweight of cattle fed ration 1 varied from 3.25 ± 1.24 to 15 ± 3.58 kg. That of animals fed with ration 2 varied from 5.5 ± 1.45 to 17.25 ± 3.79 kg, for ration3 varied from 6.5 ± 2.28 to 23 ± 4.58 kg and 3.5 ± 1.25 kg to 13.25 ± 3.59 kg in animals fed ration 4 with variation coefficients respectively 0.472; 0.407; 0.429 and 0.405 (Table 5). From the start of the experiment to the 56th day, a significant difference was observed in terms of the average bodyweight of the animals fed the four rations (P> 0.001). The average bodyweight of the four rations did not show any significant difference (P> 0.05). The comparison of the live weight of the rations shows that there is no significant difference between rations 1 and 4. The two rations (2, 3) have a significant difference between them (P <0.05). The same significant differences are observed between rations 1 and 4 with rations 2 and 3 (P> 0.05) table n ° 5. Figures 3 and 4 respectively show the evolution and variability of the bodyweight of the four rations.

Table 5: Evolution of the biweekly bodyweight

Weeks	Evolution of bodyweight (kg) Lot1(Panicum)	Lot2(Wari)	Lot3(Espoir)	Lot4(SR21)	Pr(>F)
S2	3,25±1,24	5,5±1,45	6,5±2,28	3,5±1,25	6,75e-10 ***
S4	6,25±2,05	7,75±2,89	10,5±4,58	6,75±2,05	3,48e-08 ***
S6	9,25±3,45	10,75±4,35	13,75±4,28	9,25±1,79	4,04e-06 ***
S8	12,5±4,89	14±3,24	16,75±5,27	11±3,58	0,00133 **
S10	15±4,58	17,25±3,25	23±5,57	13,25±4,27	1,00000
S12	15±3,58	17,25±3,79	23±4,58	13,25±3,59	1,00000
Average	10,21±4,82a	12,08±4,92b	15,58±6,68c	9,50±3,85a	0,2069
CV	0,472	0,407	0,429	0,405	

On the same line, the letters abc indicate membership in different groups according to the Student Newman and Keuls test at the 5% threshold. CV = coefficient of variation Prob: Probability; Significant. P codes <0.1; *: P <0.05; **: P <0.01; ***: P <0.001

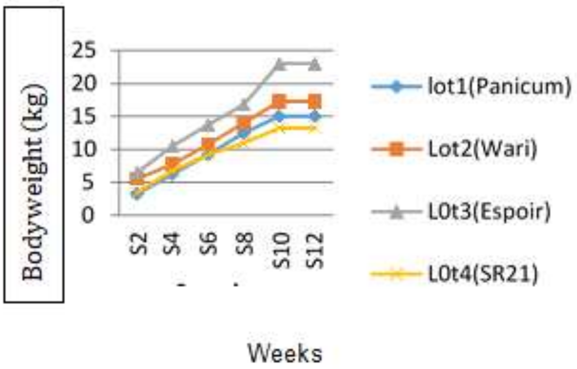

Figure 3: Evolution of the average weekly bodyweight of cattle

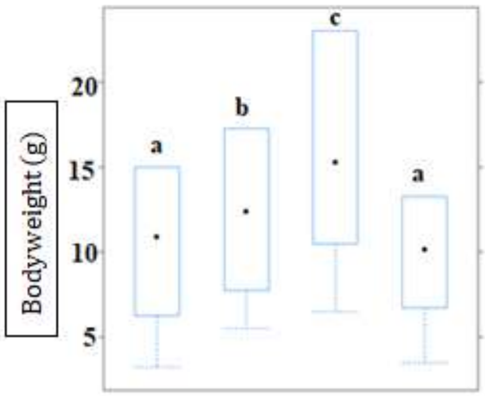

Figure 4: Variability in average weekly bodyweight in cattle

Evolution of the biweekly average GMQ of cattle

The results show that the average daily gains in the second week of experiencing significant difference from the four rations (p <0.001), 232.14 ± 34.32g / d, 392.86 ± 45.87g / d, 464.29 ± 17.65g / d, and 250 ± 13.56g / d respectively, for the rations (1, 2, 3 and 4) Table 6. The difference between the average daily gain of cattle fed on feed 1 and that of cattle fed on food ration 4 was not significant (P> 0.05). On the other hand, a difference was significant between the average GMQ of cattle fed with food ration 2 compared to those of cattle fed with food rations 3 (p <0.05). A difference was observed between the two rations (1, 4) and the rations (2,3). Figures 5 and 6 respectively show the evolution and variability of the average GMQs of the four rations.

Table 6: Evolution of the GMQ and biweekly consumption index

Weeks	Evolution GMQ(g) lot1(Panicum)	Lot2(Wari)	Lot3(Espoir)	Lot4(SR21)	Pr(>F)
S2	232,14±34,32	392,86±45,87	464,29±17,65	250±13,56	0,000485 ***
S4	223,21±26,12	276,79±23,12	375±23,65	241,07±34,32	0,111825
S6	220,24±74.23	255,95±37,50	327,38±23,56	220,24±23,45	0,586581
S8	223,21±29,43	250±38,89	299,11±65,12	196,43±35,54	0.905467
S10	214,29±19,34	246,43±21,76	328,57±32,54	189,29±29,43	0,905467
S12	178,57±23,87	205,36±45,78	273,81±23,65	157,74±23,65	0,063471.
Average	215,28±18,89a	271,23±63,97b	344,69±67,65c	209,13±34,67a	0,0004698 ***
CV	0,088	0,236	0,196	0,166	

On the same line, the letters abc indicate membership in different groups according to the Student Newman and Keuls test at the 5% threshold. CV = coefficient of variation Prob: Probability; Significant. P codes <0.1; *: P <0.05; **: P <0.01; ***: P <0.001

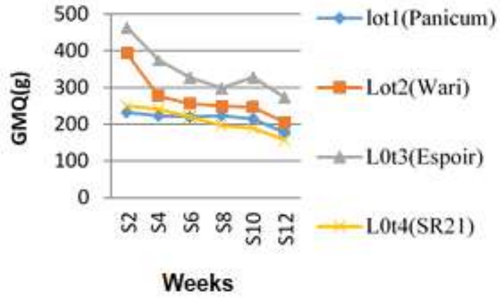

Figure 5: Evolution of the bi-weekly average GMQ of cattle

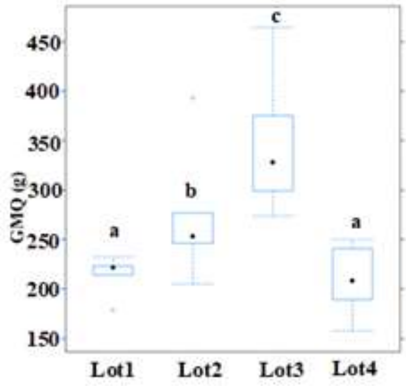

Figure 6: Variability of the average weekly GMQ of cattle

The average consumption indices recorded during the experiment varied from 0.58 ± 0.31 to 0.97 ± 0.68 (Table 7). Figures 7 and 8 shows the biweekly evolution and variability of the ration consumption indices over the duration of the trial. The average consumption indices of cattle fed the four rations were not significantly different (P> 0.05).

Table 7: Evolution of consumption indices

	Evolution consumption index				
Weeks	Lot1(Panicum)	Lot2(Wari)	Lot3 (Espoir)	Lot4(SR21)	Pr(>F)
S2					
S4	2,26±0,96	1,34±0,65	1,14±0,56	2,11±0,47	1,05e-07 ***
S6	1,18±0,86	0,96±0,24	0,71±0,17	1,11±0,35	0,00114 **
S8	0,80±0,14	0,69±0,32	0,54±0,12	0,80±0,24	0,07575 .
S10	0,59±0,10	0,53±0,12	0,45±0,16	0,68±0,12	0,43246
S12	0,50±0,18	0,43±0,13	0,33±0,12	0,57±0,13	0,43246
Average	0,50±0,21	0,44±0,16	0,33±0,18	0,57±0,15	0,97040
CV	0,97±0,68a	0,73±0,36a	0,58±0,31a	0,97±0,59a	0,4838
	0,700	0,486	0,527	0,610	

On the same line, the letters abc indicate membership in different groups according to the Student Newman and Keuls test at the 5% threshold. CV = coefficient of variation Prob: Probability; Significant. P codes <0.1; *: P <0.05; **: P <0.01; ***: P <0.001

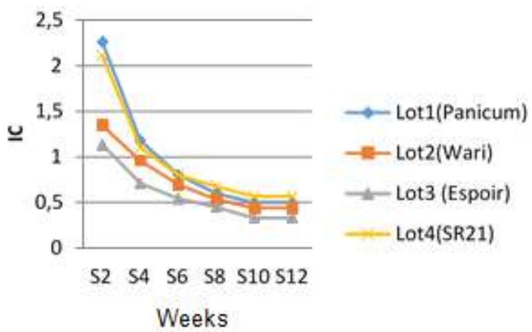

Figure 7: Evolution of the biweekly average consumption index for cattle

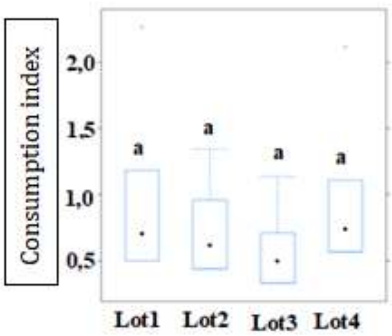

Figure 8: Variability of the average weekly cattle consumption index

The final average weights are 260.00 ± 5.00 kg, 205.00 ± 5.00 kg, 179.00 ± 9.00 kg respectively for rations 1, 2, 3. and 4 Table 8.

Table 8: Animal zootechnical performance

Parameters	Lot1(Panicum)	Lot2(Wari)	Lot3 (Espoir)	Lot4(SR21)
Initial weight (kg)	245,00±5,00	205,00±5,00	179,00±9,00	246,00±4,00
Final weight (kg)	260,00 ±5,00	222,25 ±5,00	202,50 ±8,00	259,75 ±4,00
Bodyweight (kg)	10,21±4,82a	12,08±4,92b	15,58±6,68c	9,50±3,85a
GMQ (g/j)	215,28±18,89a	271,23±63,97b	344,69±67,65c	209,13±34,67a
Consumption ($g/P^{0.75}$)	120,07±40,95a	138,10±68,55b	153, 08±35,03c	119,93±50,93a
Consumption index	0,97±0.68a	0,73±0.36a	0,58±0.31a	0,97±0.59a

Discussion

Nutritional values of rations

The contents measured in organic matter, total nitrogenous matter, mineral matter of soybean haulms (7.36%) were similar to those obtained by many authors (Rivière, 1991, Mame 1998, Zoungrana et al. 1999, Zoungrana, 2010). La value of total nitrogenous matter of maximum Panicum C1 (3.54%); corn husks Hope (2.23%); SR21 (2.24%) determined is in the range of 2 to 5% (Abdou, 1998) except the wari spathe (1.75%). The total nitrogen values of the production food (13.68%) is less than 38.81% (Abdou, 1998, Chenost et al., 1997).

In the first 14-day trials in which corn husks were freely distributed to cattle, the ingestibility (amount of dry matter voluntarily ingested) was much more variable from one corn spathe to another. The differences in ingestion observed between varieties could not be linked to differences in morphological composition (proportion of ears at approach of maturity) or chemical composition (contents of nitrogenous matter or crude cellulose). Their causes are therefore unknown, but probably result, as for the classic fodder of grasses and legumes (Demarquilly et al., 1969), from differences in the kinetics of digestion in the rumen. The amount ingested is practically independent of the stage of development of the plant. The optimum harvest stage is that when the quantity of dry matter harvested per hectare is maximum, that is to say at the vitreous stage of the grain. The DM content of the plant (33-35%) is then ideal for obtaining a good quality of conservation of the spathes (Demarquilly, 1994).

Finally, we know that the nitrogen content of corn spathe is most often insufficient to cover the nitrogen needs not only of animals, even those kept in the vicinity of the interview, but also of the microorganisms in their rumen. At this level we used a complex (taurified soybean seed and cottonseed meal) and 1 kg of cottonseed each evening. Corn silage must therefore be properly supplemented with nitrogen (and also minerals) to achieve its potential ingestion and nutritional value. Distribution of the energy supplements necessary to cover the needs of animals with high production levels. Molasses is a concentrate of sugar rich in minerals (Ca, P, K..) and vitamins, which would have contributed to improving the food use efficiency of the different rations (Areghore and Perera, 2004) The chemical composition of fresh corn husks consist of DM (53%), mineral matter 4% DM, 5% total nitrogenous matter, 29% crude fiber, 0.8 g / kgMS calcium, 1.9 g / kgMS phosphorus (INRA, 1988)). The dietary values of fresh corn husks are 0.79 UFL / KgMS, 0.72 UFV / KgMS, 15 g / kgMS of PDIA, 31 g / kgMS of PDIN 73 g / kgMS of PDIE (INRA, 1988). According to Jarrige et al., (1978) changes in the morphological and physiological characteristics of the plant with age lead to a decrease in its ingestibility. The average NDF, ADF and ADL contents of the whole corn plant are respectively 47.1%, 22.9%, 2.5% DM (INRA, 2007) and 39.9%, 22.0%, 1.8% DM (Khan et al., 2014). The MAT content of the plant organs (stems, grains, spathes and stems) changes little with maturity. (Peyrat, 2014). The MAT of the grain then represents 65% of the MAT of the whole plant at a stage of maturity of 35% DM of the whole plant (Kuehn et al., 1999). Finally, the mineral content (ash) is also relatively low. It represents 5 to 7% of the whole plant (Demarquilly, 1994), 2% of the ear and 6% of the stem (Demarquilly, 1969) and is relatively constant with the advancement of the stage of maturity (Schittenhelm, 2008).

Food consumption

During the dry season, agricultural by-products (SPA) are the main source of food for livestock. The availability of these crop residues in the dry season makes it possible to take over from the routes used in the rainy season (Ouattara, 2014). The corn husks and Panicum maximum C1 were completely consumed throughout the duration of the test. For the total ration, the refusal rate which was on average 30% DM of the distributed dropped to 10% DM by the end of the trial for all the batches. The average food consumption of the four rations are 120.07 ± 40.95 g / kg P0.75, 138.10 ± 68.55 g / kg P0.75, 153.08 ± 35.03 g / kg P0.75, 119, 93 ± 50.93g / kg P0.75. In real environment, daily consumption, Fall-Touré et al,(1997) obtained a consumption of 134, 123 and 124 g / kg P0.75 our results are lower than those of Fall-Toure et al., (1997); which were t of 7.8; 8 to 7.5 Kg MS per head respectively for three lots. In 1994, these consumptions were 113 and 133 g / kg P0.75 respectively for lots 1 and 2 in the same localities with a ration comprising millet stalks, millet bran, peanut meal, salt and mineral blocks to lick. Our results are superior to those of Traoré et al., (1995) who observed consumption of 92 and 95 g / kg P0.75 respectively for rations containing 25 and 52 p100 of fresh leaves of Leucaena leucocephala. Kini, 2018, obtained quantities of MSI ranging from 3,824.52 g / animal / day for ration 1 and 4,410.87 g / animal / day for ration 2 at young bulls receiving a nitrogen supplement from the Faidherbia pod albida. These results confirm the data from our study for lot1 at the straw stage of Panicum maximum C1. The quantities ingested are 120.07 ± 40.95 MS / kg P0.75, 119.93 ± 50.94 MS / kgP0.75 respectively for lot (1) and lot (4). Significant difference between these two lots ($p < 0.05$). At the lot level (2 and 3) we have respectively 138.10 ± 68.55 MS / kgP0.75 and. 153.08 ± 35.03 MS / kg P0.75. The values of lot 2 and lot 3 are higher than 30g / kgp0.75 for the straws announced by Hoden, 1978 for sheep. These values are higher than those found by (Richard et al., 1987, Guerin et al., 1987, Richard, 1987) for tropical grasses find average intakes of 66 ± 11.6g in the dry season. With the differentiation of the organs the quantities ingested decrease. This variation is linked to the physical structure of the plant (Allison, 1985) and to its chemical composition, in particular its MAT and NDF level (Demarquilly, 1987). Van Soest (1965) suggests that when the NDF rate increases above 55 to 60%. It can become the limiting factor of ingestion.

Weight gain in cattle

At the end of the experiment we obtained GMQs of 215.28 ± 18.89 g / d, 271.23 ± 63.97 g / d, 344.69 ± 67.65 g / d, 209.13 ± 34.67 g / d respectively for rations 1, 2 3, 4. Our results were lower than other authors, Kini, 2018, obtained GMQs of 486.11 g / d for lot 1 and 623, 02 g / d for lot 2. Fall et al. (1997) found GMQs higher than 1100, 615 g / d respectively for ration 1 and 2, however ration 3 (173 g / d) was lower than our results. Traoré et al (1995) who observed consumption of 92 and 95 g / kg P0.75 respectively for rations containing 25 and 52 p100 of fresh leaves of Leucaena leucocephala these data are lower than our results.

The weight evolution observed was different from one batch to another, which illustrates a highly significant exploitation effect ($P < 0.001$). For a young calf with an average weight of 200 kg, the energy and nitrogen contributions allowed a daily weight gain of 1100 and 1400g respectively (INRA, 1989).

Gnanda et al., (2015), a survey on the implementation of the bovine RTE test fattener shows that the fattening cattle monitored expressed positive weight growth. The weight gains were more interesting in terms of animals having were fed ration 2 (700 ± 106 g / d) and 5 (1667 ± 87 g / d) and to a lesser extent those who were fed ration 3 (483 ± 64 g / d). ration 4 (417 ± 41 g / d) in MAD and in UF, the animals in this ration were as well as those in ration 1 (400 ± 56 g / d) less efficient in weight gains (Gnanda et al., 2015). A balanced MAD / UF ratio is always necessary to induce better fattening performance in animals in total housing (Gnanda et al., 2000).

Conclusion

This experiment on corn byproducts and spathes has made it possible to better optimize their use by animals. In fact, the objectives of this study have been achieved in so far as the introduction of corn husks and soybeans has improved the efficiency of using rations and the weight performance of cattle. In tests 1 and 4, the average daily quantities of dry matter ingested by the cattle receiving the corn spatula SR21 and the straw of Panicum maximum C1 did not present any significant difference at the threshold of 5%, respectively 120.07 ± 40.95 g / kg P 0.75 and 119.93 ± 50.93 g / kg P 0.75 on the other hand, the best intakes are obtained with the hop corn and wari spathe, which are respectively 153.08 ± 35.03 g / kg P 0.75 and 138.10 ± 68.55 g / kg P0.75. Cattle showed a strong preference during the feeding period for hop and wari corn husks over other forage categories. Consequently, we suggest that this study be continued with all varieties of corn to confirm the validity of the results.

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