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CUTTING EFFECTS ON ALFALFA (MEDICAGO SATIVA) GROWN UNDER UREA WITHOUT RHIZOBIUM MELILOTI FORAGE DYNAMICS

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ABSTRACT

In order to see the effects of cutting on the forage dynamics of alfalfa to which urea was added instead of Rhizobium meliloti, this study was conducted in one year.
A randomised full block design was used to conduct the trials. Four treatments were carried out with different doses of urea in experimental plots of 3 m by 1 m: a dose of 30g/plot; a dose of 40g/plot, a dose of 50g/plot and a last dose of 60g/plot. In addition to these treatments, there is the control which is alfalfa whose seeds have been inoculated.
Forage production has fluctuated over the course of ten cuts done. The results are as follows : dose 1, the minimum obtained is 1597.71 kg DM/ha obtained in section 1 and the maximum is 2704 kg DM/ha obtained in section 5 ; dose 2, the minimum is 1943.97 kg DM/ha obtained in section 1 and the maximum is 3394.8 kg DM/ha in section 5 ; dose 3, the minimum obtained is 2424.00 kg DM/ha obtained in section 8 and the maximum is 4255.97 kg DM/ha in section 3; dose 4, the minimum is 2288.00 kg DM/ha in section 8 and the maximum is 4501.01 kg DM/ha in section 1. For the control, the minimum dry biomass obtained is 1549.00 kg DM/ha obtained in section 3 and the maximum is 2719.01 kg DM/ha obtained in section 3. In every cut, leaf/stem ratio was superior to 0.5. The results of this work show that cutting has a strong impact on alfalfa forage production. After this, alfalfa yield producted in this study is better than natural forage yield production, it means that alfalfa can be a solution for animal feed to face forage problems.

Keywords: Cutting Effect, Forage Dynamics, Urea, Alfalfa, Rhizobium Meliloti

1. INTRODUCTION

The feeding of domestic ruminants during the dry season of the year is faced with enormous qualitative and quantitative difficulties in the Sahelian zone Zoungrana (2010), an area where fodder production is totally dependent on rainfall, this natural fodder production can barely ensure the maintenance of the animals (Yanra 2006).

Faced with this situation, which has a strong impact on the zootechnical productivity of herds, various alternatives are being put on the table to overcome it. Among these, one of the most common is fodder cultivation. These forage plants would certainly contribute to forage autonomy but also guarantee the availability of quality fodder at all times for the herd.

Among the multitude of forage plants, one stands out in particular for its multiple qualities: alfalfa (Medicago sativa). Adapted to various agro-climatic conditions Annicchiarico et al. (2010), alfalfa is a very nutritious fodder because it is rich in protein (Geren and al., 2009), all associated with a good forage yield per hectare and ease of crop establishment Çaçan & Kökten (2023). But one of the limitations of the plant is the need for inoculation with Rhizobium meliloti (a symbiotic bacterium specific to alfalfa) when it is first planted on soil that has never carried it. This is why this study set out to see the dynamics of forage yield by growing alfalfa without Rhizobium meliloti, but replacing it with urea.

2. MATERIALS AND METHODS

This study was conducted over a twelve-month period from October 2021 to September 2022. The site where this study was carried out is located at the experimental park of the Faculty of Agronomy of the Abdou Moumouni University of Niamey, located at latitude 13° 30' North and longitude 2°08' East Yenikoye et al. (1981).

The physico-chemical characteristics of the soil show that the soil has a sandy fraction high at 77% with an average rate of fine particles which gives it a sandy loam texture.The soil is slightly acidic with a pH of around 6.26 and a very low content of organic carbon, total phosphorus and available nitrogen Ambouta et al. (2020).

A complete randomized block system has been adopted. Thus, three blocks have been designed. Each block has 5 X 3 plots corresponding to the different treatments of the experiment and the control. Each treatment was repeated three times per block and each block repeated 3 times, resulting in a total of nine replicates per treatment and 45 plots in total. On each plot, a dose of 6 kg of bottom fertiliser, consisting of small ruminant manure, is applied before sowing. Sowing is done in rows at a rate of 10g of alfalfa seed per row (4 rows per plot, spaced 20cm apart) or 40g of seed per plot. At the end, after the cutting, which took place every thirty days, the weights of the plants, leaves and the completely stripped stem were determined using an electronic scale with a capacity of 400g. The water is provided in such a way that the plants do not have any water stress. First, a deep watering is done twice a week followed by two superficial waterings.

3. RESULTS AND DISCUSSION

3.1. RESULTS

At the end of the experiment, 10 cuts were made over 12 months of cultivation. Statistically significant variations were found between different cuts within the same treatment. Table 1, Table 2, Table 3, Table 4 and Table 5 give the forage yields and their dynamics as a function of the cuts and in the order from dose 1 to dose 4 and ending with the control.

Table 1

Table 1 Vegetative Parameters and Forage Dynamics of Alfalfa of Rate 1 as a Function of Cuts

	Foot weight (g)	Stem weight (g)	Leaf weight (g)	Tillers	Height (cm)	Yield (Kg DM/ha)	Ratio
c1	22,26±5,78 ad	13,71±3,67 a c	8,95±2,83 a	16,43±6,74 a	81,36±13,94 a	1597,71±526,95 a	0,67±0,09 ab
c2	18,85±1,34 abcd	11,1±1,24 ab c	7,75±1,42 a b	21,35±1,42 b	67±8,55 b	1781,99±384,62 ab	0,8±0,06 ab
c3	19,35±7,49 acd	11,65±4,94 a bc	7,95±2,66 a b	21,35±3,81 b	55±13,75 c	1937,51±318,54 ab	0,68±0,08 ab
c4	13,25±8,48 b	8±5,38 b	5,25±3,34 b	31,4±3,66 c	60,45±5,52 b	1783,99 378,27 ab	0,66±0,14 ab
c5	31,4±4,35 e	18,35±3,06 d	12,5±2,26 e	32,4±4,48 c	88,3±14,89 a	2704,08±378,27 c	0,66±0,09 ab
c6	15,05±4,75 bc	8,9±3,36 b	6,15±2,07 a b	15,45±3,61 a	49,35±12,90 c	1655,99±612,82 a	0,71±0,26 ab
c7	7,2±12,30 f	4,15±7,73 e	3,05±4,63 c	17,3±4,79 a	55,5±18,36 c	1775,99±742,41 ab	0,78±0,34 ab
c8	15,9±4,45 bc	8,8±3,13 b	7,55±2,83 a b	15,15±6,74 a	55,5±13,94 c	1743,94±526,95 ab	0,94±0,46 b
c9	17,45±2,64 abcd	11,1±2,11 ab c	6,35±1,14 a b	16,25±7,41 a	55,25±10,15 c	2191,92±509,06 b	0,58±0,15 a
c10	14,6±5,72 bc	8,65±3,92 b	5,95±2,62 b c	19,15±2,93 ab	54,2±8,39 c	1937,51±230,40 b	0,79±0,11 ab

The elements in columns, accompanied in power by the same letters, are statistically not different (P<0.05 according to the Tukey test); c = section; g = gram, cm = centimetre; kg DM/ha = kilogram of dry matter per hectare; ratio = leaf to stem ratio.

Observation of this table shows that the weight of the plants, as well as that of the stems and leaves (the three being strongly related) varied greatly over the ten cuts made to alfalfa. The maximum weights for these vegetative parameters were obtained at the 5th cut with 31.4g; 18.35g; 12.5g while the minimums are obtained at the 7th cut with 7.2g in order; 4.15 g; 3.05g in the order of appearance in the table above. The number of tillers per main alfalfa plant also varied greatly and irregularly throughout the production cycle. For this parameter, the maximum number of tillers is obtained at the 5th cut with 32.4 tillers and the minimum at the 8th cut with 15.15 tillers per plant. In terms of the height of the plants at cutting, cut 5 with 88.3 cm in height is the maximum obtained while the 6th cut gave the smallest height with 49.35 cm. At this level too, there is a significant variation in height depending on the alfalfa cuts. As for the forage dry matter harvested, there is also a strong disparity between the cuts. The largest harvest is made at the 5th cut for a dry fodder biomass of 2704.08 kg DM/ha on average while the lowest forage yield is obtained at the 1st cut with 1597.71 kg DM/ha. The best leaf to stem ratio appears at the 8th cut (0.94) and the lowest at the 9th cut (0.58).

Table 2

Table 2 Vegetative Parameters and Forage Dynamics of Alfalfa of Rate 2 as a Function of Cuts

	Foot weight (g)	Stem weight (g)	Leaf weight (g)	Tillers	Height (cm)	Yield (Kg DM/ha)	Ratio
c1	20,58±11,73 a	8,95±6,26 a	11,63±5,90 a	14,05±2,98 a	81,44±9,86 a	1943,97±248,05 a	0,76±0,24 a

c2	11,3±1,78^{b}	5,55±1,88^{b}	5,75±0,94^{b}	17,2±4,07^{ab}	83,2±6,60^{a}	2399,9±435,70^{ab}	0,87±040^{a}
c3	19,15±10,83^{a}	7,95±6,26^{ab}	11,2±5,12^{a}	17,55±3,31^{ab}	41,4±7,59^{b}	2223,96±378,75^{ab}	0,7±0,24^{a}
c4	18,5±3,45^{a}	7,1±2,47^{ab}	11,4±11,37^{a}	24,05±6,77^{c}	93,3±10,69^{d}	2944,08±250,38^{dc}	0,64±0,12^{a}
c5	17,3±4,39^{a}	6,95±2,97^{ab}	10,34±1,82^{a}	19,5±2,50^{bc}	96,4±7,68^{d}	3394,8±269,67^{d}	0,69±0,19^{a}
c6	15,95±2,94^{ab}	6,4±2,23^{ab}	9,55±1,23^{a}	16,35±2,68^{ab}	62,75±6,11^{c}	2247,98±455,10^{ab}	0,69±0,16^{a}
c7	15,95±2,45^{ab}	6,45±1,84^{ab}	9,5±2,74^{a}	16,55±2,23^{ab}	48,35±12,75^{abc}	2543,97±624,19^{bc}	0,73±0,39^{a}
c8	16,32±2,96^{ab}	7,23±1,79^{ab}	8,9±2,38^{ab}	17,32±3,85^{ab}	70,5±16,01^{c}	2246,45±451,19^{ab}	0,51±0,31^{b}
c9	16,25±2,45^{ab}	6,95±1,75^{ab}	9,3±2,23^{ab}	16,75±2,51^{ab}	55,25±6,78^{bc}	2215,92±386,36^{ab}	0,78±0,31^{ab}
c10	19,4±6,68^{a}	8,1±3,70^{ab}	11,3±3,37^{a}	18,4±3,37^{b}	49,5±12,12^{ab}	2401,97±835,06^{ab}	0,72±0,26^{a}

The elements in columns, accompanied in power by the same letters, are statistically not different (P<0.05 according to the Tukey test); c = section; g = gram, cm = centimetre; kg DM/ha = kilogram of dry matter per hectare; ratio = leaf to stem ratio.

This table shows that the various vegetative parameters have fluctuated a lot during the alfalfa production cycle. Thus, we notice that the weight of the feet varies from 20.58 g obtained at the first cut to 11.3 g, the minimum value obtained with the 2nd cut. Thus the values of the stems and leaf weights followed. Regarding the number of tillers, it also varied greatly, but without being linked to the variation in the weight of the feet. Indeed, for the number of tills, the largest number is obtained with the 4th cut (24.05 tills) while the smallest is at the level of the 1st cut (14.05 tills). The height of alfalfa at cutting also varied depending on the cut. This variation was made without following those of the weight of the feet or the number of tillers. The tallest plants are obtained at the 5th cut (96.4 cm) while the shortest plant is at the level of the 3rd cut with a height of 41.4 cm. This variation is also visible in the forage yield obtained by cutting and is not directly related to the previous parameters. The 5th cut with the highest forage yield (3394.8 kg DM/ha) does not have the best foot weight or the number of tillers (17.3 g and 19.5 tillers respectively). Similarly, the smallest forage yield obtained with cut 1 (1943.97 kg DM/ha) does not have the smallest of the foot weights and the number of tillers (20.58 g; 14.05 tillers respectively). As for the forage quality of alfalfa, it appears at the level of the 2nd cut with a lef to stem ratio of 0.87 while the lowest is obtained at the 8th cut with a leaf to stem ratio of 0.51. Again, there is no direct link between this ratio and forage yield or vegetative parameters.

Table 3

Table 3 Vegetative Parameters and Forage Dynamics of Alfalfa of Rate 3 as a Function of Cuts

	Foot weight (g)	Stem weight (g)	Leaf weight (g)	Tillers	Height (cm)	Yield (Kg DM/ha)	Ratio
c1	20,4±9,18^{b}	11,44±1,57^{c}	3,01±0,92^{a}	31,65±3,51^{d}	86,3±11,01^{d}	3633,59±680,3^{cd}	0,51±0,22^{a}
c2	8,23±2,16^{a}	3,65±1,41^{ab}	4,58±1,48^{a}	31,65±3,51^{d}	104,05±8,96^{e}	4023,96±705,76^{de}	0,83±0,13^{c}

c3	5,28±1,46[a]	2,92±1,14[a]	2,36±0,74[a]	36,95±4,05[d]	94,05±20,66[de]	4255,96±238,49[e]	0,81±0,47[c]
c4	7,05±1,39[a]	4,15±0,98[ab]	2,9±0,78[a]	16,5±4,79[a]	44,75±4,74[a]	2671,94±407[a]	0,74±0,34[ab]
c5	28,75±7,34[c]	17,75±3,75[d]	11,1±5,07[c]	28,5±2,81[d]	70,9±3,36[c]	3399,94±462,24[bc]	0,63±0,23[ab]
c6	20,6±4,70[b]	12,4±3[c]	8,2±2,13[b]	22,1±2,93[c]	56,3±7,34[b]	2808±329,27[ab]	0,59±0,14[ab]
c7	20,65±0,94[b]	13±1,17[c]	7,65±1,34[b]	21,2±1,72[bc]	62,45±6,78[bc]	3008±415,01[ab]	0,58±0,48[ab]
c8	19,7±1,38[b]	12,6±1,58[c]	7,1±1,65[b]	19,15±2,64[abc]	55,65±9,74[ab]	2424±539,12[a]	0,86±0,20[c]
c9	19,2±211[b]	7,1±1,16[b]	12,1±1,97[c]	19,15±4,71[abc]	61,85±16,87[bc]	2791,98±405,65[ab]	0,47±0,15[a]
c10	30,55±10,29[c]	17,85±4,75[d]	7,65±2,62[b]	18,3±3,34[ab]	65,7±8,39[bc]	2928±405,95[b]	0,45±0,21[a]

The elements accompanied in column by a power; of the same letters are not statistically different (P<0.05 according to the Tukey test); c = cut; g = gram, cm = centimeter; kg DM/ha = kilogram of dry matter per hectare; ratio = leaf/stem ratio.

This table also shows strong fluctuations in the different vegetative parameters linked to forage production and the forage produced from one cut to another. We notice the greatest weight of the plant (correlated with those of the stems and leaves) appearing at the 10th cut while this cut has a number of tillers of 31.65; a cutting height of 86.3 cm, a dry matter yield of 3633.59 kg DM/ha and a leaf to stem ratio of 0.51 which is the lowest of the leaf to stem ratios out of all 10 cuts made during the production cycle. Although having the best plant weight, this cut does not have the greatest number of tillers (obtained at cut 3 with 36.95 tillers), nor the highest plant height which appears at cut 2 with a 104.05 cm high and the smallest at cut 4 with 44.75 cm. The same goes for the forage yield, the highest of which is found at the level of cut 3 with 4255.96 kg DM/ha compared to 2424 kg DM/ha, the lowest forage yield obtained with cut 8. Leaf to stem ratio which is visible at cut 8 with 0.86, although this presents the lowest forage yield.

Table 4 gives the forage production of rate 4 according to the cuts.

Table 4

Table 4 Vegetative Parameters and Forage Dynamics of Alfalfa of Rate 4 As a Function of Cuts

	Foot weight (g)	Stem weight (g)	Leaf weight (g)	Tillers	Height (cm)	Yield (Kg DM/ha)	Ratio
c1	10,14±2,25[a]	5,7±1,78[a]	2,96±0,92[a]	31,19±3,51[d]	108,79±13,31[e]	4501,52±780,48[d]	0,57±0,26[a]
c2	20,47±12,60[bcd]	12,47±7,94[bc]	8±4,67[bc]	31,05±3,51[d]	101,9±9,5[de]	4023,6±705,79[cd]	0,67±0,44[a]
c3	24,3±11,02[cde]	15,05±7,75[cd]	8,14±5,3[bc]	36,65±4,05[e]	98,7±6,07[d]	4255,4±123,49[d]	0,5±0,14[a]
c4	26,1±12,24[de]	14,75±6,98[cd]	11,04±5,77[cd]	17,5±4,79[a]	86,84±9,53[c]	3447,6±513,32[bc]	0,76±0,3[a]
c5	17,1±2,73[a][bc]	10,5±2,60[ab][c]	6,6±2,92[ab]	20,5±2,81[d]	48,25±5,24[a]	4127,7±633,73[cd]	0,71±0,49[a]
c6	14,9±2,12[a][b]	8,7±1,68[ab]	6,2±1,64[ab]	22,1±3,06[c]	58,2±7,33[ab]	2968,8±295,07[ab]	0,74±0,24[a]
c7	15,85±4,25[ab]	10,1±2,88[ab][c]	5,75±2,19[a][b]	20,2±1,73[bc]	63,2±9,20[b]	2599,2±576,42[b]	0,58±0,22[a]

c8	16,95±2,52 abc	11±2,05 bc	5,95±2,98 a b	24,15±2, 64 abc	56,05±6,5 9 ab	2288±547,6 1 ab	0,59±0, 27 a
c9	20,1±4,03 bc d	13,15±3,24 bcd	6,95±1,98 b	19,15±4, 71 abc	56,05±17, 13 ab	2503,2±575, 78 ab	0,57±0, 21 a
c1 0	31,05±10,4 6 e	17,85±5,76 d	13,2±4,85 d	19,3±3,3 4 ab	65,25±11, 52 b	2544±512,8 5 b	0,73±0, 3 a

The elements accompanied in column by a power; of the same letters are not statistically different (P<0.05 according to the Tukey test); c = cut; g = gram, cm = centimeter; kg DM/ha = kilogram of dry matter per hectare; ratio = leaf/stem ratio.

In this table, cut 10 has the best foot weight (31.05g) while this cut does not give the largest number of tillers which appears in the 3rd cut with 36.65 tillers is found with a number of tillers of 19.3. The maximum height of the plants in dose 4 is obtained from the first cut with a height of 108.79 cm and the minimum appears in section 5 with a height of 58.2 cm. However, it can be seen that cut 1 gave the best forage yield (4501.52 kg DM/ha) while the lowest forage yield only appears at the 8th cut with a forage yield of 2288 kg DM/ha. Finally, as for the leaf to stem ratio, it can be seen from the table that section 4 has the best ratio with 0.76 while section 3 has the lowest leaf to stem ratio (0.5) although it does not have the lowest forage yield. All vegetative parameters varied irregularly between the different cuts, often with strong fluctuations (for example, for the forage yield going from 4501.52 at the 1st cut to 2288 at the 8th cut). The table therefore does not allow a direct link to be made between the vegetative parameters, the dry matter yield and the leaf to stem ratio. Indeed, for a parameter considered, a section presenting a piece of data does not present it in the same order for another parameter.

Table 5 below shows forage production by cut for the control.

Table 5

Table 5 Vegetative Parameters and Forage Dynamics of Control Alfalfa as a Function of Cuts

	Foot weight (g)	Stem weight (g)	Leaf weight (g)	Tillers	Height (cm)	Yield (Kg DM/ha)	Ratio
c1	20,32±7,88 cd	11,52±5,05 bcd	8,57±3,15 c de	32,26±2, 68 b	88,84±14, 89 e	2719,01±467 ,32 d	0,75±0, 09 ab
c2	7,65±11,5 a	4,37±7,15 a	3,27±4,66 a	16,5±2,6 8 a	81,15±8,9 4e	1824,94±384 abc	0,87±0, 61 ab
c3	22,3±5,77 cd	13,45±3,91 d	8,85±2,25 d e	16,5±2,6 8 a	80,9±8,94 e	1549±427,24 a	0,67±0, 61 ab
c4	17,8±2,13 e	10,9±1,16 bc d	6,9±1,24 bcd	31,4±7,6 1 b	60,45±7,6 1 bc	2011,32±507 ,62 abc	0,65±0, 14 ab
c5	29,45±6,32 bcd	18,6±4,08 e	11,25±2,58 e	32,4±2,0 8 b	88,3±14,8 9 e	2623,29±467 ,32 d	0,61±0, 09 a
c6	17,25±3,32 ab	10,15±2,11 bcd	7,1±2,01 bcd	18,4±3,3 7 a	49,5±12,1 2 abd	2272,31±835 ,06 bcd	0,73±0, 26 ab
c7	13,35±1,39 ab	8±0,98 ab	5,35±0,78 a b	16,5±4,7 9 a	44,75±4,7 4 a	2258,12±407 ,88 bcd	0,73±0, 34 ab
c8	15,9±4,45 bc d	8,8±3,13 bcd	7,55±2,83 b cd	15,25±2, 91 a	54,5±1,94 abc	1757,65±596 ,50 ab	0,94±0, 46 b
c9	15,15±2,64 bc	9,2±2,11 abc	5,95±1,14 a bc	16,35±4, 82 a	65,25±11, 52 cd	2379,56±512 ,85 cd	0,62±0, 15 ab
c1 0	20±2,64 cd	12,15±2,11 bcd	7,65±1,14 b cd	18,3±3,3 4 a	65,7±8,39 d	2703,3±405, 95 d	0,62±0, 11 a

The elements accompanied in column by a power; of the same letters are not statistically different (P<0.05 according to the Tukey test); c = cut; g = gram, cm = centimeter; kg DM/ha = kilogram of dry matter per hectare; ratio = leaf/stem ratio.

In this table, it can be seen that section 5 (with 29.45g) has the best foot weight, the best number of tillers (32.4; (differences not significant with section 1 and 4); P<0.05). As for the height of the plants at the cut, the first cut showed the tallest plants with 88.84 cm and the shortest are obtained at cut 7 with 44.75 cm. Regarding the forage yield, the best yield is obtained at the 1st cut with 2719.01 kg DM/ha and the lowest with the 3rd cut which has a forage yield of 1549 kg DM/ha. In terms of leaf to stem ratios, the best ratio is observed at section 8 with 0.94 and the lowest with section 5 giving a leaf to stem ratio of 0.61. This table also does not allow a direct link to be made between the different vegetative parameters during the 10 cuts carried out over the entire forage production cycle. Indeed, even if cut 1 gave the best values in terms of plant weight, cutting height and forage yield (respectively 20.32g; 88.84g; 2719.01 kg DM/ha), it does not present the best values in terms of the number of tillers and the leaf to stem ratio. But this is not homogeneous with all cuts. This is the case, for example, of cut 2 which has the lowest foot weight (7.65g), while in terms of the number of tills, the height at the cut, the forage yield and the leaf to stem ratio, it does not have the lowest values (respectively 16.5 tills; 81.15 cm; 1824.94 kg DM/ha; 0.87).

During the 12 months of production that allowed 10 forage cuts to be made, significant fluctuations in forage yield were observed. This is illustrated in Figure 1. It shows this forage fluctuation for all 4 treatments and the control at the same time.

Figure 1

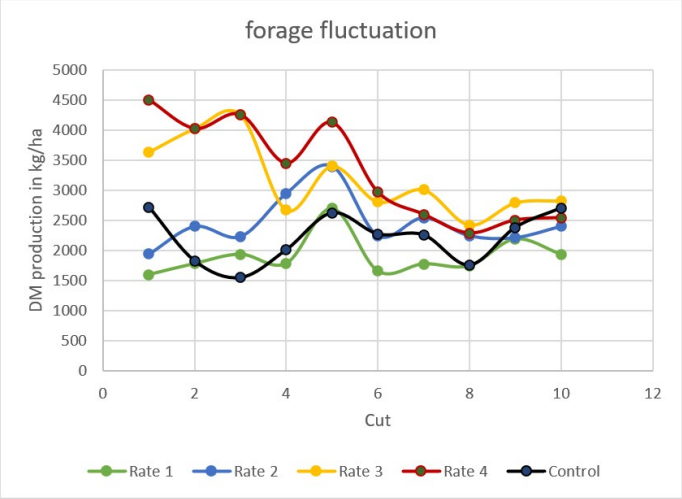

Figure 1 Forage Fluctuation for all 4 Treatments and the Control

Figure 1 shows a decrease in forage production over time, but this decrease was uneven from one section to the next for all 4 doses and the control. Rate 4 gave the best forage yield at the first cut with an average of 4496.05 kg DM/ha while rate 2 gave the lowest forage yield with 2704 kg DM/ha at the same cut. Of the 10 cuts carried out, rate 1 was the one with the lowest forage yields over the entire production cycle, with yields of 1488 and 1549 kg DM/ha respectively in the 2nd and 3rd cuts. On the other hand, dose 4 is the one that has experienced the greatest drop. Its production has increased from 4496.05 kg DM/ha at the first cut to 2672 kg DM/ha at the 4th cut. Rate 2 had the lowest forage yield at the first cut and

increased its forage production to peak at the 5th cut when it produced 3394.80 kg DM/ha. At the last cut of forage production, all rates had lower yields than the first cut except for rate 1 where the yield which was 2704 kg DM/ha at the first cut increased to 2928 kg DM/ha at the last cut.

Figure 2 relates the leaf to stem ratio of plants, which is a way of expressing the forage quality of alfalfa, to the number of tillers per main alfalfa plant.

To read the figure, multiply the number of tillers by 10

Figure 2

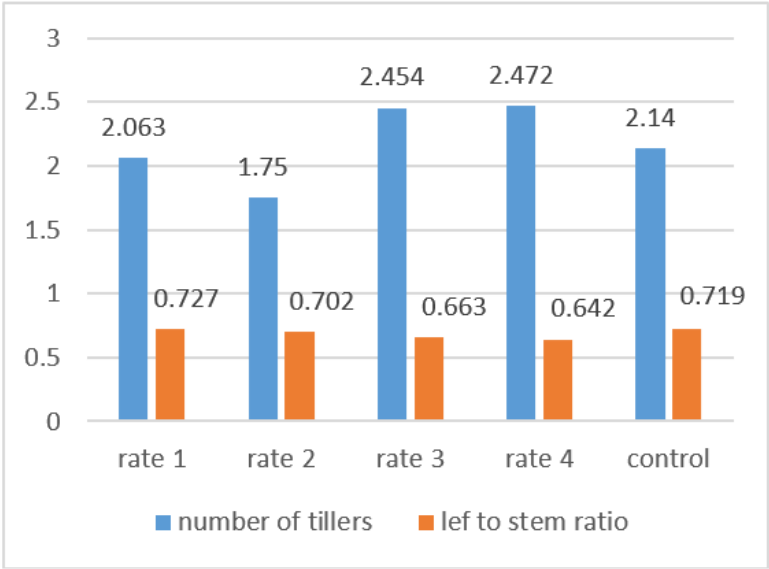

Figure 2 Effect of the Number of Tillers on the Leaf to Stem Ratio

4. DISCUSSION

The number of cuts (ten cuts) of alfalfa carried out over the twelve months of production could be greater if the frequency (30 days apart) of cutting was not defined in advance. On the other hand, it must be taken into consideration that the first cut took place more than two months after the alfalfa was established (80 days after sowing). The heights obtained varied greatly from one cut to another during the production cycle and from one dose to another. It should be noted that the maximum heights obtained range from dose 4 (60g/plot) having received the largest quantity of urea to dose 1 (30g/plot) having received the smallest quantity. The maximum heights obtained are 108.79 cm; 104.15 cm; 96.40 cm; 88.84 cm; 88.3 cm respectively at the 1st cut for dose 4; at the 2nd cut for dose 3; at the 5th cut for dose 2; at the 1st cut for the control and at the 5th cut for dose 1. This shows that overall, urea acted on the height of alfalfa plants. Indeed, this fertilizer leads to a perfect development of leaves, buds and stems in the development of a plant and is the nutrient that influences yield the most, so it is considered the engine of plant growth Gagno (2009). In this study, the minimum height obtained is 88.3 cm obtained with dose 1 at the 5th cut, this height is higher than that obtained by Gezahegn et al. (2022) on different alfalfa varieties with a maximum height of 79.40 cm, and also the height obtained by Yowook et al. (2022). with a maximum height of 50.50 cm on different alfalfa varieties grown in climatic conditions of the Korea south. However, the minimum height obtained in this study being 41.4 cm with dose 2 at the 3rd cut is lower than the minimum height of 64.2 cm obtained in the same study by Gezahegn et al. (2022). These results are lower than those obtained by

Tewodros et al. (2012), who obtained a maximum height of alfalfa plants of 127.2 cm, as well as the minimum height obtained by the latter, which is well above those obtained in this study (83.7 cm 41.4 cm in this study). The number of tillers also contributes to the forage yield of alfalfa. Indeed, the importance of the number of tillers per alfalfa plant is decisive in the forage yield. The results of this study show that the number of tillers influenced forage yield. In terms of dose, the highest number of tillers is obtained at the 5th cut with 32.4 tillers corresponding to the best forage yield of 2704.08 kg DM/ha. Similarly, at dose 4 and control, the greatest number of tillers was obtained at section 5 and for control 4 with 32.4 tillers. In a study on the effectiveness of alfalfa in producing nodules following the application of nitrogen fertilizer, Oliveira (2022) obtained a maximum number of tillers of 53 per alfalfa plant and a minimum number of 44 tillers per plant Wladecir et al. (2014). This higher number of tillers than that obtained in this study can be explained by the fact that the non-inoculation of alfalfa affects the development and forage yield of the plant. On the other hand, the forage yield obtained by Oliveira (2022) is lower than the yields obtained in this study. The maximum obtained in their study is 2720 kg DM/ha while in this study the maximum obtained is 4255 kg DM/ha, obtained with dose 4 at the 3rd cut. Ibriz et al. (2004) reported that the application of nitrogen to alfalfa in the absence of any inoculation with Sinorhizobium, positively improves the above-ground biomass of the different alfalfa genotypes. These yields obtained in this study are everywhere higher than the natural forage yield in the Sahel zone, which is less than one tonne of dry matter per hectare. These yields are also higher than those of the main forage cowpea varieties grown in Niger such as TN256-87 (1425kg/ha) and IN92E-26 (1226 kg/ha) Ousseina (2020), Ado (2014) which has good forage aptitude with a haulm yield of 1174 kg/ha. Indeed, the urea added to alfalfa boosts leaf yield and plant growth, combined with the number of tillers to obtain high forage yields. Mekuanint et al. (2015), obtained significant differences on vegetative parameters, forage yield and leaf/stem ratio according to cuts on different alfalfa varieties. The maximum ratio they had is 1.3 and the minimum is 0.4 obtained. Overall, it can be said that in both studies, the forage quality of alfalfa, physically assessed on the basis of the leaf/stem ratio, is more or less the same. Alfalfa in this study had dry grassland yield within the range reported in the literature, even under drought and adverse environmental conditions. During the first year of vegetation, under severe drought conditions, Maria (2007) reported that average yield values for alfalfa are 3 t/ha DM. Logging cycles had a significant effect on total biomass yield, in agreement with the discovery of Julier & Huyghe (1997). The study by Neal et al. (2006) found that the cutting interval, which has a direct impact on maturity, had a stronger influence on grassland yield and quality, which is consistent with this study. But in this study, neither the felling nor the seasons drastically reduced forage productivity. In fact, in a forage plant, yield and survival are the best measures of adaptation to cultural and environmental conditions. The study of the distribution of production over one or more years, and of the ability to produce at different periods may be additional information Jones & Walker (1983). The variation in forage yield with cuts showed that when yield is high, the leaf-to-stem ratio decreases. On the other hand, when the yield decreased, the leaf/stem ratio increased. Indeed, the proportion of the stems weighs heavily in determining forage yield. This is similar to the study by Davodi et al. (2011) where it demonstrated that dry matter yield was negatively correlated with the leaf-to-stem ratio.

5. CONCLUSION

This study on the dynamics of alfalfa forage yield as a function of cuts showed strong variations over the ten cuts carried out on alfalfa over the entire production cycle. This fluctuation in yield was accompanied each time by variations in certain vegetative parameters such as the number of tillers per plant and the height of the plants at cutting. The forage yields obtained in this study show that alfalfa could be an alternative to deal with the forage problem that the animals face. But we have to know if this fluctuation in forage yield depending on the cuts cannot have consequences on the nutritional value of the plant as well as the supply of urea ?

CONFLICT OF INTERESTS

None.

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