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Eating behavior and forage intake of mixed-breed cattle (Gir x Borgou) complemented with sorghum brewer's at *Panicum maximum* C1 grazing in Northern Benin

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Abstract

Understanding of herbivorous eating behavior on pasture bid interest for breeding and environment. Therefore the objective of the study was aimed to study eating behavior of mixed cattle (Gir x Borgou) on *Panicum maximum* C1 in North Benin. Twelve young bulls and twelve suckler cows are respectively distributed in three lots of four animals each. All lots graze the *Panicum maximum* C1. Lot 1 received no dietary complement. Lots 2 and 3 of young bulls received respectively 1 and 1.5 kg of sorghum brewer's each evening while lots 2 and 3 of suckler cows received 1 and 2 kg respectively. Activities carried out by these grazing animals are observed during grazing. Ingesting on pasture is estimated by the method of harvesting fodder in the manner of the animal (hand plucking). One-way analysis of variance was done. The differences between the mean values were compared by Fisher's test. In young bulls, grazing occupied respectively 67.7; 62.99 and 62.05% of time spent grazing. These differences are significant (P<0.05) between the complemented lots and the control. Resting/rumination occupied respectively 7.88; 13.17 and 12.94%. These differences are significant (P<0.05) between the complemented lots and the control. As for the displacement, it is identical and amounts to 17.05%. Watering occupied 5.88% in all lots. On the suckler cow's side, grazing occupied 67.94; 64.70 and 63.52% of time grazing. These differences are significant (P<0.05) between the complemented lots and the control. Resting/rumination occupied respectively 8.54; 11.77 and 12.96 %. These differences are significant (P<0.05) between the complemented lots and the control. Displacement and drinking accounted for 17.64 and 5.88% respectively in all lots. On average the cattle of the lot 1 ingested more than those in complemented lots, and the higher the complemented, the fewer cattle graze. These are fundamental data for the implementation of feeding plans for these mixed-breed cattle.

Key Words: Mixed cattle, eating behavior, pasture, sorghum brewer's, Northern Benin

Introduction

In Africa, cattle breeding, characterized by large and varied livestock, is one of the main sources of animal protein for the population (Kassa *and al*. 2016). But the deficit in animal protein in the population is far from being filled despite this size in connection with population growth (Lambare, 2015). In Benin, the cattle herd is composed of taurines lagoon, Borgou, Somba ; zebus M'bororo, Goudali, White Foulani as well as subjects from their crossing (Youssao, 2015). At a time when development aid to the African countries and in particular to Benin continues to decrease and when the devaluation of the CFA franc made very expensive imports (Moumouni, 2006), it becomes essential to find solutions to the deficit in animal protein.

To do this, the government has opted in 2014 for the introduction of highly efficient breed-cattle such as Azawak, Girolando, Gir and seeds of four dairy breeds: Girolando, Gir, Montbeliarde and Tarentaise. Several crosses and/or inseminations took place with our local cows "Borgou". The mongrels obtained are able to resist trypanosomiasis and produce better than "Borgou" animals. These half-breeds are therefore to be preferred.

Apart from the performance that will be able to externalize these animals, it is necessary not only to forage in quantity of food grazing quality but also to complement, especially in the dry season. Yet understanding the eating behavior and the ingestion of cattle on these pastures seems necessary for a rational management of the pasture and the herd (Zoffoun *and al.* 2011).

No study is conducted on the eating behavior of these animals in the country. The present study aims to investigate eating behavior of mixed-breed cattle (Gir x Borgou) complemented with sorghum brewer's and to determine pasture intake.

Material and Methods

Description of the Study Area

Our research was conducted on the Okpara farm in the commune of Tchaourou, located between 2°40' and 2°49' East longitude and 9°15' and 9°20' North latitude. Its area is 33 000 ha. The study was conducted during the dry season (from February 15th to 24th and from February 26th to March 7th, 2019).

It is subject to the influence of a dry season and a rainy season. The maximum height of rainfall is recorded from August to September. The average annual temperature varies between 26°C and 38°C. The relief consists of plains and plateaus surmounted by hillocks explaining the presence of granites, gneisses, quartzite and micaschists. The hydrographic network is mainly dominated by tributaries of Oueme and Okpara's rivers. We also distinguish other rivers of significant importance including: Sui, Dama, Yerimaro and Okossi. It is a savanna zone with some semi-deciduous forests and forest galleries.

Animal Material

The research focused on breed cattle (Gir x Borgou). Twelve bulls and twelve suckler cows were used. For young bulls, three homogeneous lots of four animals each were made taking into account age and weight. The young bulls in lot 1 were 575 ± 4.08 days old and weighted 170.5 ± 5.50 kg. Those in lot 2 were 574.5 ± 4.79 days old and weighted 174 ± 3.60 kg. As far lot 3, the animals were 575 ± 4.08 days old and weighted 177 ± 4.00 kg.

As far suckler cows, three homogeneous lots of four animals each were constituted taking into account the age, the weight and the date of calving. The cows in lot 1 were 6.33 ± 0.57 years old, had calved 89 ± 2.51 days ago and weighted 324.5 ± 9.53 kg. Those in lot 2 were 6.33 ± 0.57 years old, had calved 89.66 ± 2.08 days ago and weighted 370 ± 17.61 kg. As far lot 3, the animals were 6.33 ± 0.57 years old, had calved 88.33 ± 2.08 days ago and weighted 363.5 ± 19.75 kg.

Plan Material

The experiment was carried out on artificial pasture with *Panicum maximum* C1 having an area of 3 ha. The manure from which this pasture benefited is constituted by the excrement of animals during grazing.

Lot 1: the two sex was the control batch without any complementation after grazing;

Lot 2: after returning from the pasture, each young bull received 1 kg of dried sorghum brewer's while each suckler cow received 1 kg.

Lot 3: after returning from the pasture, each young bull received 1.5 kg of dried sorghum brewer's, while each suckler cow received 2 kg.

This will allow us to study the impact of different quantities of complement on the quantities of fodder ingested on pasture.

Animals Behavior

The twenty-four animals were followed with observations of their ingestion behavior from grazing. Before their sent to pasture, they underwent external deworming and were vaccinated against pasteurellosis. The time spent grazing lasted from 8h 30min to 18h 30min to have a total of 10h per day. Back from the pasture, the animals were placed in a barnand tied at a distance of 2 meters from each other. At 20h 30min, the animals were detached to have access to the free housing park where they received the stone to lick and drinking water a twill. The experiment on eating behavior lasted 10 days for suckler cows and 10 days for bulls as experienced by Babatoundé *and al.* (2009) and Zoffoun *and al.* (2011) after an eleven days adaptation period. A total of 6 samples of fodder in the morning and 6 samples in the afternoon were collected per animal in order to perform their chemical analyzes in the laboratory.

Determination of the rate of activities by grazing cattle

The cattle were followed on pasture to observe their behavior. During the entire pasture duration, the different activities of the animal (grazing, resting/rumination, watering and moving) were noted in a sequence of 30min.

Counting the number of bite during grazing

This operation is performed by visual observation of the animals during grazing. The counting lasted 5min and is done six times each day (3 in the morning and 3 in the evening).

Determination of the voluntary ingestion of cattle and the weight of the bite

Simultaneous sampling in the pasture, in the manner of the animal, the different parts and the quantity of plant consumed representative of a bite (hand-plucking) (Silveira *and al*. 2005) were made. This made it possible to form a representative sample of the ingested fodder. Six samples are taken per day and animal and last 5min (3 in the morning and 3 in the afternoon). The amount of the dry matter (DM) harvested and divided by the number of the bite recorded beforehand on the weight of the bite. Each forage sample was pre-dried at shading for 3 days before being overheated at 105.8°C to constant weight for dry material determination (AOAC, 1990) and bite weight calculation. Ingestion on pasture is obtained by the following relation : I = CT x NB x WB where I = Ingestion in g DM/day ; TC = Consumption time (in min) and CD = Number of bite and WB = Weight per bite.

Method of data analysis

All data were coded and recorded in Microsoft excel sheet. Statistical analyses were made separately for young bulls and cows. The data were analyzed with the MINITAB software, version 17. They were subjected to the normality and homogeneity of the variance test. One-way analysis of variance (ANOVA) was done using the general linear model (GLM) with one factor (amount of complement) at the 5% level. Mean comparisons of grazing time, resting/rumination time, watering time number of bite per minute, the weight of bite and voluntary ingestion were made by using Fisher's range test method at $p<0.05$. The results were presented as an average ± standard error.

Results

Chemical composition of the foods used

The chemical composition and the nutritive value of the feed used during the test are shown in table 1. *Panicum maximum* C1 has a higher rate of organic matter (90.10%) than sorghum brewer's (76.25%). However, the digestibility of this organic matter in the *Panicum maximum* C1 seems very low (58.63%) than in the sorghum brewer's (93.82%). Similarly, the organic matter-ash digestibility is very low in *Panicum maximum* C1 (49.83%) than in sorghum brewer's (90.04%). The quantity of nitrogenous matter contained in sorghum brewer's is practically 3 times that contained in *Panicum maximum* C1 and its digestibility is very interesting in draff. In general, the nutritional value of sorghum brewer's is significantly higher than that of the *Panicum maximum* C1.

Table 1: Chemical composition in (% DM) and the nutritional value of the feed used

Foods	*Panicum maximum* C1	Sorghum Brewer's
DMa	92.08	96.16
AT (% MS)	9.90	23.75
OM (% DM)	90.10	76.25
NMT (g/kg)	6.45	19.54
dOMa (%)	49.83	90.04
DNM (g/kg)	44.50	123.96
UFL (/kg MS)	0.09	0.15
dOM (%)	58.63	93.82
UFV (/kg MS)	0.11	0.20
DNM/UFL	494.44	826.4

DMa: Dry Matter Analytic ; AT : Ash Total ; OM : Organic Matter ; NMT: Nitrogenous Matter Total ; dOMa : Organic Matter-Ash Digestibility; DNM : Digestible Nitrogenous Matter; dOM : Organic Matter Digestibility

Rate of cattle activities on pasture

The mean values and standard error of the average proportion of time devoted to the various activities by cattle in the *Panicum maximum* C1 artificial pasture, are respectively recorded in tables 2 and 3 for suckler cows and young bulls.

Table 2: Proportion of time spent on different activities by suckler cows grazing

Activities	Lot 1	Lot 2	Lot 3	SS
Grazing *Panicum maximum* var. c1	67.06 ± 5.20[a]	64.12 ± 6.59[b]	63.23 ± 7.11[b]	P<0.05
Grazing other herbaceous plants	0.88 ± 2.15[a]	0.58 ± 1.81[a]	0.29 ± 1.31[a]	P>0.05
Resting-Rumination	8.54 ± 5.56[b]	11.77 ± 6.18[a]	12.96 ± 7.29[a]	P<0.05
Displacement	17.64 ± 00[a]	17.64 ± 00[a]	17.64 ± 00[a]	P>0.05
Watering	5.88 ± 00[a]	5.88 ± 00[a]	5.88 ± 00[a]	P>0.05
Others	0.00 ± 0.00[a]	0.01 ± 0.06[a]	0.00 ± 0.00[a]	P>0.05
Total (%)	100	100	100	-

SS = Threshold of Significance ; the values of the same line indexed with different letters are significantly at the 5% threshold.

In suckler cows, the average daily proportion of time spent grazing the *Panicum maximum* C1 are significantly different between the lot 1 and the complemented lots. A slight difference appears between the complement lots but is not significant (P>0,05). So it affects the time spent on grazing. The proportion of time reserved for grazing the few herbaceous plants found is also not significantly different between lots. It varies by 1.31 to 0.88 ± 2.15% of the time spent grazing. Concerning the time spent for resting and rumination, it appears a significant difference between the complemented lots and the lot 1 (P<0.05). The time devoted to resting and rumination has been influenced by the complementation. In all lots, movement, watering and other activities carried out by the grazing animal, have equal values (respectively 17.64 ± 00%, 5.88 ± 00% and 0.00 ± 0.00%). Indeed, the animals go for the drink and back together, and this reflects the same time. These results show that in lactating cows, complementation has an effect on the time spent grazing and ruminating and/or resting on pasture.

Table 3: Proportion of time devoted to different activities by grazing young bulls

Activities	Lot 1	Lot 2	Lot 3	SS
Grazing *Panicum maximum* var. c1	66.82 ± 8.16[a]	62.41 ± 4.03[b]	60.88 ± 7.93[b]	P<0.05
Grazing others herbaceous plants	0.88 ± 2.15[a]	0.58 ± 1.80[a]	1.17 ± 2.41[a]	P>0.05
Resting-Rumination	7.88 ± 7.46[b]	13.17 ± 4.63[a]	12.94 ± 5.25[a]	P<0.05
Displacement	17.05 ± 1.80[a]	17.05 ± 1.80[a]	17.05 ± 1.80[a]	P>0.05
Watering	5.88 ± 00[a]	5.88 ± 00[a]	5.88 ± 00[a]	P>0.05
Others	1.49 ± 2.41[a]	0.91 ± 2.15[a]	2.08 ± 3.45[a]	P>0.05
Total (%)	100	100	100	-

SS = Threshold of Significance ; the values of the same line, with the same letters are not different at the 5% threshold

The proportion of time reserved for grazing by young bulls appears to be significantly different between lot 1 and the other lots. Among the latter, it varies from 60.88 ± 7.93 to 62.41 ± 4.03% of time spent grazing, the lowest value being observed in lot 3. The grazing of the other herbaceous plants times are not significantly different between lots (P>0.05). As regards the time spent for rest and rumination, there is a significant difference between the latter and the lot complemented from 5.06 to 5.29% of time spent grazing, but there is no significant difference (P>0.05) between lots 2 and 3. As with lactating cows, displacement and watering have equal values (respectively 17.64 ± 1.80% and 5.88 ± 00%). As for the time spent on other activities, no difference is. The complementation therefore, affect the time devoted by bulls to the different activities on pasture.

Voluntary ingestion of cattle on pasture

Average daily values of average numbers of bite per minute, average bite weight and amount of *Panicum maximum* C1 deliberately ingested on grazing are shown in tables 4 and 5.

Table 4: Average numbers of bite per minute, average bite-size and quantity of fodder deliberately ingested on grazing by suckler cows

Parameters	Lot 1	Lot 2	Lot 3	SS
Average number of bite/day	23.01 ± 3.36[a]	20.37 ± 3.49[b]	19.97 ± 4.22[b]	P<0.05
Average bite-size (g DM)	0.96 ± 0.21[b]	0.99 ± 0.22[a]	0.97 ± 0.16[b]	P<0.05
Ingested quantities (g DM/kg PV)	402.56 ± 12.73[a]	356.43 ± 21.92[b]	345.55 ± 17.46[c]	P<0.05
Ingested quantities (g DM/kg $P^{0,75}$)	94.85 ± 3.65[a]	81.27 ± 5.22[b]	79.14 ± 4.75[c]	P<0.05

SS = Threshold of Significance ; DM = Dry Matter ; $P^{0,75}$ = Metabolic Weight ; the values of the same line, with the same letters are not significantly different at the 5% threshold

Average suckler cows bite per minute are significantly different between lot 1 and the others. Lot 1 cut about 23.01 ± 3.36 times while lot 2 cut 20.37 ± 3.49 times and lot 3, 19.97 ± 4.2 times. Between the control group and lot 2, the mean weight of bite is significantly different (P<0,05). There was no difference between lot 1 and lot 3. Concerning the number of groups voluntarily ingested, it appears significantly different between all lots. The lot 1 has ingested approximately 1.16 times than the lot 2 and 1.19 times than the lot 3 respectively. In suckler cows, the complementation had an effect on the number of bites, the weight of a bite and pasture ingestion between lots, with the highest values being observed in control animals.

Table 5: Mean number of bite per minute, mean weight of bites and amount of forage deliberately ingested on the pasture by young bulls

Parameters	Lot 1	Lot 2	Lot 3	SS
Average number of bite/day	24.67 ± 4.15[a]	21.93 ± 3.53[b]	19.89 ± 4.96[b]	P<0.05
Average bite-size (g DM)	0.49 ± 0.08[b]	0.51 ± 0.10[ab]	0.58 ± 0.09[a]	P<0.05
Ingested quantities (g DM/kg PV)	333.27 ± 28.90[a]	288.26 ± 32.68[b]	286.14 ± 43.76[b]	P<0.05
Ingested quantities (g DM/kg $P^{0,75}$)	92.23 ± 8.02[a]	79.37 ± 9.08[b]	78.45 ± 12.07[b]	P<0.05

SS = Threshold of Significance ; DM = Dry Matter ; $P^{0,75}$ = Metabolic Weight ; the values of the same line indexed with different letters are significantly differents at the 5% threshold

The mean number of bites per minute in young bulls are significantly different between lot 1 and the other lots. The lot 1 cuts more times of grass (24.67 ± 4.15) than the other lots (19.89 ± 4.96 to 21.93 ± 3.53). The average weight of bite in young bulls shows a gap between lots and displays a significant difference between the lot 1 and the lot 3. As for the quantity of grass volountarily ingested by young bulls, a clear difference was found between the complemented lots and lot 1. This latter ingested respectively 12.86 and 13.78 g DM/kg $P^{0,75}$ more than the lots 2 and 3. The complementation therefore affected the number of bite, the weight of a bite and grazing ingestion between lots in young bulls. The high values are observed in complemented animals.

Discussion

Chemical composition of the foods used

The percentage of dry matter in sorghum brewer's that we had found (96.16) is similar to that (95.94) reported by Mopaté *and al.* (2011) in Tchad. For Heuzé and Tran (2017), brewer's generally have a dry matter content ranging from 59 to 67%. Furthermore, Montcho *and al.* (2016) revealed 93.98% in the Republic of Benin and Adama *and al.* (2007) reported 93.33%. These rates are low compared to ours. As for mineral matter, the study of Mopaté *and al.* (2011) and Montcho *and al.* (2016) revealed a very low rate (5.90% DM and 13.70% DM respectively) compared to the one we found (23.75% DM). Montcho *and al.* (2016) reported 81.87% DM for organic matter unlike the 76.25% DM that we found. The amount of NMT reported by our analyzes was 19.54 g / kg and corroborates the 18.50 and 19.50 g / kg that Mopaté *and al.* (2011) and Montcho *and al.* (2016) reported respectively. For DNM, our value was 123.96 g / kg DM but remains lower than the 151.36 g / kg DM displayed by the analyzes of Montcho *and al.* (2016). These differences are explained by the drying temperature on which the degradability of the protein depends (Heuzé and Tran, 2017). We had found that the digestibility rate of organic matter is 93.82%, which is higher than the 76.68% reported by these authors. With regard to the milk and meat fodder units (UFL, UFV), studies by these same authors show respectively 1.03 and 0.96 against 0.15 and 0.20 respectively on our side. Furthermore, our DNM / UFL ratio was 826.4. This result is higher than the 146.22 found by Montcho *and al.* (2016). The differences observed in the chemical composition and the nutritional value of the sorghum brewer's can be explained by existing processes from one processor to another, the use as raw material of different varieties or by the conditions of culture (Sauvant and al. 2014; Heuzé and Tran, 2017). The cereal

beverage production sector is very innovative and the fermentation processes evolve rapidly over time, causing frequent changes in the composition of grains (Sauvant *and al.* 2014).

The dry matter content (92.08%) of the fodder in our study (*Panicum maximum* C1) is higher than that found (42.70%) by Idrissou *and al.* (2017) in the Republic of Benin but remains lower than that reported by Adéossi *and al.* 2019 and that of Zoffoun *and al.* (2019) in the same country. The level of organic matter that we found (90.10% DM) corroborates that revealed by the analyzes of Idrissou *and al.* (2017) and Adéossi *and al.* (2019). As for total ash, the rate reported by our studies (9.90%) is similar to that of Zoffoun *and al.* (2019). The amount of NMT amounted to 12.05 g / kg in the studies by Adéossi *and al.* (2019) and 10.10 g / kg for Idrissou *and al.* (2017). These values are higher than ours which was 6.45 g / kg. As for the MAD, it was worth 58.60 g for Idrissou *and al.* (2017) against 44.50 g in our study. The differences observed between these values may be due to the forage stage (Zoffoun *and al.* 2019), the study season and also the region.

Rate of Cattle Activities on Pasture

The allocated time for grazing activities is well above that of other activities. This finding is similar to De Paula *and al.* (2019) studies in Bresil on beef calves grazing *Brachiaria decumbens* pasture and Babatoundé *and al.* (2008) studies in Republic of Benin about Djallonke sheeps grazing fodder crops. In the same way, our results corroborate those of Babatoundé and al. (2009a) about non complemented Borgou bulls in Republic of Benin and those of Zoffoun and al. (2011) about the Girolando bulls in Republic of Benin. Studies conducted by Babatoundé and al. (2009a) have revealed that the grazing took 67.0% of the time spent on *Sorghastrum bipennatum* and *Brachiaria falcifera*; *Hyparrhenia involucrata* and *Sorghastrum bipennatum*; *Pennisetum polystachion* and *Tridax procumbens*; *Andropogon tectorum* and *Rootboelia cochensinensis* fallows in rainy season. This value approximates those (67.06 ± 5.20 and 66.82 ± 8.16%) that we found respectively for suckler cows and bulls in the control group. This value also corroborate the 66.7% reported by Zoffoun and al. (2011) on the Girolando bulls at *Panicum maximum* C1 pasture in rainy season in Benin. On the other hand, these values we found are higher than the one (54.3%) found by Zoffoun *and al* (2011) on the artificial pasture of *Panicum maximum* ; than that reported by Ferreira (2018) on suckler cows in Turkey and than (51 – 56%) that reported by De Paula *and al.* (2019) in Bresil on beef calves grazing *Brachiaria decumbens* pasture. The observed differences could be explained on the one hand, by the season of the study (Michiels *and al.* 2000 ; Ginane *and al.* 2008 ; Babatoundé *and al.* 2009a ; De Paula *and al.* 2019) but also the fodder species found on pasture (Coleman *and al.* 2003 ; Ginane *and al.* 2008 ; Valente *and al.* 2014) and the environmental conditions (Michiels *and al.* 2000 ; Ginane *and al.* 2008). In complemented lots, ours values found are significantly lower than those obtained in the control group. In contrast, De Paula *and al.* (2019) reported that complemented lots spent 52-56% of the time on pasture while the control lot spent 51.81%. This difference can be explained by the nature of the complement and the forage species.

For resting/rumination time, we found proportions of 8.54 ± 5.56% in suckler cows and 7.88 ± 7.46% in bulls of the control group. These values are lower than that (15.6%) reported by De Paula *and al.* (2019) on beef calves (42–46%) in Bresil, those found Zoffoun *and al.* (2011) : resting/rumination (28%) on the pasture of *Panicum maximum* and (40.4%) on the pasture of *Panicum maximum* C1. Significant values were also reported by Babatoundé *and al.* (2008) on Djallonke sheeps grazing *Andropogon gayanus* + *Aeschynomene histrix* and *Panicum maximum* C1 + *Aeschynomene histrix*. Tölü *and al.* (2016) declare that rumination is significantly different between seasons during his studies conducted on goats in winter, in spring, in summer and in autumn. This explain the difference observed without forgetting the influence of the ingested species on grazing (Coleman *and al.* 2003). The model animals have spent less time for resting/rumination than the complemented lots. The animals which spent enough time grazing on the stomach have less rumination (Tölü *and al.* 2016). This idea explains our difference observed between the complemented lots and the model ones.

The time taken by displacement represents 17.05% of the grazing time. This is higher than the 10.6% found by Babatroundé *and al.* (2009a). As for watering, our reported values corroborate those found by Babatoundé *and al.* (2009a) and which are respectively of 6.7% and 5.3%.

Number of Bites

The number of bites must at least 20 (Thomas and Chamberlain, 1990). Our values, 24.67 ± 4.15 and 23.01 ± 3.36 bites respectively in young bulls and suckler cows of the model lots, corroborate with his results. These results join also those obtained by Zoffoun *and al.* (2011) which revealed 23 to 27 bites on average per minute in Girolando bulls on pasture at *Panicum maximum*. On the other hand, the same authors declare 25 to 34 bites per minute on the *Panicum maximum* C1 pasture during the rainy season. Sidi (2009) observed a 27.2 bites grazing frequency in Borgou bulls weighting 120 kg. Our small reported values can be explained by the season and therefore the quality of the fodder. The complemented lots have shown low numbers of bites on pasture. This may be related to the time spent grazing lower than the one devoted by the model lot. It can also be explained by the attitude of these animals to select forage in the afternoon.

Weight of bites

For Zoffoun *and al.* (2011), the average weight of a bit varied from 0.36 to 0.54 g DM on the *Panicum maximum* C1 pasture. Our value found (0.49 ± 0.08 g DM) in the model group of bulls, corroborate with that of this author in bulls. However, the suckler cows in the control group ingested 0.96 ± 0.21 g DM, a higher value than those of these authors. This difference can be explained by the

weight of the females (324.5 ± 9.53 kg) higher than their bulls (264 to 260 kg). Complemented lots slightly high bites weights. This can be related to the low frequency of brewing.

Voluntary feed ingestion

During the rainy season in Republic of Benin, the Borgou bulls have ingested 96 g DM/kg P0,75 (Babatoundé *and al.* 2009a). Besides, this ingestion is fixed at 69.67 g DM/kg P0,75 on the *Panicum maximum* C1 in Girolando bulls by Zoffoun *and al.* (2011). De Paula *and al.* (2019) reported 19.17 kg DM/BW in the control group of bull calves in Brazil and 11-16 kg DM/BW in the complemented lots with a soya, wheat and sorghum concentrate on *Brachiaria decumbens* pasture. Our values, in suckler cows and young bulls are higher than the reported values. The difference can be explained by the weight of animals on grazing but also the season (Valente and al. 2014). Indeed, the improvement of the nitrogen nutrition of the animal stimulated its appetite and that nitrogen complementation favors voluntary ingestion (Mathis *and al.* 2000). But here, it is surprising to find a low pasture intake of complemented animals. Our results corroborates those of De Paula *and al.* (2019) which proved that the increase in concentrate intake in cows is simultaneously explained by a lower forage intake. The complemented animals would have a reflex involving complemental reception in the evening, able to cover their needs. Babatoundé *and al.* (2009a) have reported some results similar to ours on Djallonke sheep complemented and based on forage vegetables grown (*Chamaecrista rotundifolia* and *Aeschynomene histrix*) in the Republic of Benin.

Conclusion

This study was used to explain and understand the eating behavior and the ingestion of cattle complemented with sorghum brewer's on pasture. It shows that the complementation affects the time spent for grazing, time spent ruminating and resting, the number of bite per minute, the weight of the bites and therefore the quantity of dry matter ingested at the pasture of *Panicum maximum* C1.

In young bulls, grazing occupied 67.7% of time spent grazing in control lot but 62.99% and 62.05% in complemented lots. Resting/rumination occupied 7.88% of time spent grazing but 13.17 and 12.94% in complemented lots. On the suckler cow's side, grazing occupied 67.94% of time spent grazing but 64.70% and 63.52% in complemented lots. Resting/rumination occupied respectively 8.54% of time spent grazing but 11.77% and 12.96% in complemented lots. On average the cattle of the lot 1 ingested more than those in complemented lots, and the higher the complement, the fewer cattle graze. This will serve as a base for implementing a better strategy for using these pastures. High values are generally observed in uncomplemented cattles.

Perspectives

The effect of complementation based on sorghum brewer's being highlighted on the eating behavior and the ingestion of cattle on pasture, we will have to:

- Evaluate methane emissions on pasture in cattle supplemented with the same supplement;
- Establish equations for the quantities of methane emitted as a function of age, the quantity of sorghum brewer's ingested and its nutritional value;
- Determine the amount of this supplement from which its consumption becomes harmful to cattle.

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