Universidad Austral de Chile
Facultad de Ciencias Agrarias

Technical report

Convention Universidad Austral from Chile - Tattersal

Evaluation of foliar fertilizers on the growth of a perennial Prairie dominated by *Lolium perenne* in wintertime.

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INTRODUCTION

In the South of Chile, the growth of the prairie in winter period is reduced by low prevailing temperatures. For this reason, it appears as attractive the possibility of using agrochemicals leaf with the objective of increasing growth and consequently the kg of dry matter produced in times where prairie growth rate is constraint.

Therefore, the overall objective of this study was to evaluate the effect of foliar fertilizers on the growth of a prairie dominated by *ballica perenne* in wintertime.

The specific objective was to determine the effect produced by foliar fertilizers of commercial company TATTERSAL, applied as supplementary fertilization on the yield of dry matter of a permanent prairie in winter season, the 10, 20, 30 and 40 days after applied.

MATERIALS AND METHODS

The study was carried out in the Station Experimental Agricultural of the University Austral of Chile, located 7 kilometers north of the city of Valdivia, Valdivia province, Los Ríos region, Chile.

The experiment was established in a prairie of *Lolium perenne* in a soil Typical Hapludand, series Valdivia.

First was a cut to 5 cm to homogenize the height of the Prairie. Subsequently applied 30 kg N / ha in the form of urea to the every surface (540 m). Seven days after homogenization cut applied foliar fertilizers

The trial consisted of 5 treatments listed below.

T1: Control (only application of nitrogen)

T2: Tattersall leaf A: METALOSATE CROP UP, dose 1 Lt / ha.

T3: Tattresall leaf B: NATURAMIN, dose 1 kg / ha.

T4: Tattersall Foliar A+B: M. Crop Up 1 L/ha + Naturamin 0.5 kg/ha.

T5: Commercial product: Graze More, dose 3 Lt / ha.

The experimental design consisted of complete blocks at random with 5 treatments and four blocks. The plots were 6 m long and 4 m wide (24 m^2).

Subsequent to the application of fertilizers is waited a week to make the first cut of a total of four, each separated by at least 10 days, depending on the weather conditions (avoided cutting on rainy days). Cut dates were:

Cut 1 = 04-08 - 2014

Cut 2 = 18-08 - 2014

Cut 3 = 04-09 - 2014

Cut 4 = 24-09 - 2014

Each plot was divided into 4 equal parts, each 1 m wide and cut a sub-plot for each assessment date. The experimental design is shown in Figure 1.

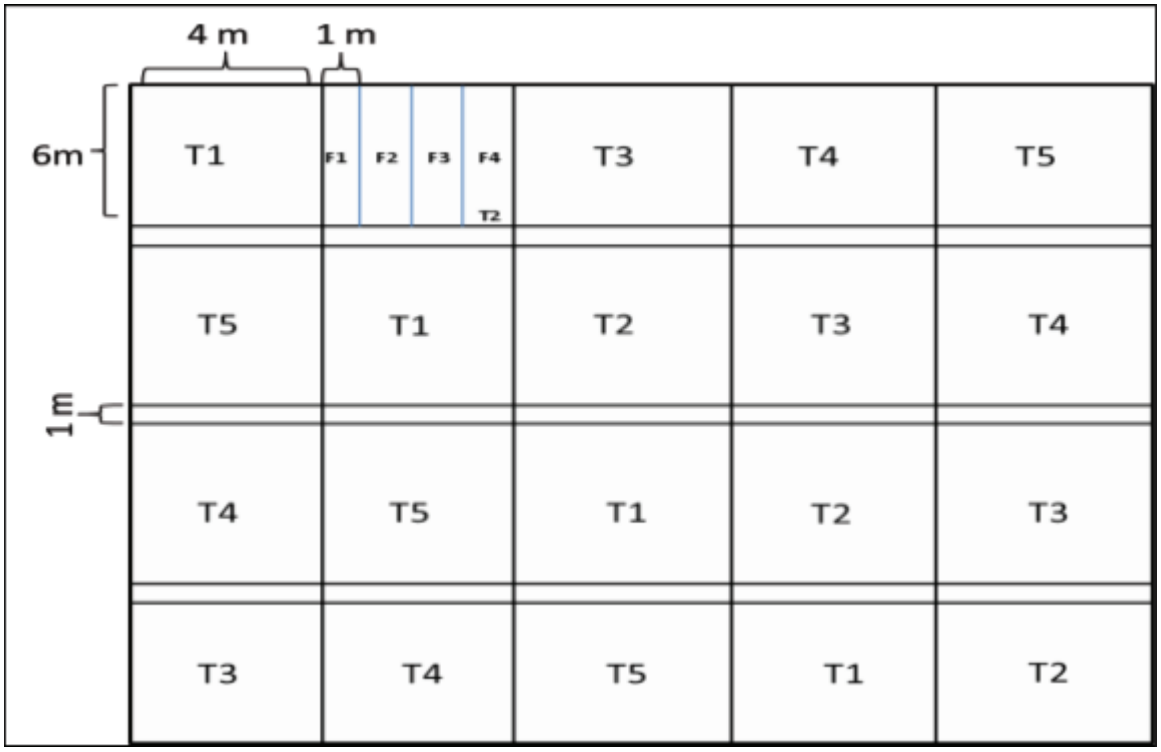

Figure 1. Diagram of the layout of blocks and treatments and cut of the test method.

Samples collected in each sub-plot and each cut were heavy and dried in an oven with forced air at 65 ° C for 48 hours; The performance is expressed in kg of dry matter by ha.

RESULTS

Table 1 and Figure 2 shows the results obtained in four made cuts. It is observed that there were no statistically significant differences in the production of dry matter and rate of growth among the different treatments applied. In the annexes are attached the original data of each parcel and the analysis of variance by cut. It is evident that the Prairie was growing through the evaluation period so the yields obtained in the fourth cut was significantly higher than the previous. The growth rate which corresponds to the average growth between the first and fourth equal cut that in the previous case was not statistically different among treatments.

Table 1. Dry matter yield for the five treatments on four dates of growth rate average of 50 days of evaluation and measurement.

Treatment	Cut 1	Cut 2	Cut 3	Cut 4	Rate growth
	Kg DM / ha	Kg DM / ha	Kg DM / ha	Kg DM / ha	Kg MS/ha/d
T1	a 117.4	173,3 a	240,5 a	351,3 a	4.7 a
T2	110.5 a	168,0 a	280,2 a	357,9 a	4.9 a
T3	101.8 a	196,0 a	246,5 a	369,0 a	5.4 a
T4	98.2 a	165.5 a	296,4 a	375,9 a	5.6 a
T5	82.3 a	155.9 a	313,8 a	382,2 a	6.0 a

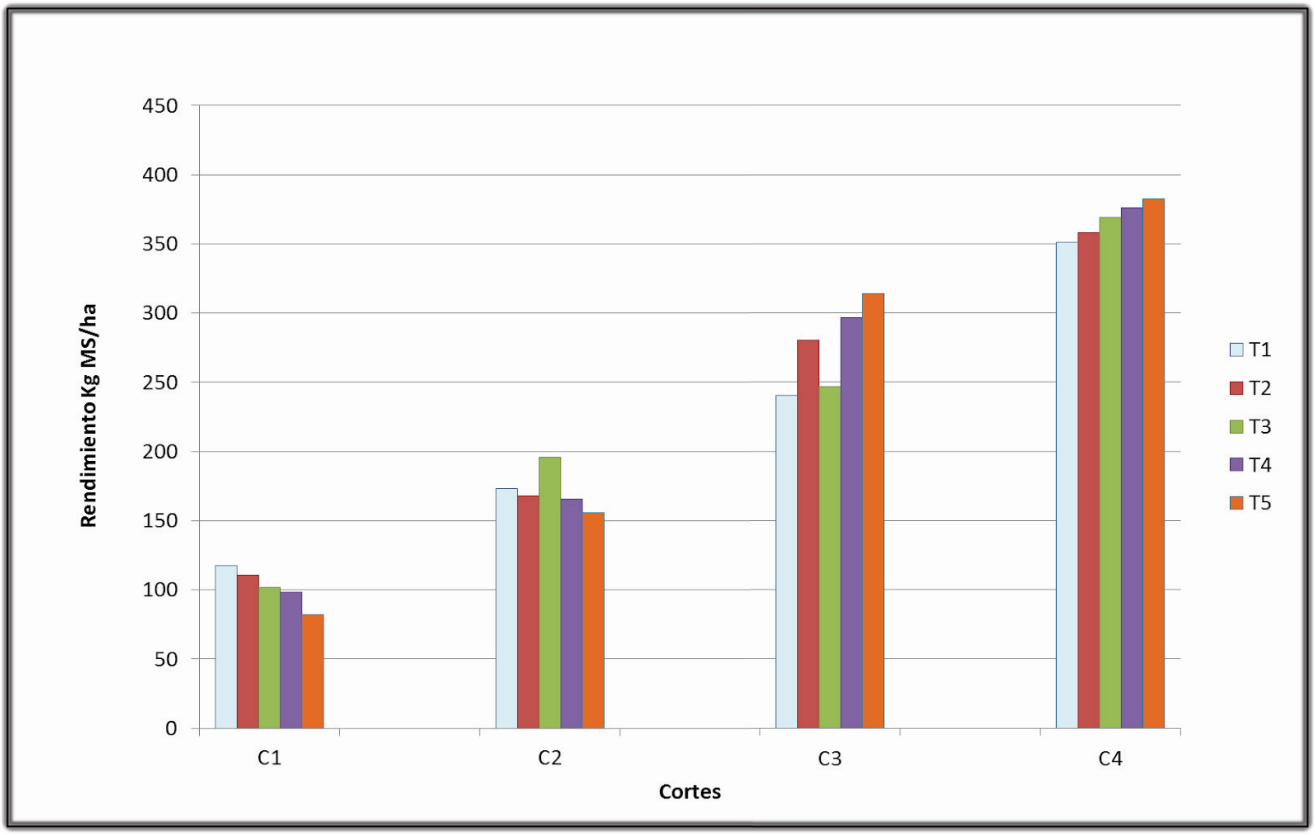

Figure 2. Kilograms of dry matter / ha in the 5 treatments made in four cuts.

CONCLUSION

The application of the different products which make up the treatment of this experiment, on a prairie of *ballica perenne* in winter not generated no statistically significant differences in dry matter production by has in the growth rate during a 50-day evaluation period.

ANNEXES

TABLE - Chemical analysis of soil was made the trial

Parameter	Value
Sampling depth	20 cm
pH in water (1: 2.5)	6.0
organic matter (%)	14.7
N Mineral (N-NO_3+ NH_4) (mg/kg)	74.9
Phosphorus Olsen (mg/kg)	15.1
Exchangeable potassium (mg/kg)	98
Exchangeable sodium (mg/kg)	0.08
Exchangeable calcium (cmol+/ kg)	5.03
Exchangeable Mg (cmol+/ kg)	0.37
Sum bases (cmol + / kg)	5.72
Exchangeable Al (cmol + / kg)	0.07
CICE (cmol + / kg)	5.79
Aluminum saturation (%)	1.2

PERFORMANCE BY CUTTING DATA

PERFORMANCE CUT 1
04-08-2014

C1	Treatment	Block	Kg MS/ha
1	1	1	217,0
1	1	2	97.3
1	1	3	88.8
1	1	4	66.7
1	2	1	91.3
1	2	2	163,8
1	2	3	67.3
1	2	4	119.8
1	3	1	105.3
1	3	2	86.2
1	3	3	68.7
1	3	4	147,3
1	4	1	142,0
1	4	2	81.8
1	4	3	106.5
1	4	4	62.3
1	5	1	91.0
1	5	2	73.7
1	5	3	90.7
1	5	4	73.8

PERFORMANCE
CUTTING 2
18-08-2014

C2	Treatment	Block	KgMS2
2	1	1	248,8
2	1	2	150,0
2	1	3	154.8
2	1	4	139,8
2	2	1	198,2
2	2	2	137,0
2	2	3	157,2
2	2	4	179,5
2	3	1	210,5
2	3	2	150,3
2	3	3	241,8
2	3	4	181,3
2	4	1	231,7
2	4	2	171.3
2	4	3	104,3
2	4	4	154.8
2	5	1	200.8
2	5	2	168,3
2	5	3	130,3
2	5	4	124,0

PERFORMANCE CUTTING 3
04-09-2014

C3	Treatment	Block	Kg DM / has
3	1	1	207,33
3	1	2	297,83
3	1	3	207,50
3	1	4	249,17
3	2	1	189,83
3	2	2	291,83
3	2	3	269,83
3	2	4	369,33
3	3	1	227,83
3	3	2	262,50
3	3	3	219,33
3	3	4	276,50
3	4	1	217,00
3	4	2	300,67
3	4	3	329,00
3	4	4	338,83
3	5	1	307,83
3	5	2	292,50
3	5	3	316,50
3	5	4	338,33

	Treatment	Block	Kg MS/ha
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PERFORMANCE
CUTTING 4
24-09-2014

C4	Treatment.	Block	KgMS / has
4	1	1	291,0
4	1	2	355,2
4	1	3	332,7
4	1	4	426.2
4	2	1	196.5
4	2	2	350,2
4	2	3	468,3
4	2	4	416,5
4	3	1	504,0
4	3	2	411,8
4	3	3	310,5
4	3	4	249,8
4	4	1	382,0
4	4	2	419,5
4	4	3	375,7
4	4	4	326,2
4	5	1	336,8
4	5	2	376,7
4	5	3	373,2
4	5	4	442,0

	Treatment	Block	KgMS/ha
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AVERAGE GROWTH RATE

from 04-08-2014 to 24-09-2014

Treatment	Block	RATE GROWTH
1	1	1.5
1	2	5.2
1	3	4.9
1	4	7.2
2	1	2.1
2	2	3.7
2	3	8.0
2	4	5.9
3	1	8.0
3	2	6.5
3	3	4.8
3	4	2.1
4	1	4.8
4	2	6.8
4	3	5.4
4	4	5.3
5	1	4.9
5	2	6.1
5	3	5.7
5	4	7.4

ANALYSIS OF VARIANCE BY COURT

Cut 1

Procedure GLM class

level information

Class	levels	values
T	5	1 2 3 4 5
B	4	1 2 3 4

Number of observations read 20
Number of observations used 20

GLM procedure

Dependent variable: V1

Source	DF	Sum of square	square of the average	F-Valor	PR > F
Model	4	2858.84800	714.71200	0.41	0.7985
Error	15	26133.85750	1742.25717		
Corrected total	19	28992.70550			

R-Quadrado	Coef Var	Root MSE	V1 Media
0.098606	40.89585	41.74035	102.0650

Source	DF	type III SS	Square of the media	F-Valor	Pr > F
T	4	2858.8480	714.712000	0.41	0.7985

GLM procedure

T-test of Waller-Duncan K-ratio for V1

NOTE: This test minimizes the Bayes risk under additive loss and other assumptions.

K ratio	100
Degrees of freedom of error	15
Error of square half	1742.257
Value	0.41
F Critical value of t	3.00452
Difference significant minimum	88.678

Average with the same letter are not significantly different.

Waller grouping	Media	N	T
TO	117.45	4	1
TO			
TO	110.55	4	2
TO			
TO	101.88	4	3
TO			
TO	98.15	4	4
TO			
TO	82.30	4	5

GLM procedure

Level		- v1 -	
T	N	Media	Dev tip
1	4	117.450000	67.6082096
2	4	110.550000	41.4819238
3	4	101.875000	33.7710305
4	4	98.150000	34.3758151
5	4	82.300000	9.8735336

Cut 2

Procedure GLM class

level information

Class	levels	values
T	5	1 2 3 4 5
B	4	1 2 3 4

Number of observations read 20
Number of observations used 20

GLM procedure

Dependent variable: V1

Source	Mexico City	Sum square of square	the average	F-Valor	PR > F
Model	4	3580.88300	895.22075	0.51	0.7324
Error	15	26560.76250	1770.71750		
Corrected total	19	30141.64550			

R-Quadrado Coef Var root MSE V1 Media 0.118802

24.50281 42.07989 171.7350

Source	DF	type III SS	Square of the media	F-Valor	Pr > F
T	4	3580.883000	895.220750	0.51	0.7324

GLM procedure

T-test of Waller-Duncan K-ratio for V1

NOTE: This test minimizes the Bayes risk under additive loss and other assumptions.

K ratio 100
Degrees of freedom of error 15
Error of square half 1770.718
Value 0.51 F
Critical value of t 2.96798 difference significant minimum 88.312

Stockings with the same letter are not significantly different.

Waller grouping	Media	N	T
TO	195.98	4	3
TO			
TO	173.35	4	1
TO			
TO	167.98	4	2
TO			
TO	165.53	4	4
TO			
TO	155.85	4	5

GLM procedure

		Level - v1 -	
T	N	Media	Dev tip
1	4	173.350000	50.6873752
2	4	167.975000	26.5952847
3	4	195.975000	39.2108297
4	4	165.525000	52.5230346
5	4	155.850000	35.7898030

Cut 3

Blevel information

Class levels values

T 5 1 2 3 4 5

B 4 1 2 3 4

Number of observations read 20
Number of observations used 20

GLM procedure

Dependent variable: V1

Source	Mexico City	Sum square of square	the average	F-Valor	PR > F
Model	4	15962.72658	3990.68165	1.74	0.1939
Error	15	34431.59507	2295.43967		
Corrected total	19	50394.32165			

R-Quadrado Coef Var root MSE V1 Media 0.316756

17.39214 47.91075 275.4735

Source	DF	type III SS	Square of the media	F-Valor	Pr > F
T	4	15962.72658	3990.68165	1.74	0.1939

GLM procedure

T-test of Waller-Duncan K-ratio for V1

NOTE: This test minimizes the Bayes risk under additive loss and other assumptions.

K ratio	100
Degrees of freedom for error	15
Mean square error	2295.44
F value	1.74
Critical t value	2.60572
Minimum significant difference	88.277

Stockings with the same letter are not significantly different.

Waller grouping	Media	N	T
TO	313.79	4	5
TO			
TO	296.38	4	4
TO			
TO	280.21	4	2
TO			
TO	246.54	4	3
TO			
TO	240.46	4	1

GLM procedure

		Level - v1 -	
T	N	Media	Dev tip
1	4	240.457500	43.0160415
2	4	280.205000	73.8324398
3	4	246.540000	27.3421006
4	4	296.375000	55.3343031
5	4	313.790000	19.1341004

Cut 4

Procedure GLM class

level information

Class	levels	values
T	5	1 2 3 4 5
B	4	1 2 3 4

Number of observations read 20
Number of observations used 20

Tatersall cutting 34 4
18:08 Monday, November 3, 2014

GLM procedure

Dependent variable: V1

Source	DF	Sum square of	square the media	F-Valor	Pr > F
model	4	2571.8280	642.9570	0.10	0.9818
Error	15	99183.1000	6612.2067		
Total	19	fixed 101754.9280			

R-Quadrado	Coef Var	root MSE	V1 Media
0.025275	22.14233	81.31548	367.2400

Source	DF	Square of type III SS	the media	F-Valor	Pr > F
T	4	2571.828000	642.957000	0.10	0.9818

GLM procedure

T-test of Waller-Duncan K-ratio for V1

NOTE: This test minimizes the Bayes risk under additive loss and other assumptions.

K ratio 100
Degrees of freedom of error 15
Error of square half 6612.207
Value 0.10 F
Critical value of t 3.13426 difference significant minimum 180.22

Stockings with the same letter are not significantly different.

Waller grouping	Media	N	T
TO	382.18	4	5
TO			
TO	375.85	4	4
TO			
TO	369.03	4	3
TO			
TO	357.88	4	2
TO			
TO	351.28	4	1

GLM procedure

		Level - v1 -	
T	N	Media	Dev tip
1	4	351.275000	56.589951
2	4	357.875000	117.942596
3	4	369.025000	112.082897
4	4	375.850000	38.333145
5	4	382.175000	43.773841

Growth rate

Procedure GLM class

level information

Class	levels	values
T	5	1 2 3 4 5
B	4	1 2 3 4

Number of observations read 20
Number of observations used 20

GLM procedure

Dependent variable: V1

Source	Mexico City	Sum square of square	the average	F-Valor	PR > F
Model	4	4.41300000	1.10325000	0.27	0.8929
Error	15	61.35250000	4.09016667		
Corrected total	19	65.76550000			

R-Quadrado Coef Var root MSE V1 Media 0.067102

38.05110 2.022416 5.315000

Source	DF	type III SS	Square of the media	F-Valor	Pr > F
T	4	4.41300000	1.10325000	0.27	0.8929

GLM procedure

T-test of Waller-Duncan K-ratio for V1

NOTE: This test minimizes the Bayes risk under additive loss and other assumptions.

K ratio 100
Degrees of freedom of error 15
Error of square average 4.090167 value
0.27 F
Critical value of t 3.06088 difference
significant minimum 4.3773

Stockings with the same letter are not significantly different.

Waller grouping	Media	N	T
A	6.025	4	5
A	5.575	4	4
A	5.350	4	3
A	4.925	4	2
A	4,700	4	1

Procedure GLM

Level - v1 -

T	N	Media	Dev tip
1	4	4.70000000	2.36502290
2	4	4.92500000	2.57471681
3	4	5.35000000	2.53048085
4	4	5.57500000	0.85780728
5	4	6.02500000	1.04363148

DATA CLIMATIC EVALUATION PERIOD

Date	Maximum (° C)	Minimum (° C)	Average(°C)	Rainfall (mm)	° Cd accumulated
01-08-14	13.6	11.9	12.8	22	7.75
02-08-14	12.8	8.5	10.7	11.02	5.7
03-08-14	12	5.1	8.6	0.4	3.55
04-08-14	9.5	3.9	6.7	0	1.7
05-08-14	13.4	7.9	10.7	23.2	5.65
06-08-14	12.7	6.9	9.8	3.4	4.8
07-08-14	11.7	5.6	8.7	0.6	3.65
08-08-14	10.9	4.2	7.6	0	2.55
09-08-14	9.9	5.1	7.5	9.8	2.5
10-08-14	10.1	4.6	7.4	0.8	2.35
11-08-14	11.8	5	8.4	7.6	3.4
12-08-14	10.8	2.7	6.8	0	1.75
13-08-14	11.8	1.6	6.7	0.2	1.7
14-08-14	10	2.4	6.2	0	1.2
15-08-14	11.7	4.7	8.2	5.2	3.2
16-08-14	11.8	8.6	10.2	10.8	5.2
17-08-14	15.8	9.7	12.8	0	7.75
18-08-14	16.1	9.2	12.7	0.2	7.65
19-08-14	13.8	9.1	11.5	0	6.45
20-08-14	11.2	9.3	10.3	4.6	5.25
21-08-14	11.6	9.7	10.7	0	5.65
22-08-14	10.7	9	9.9	8.4	4.85
23-08-14	13.2	7.7	10.5	0.8	5.45
24-08-14	13.1	7.6	10.4	0.6	5.35
25-08-14	13.1	6.8	10.0	0	4.95
26-08-14	15.4	6.7	11.1	0	6.05
27-08-14	12.3	5.3	8.8	0	3.8
28-08-14	13.4	8.1	10.8	0	5.75
29-08-14	13.9	8.2	11.1	8.4	6.05
30-08-14	15.2	8	11.6	17.8	6.6
31-08-14	15.9	5.8	10.9	0.2	5.85
01-09-14	14.6	10.5	12.6	8.6	7.55
02-09-14	12.5	10.5	11.5	18.8	6.5
03-09-14	12.7	7.8	10.3	12.8	5.25
04-09-14	16.1	5.1	10.6	0	5.6
05-09-14	16.1	6.9	11.5	3.8	6.5
06-09-14	12.9	6.8	9.9	19.6	4.85
07-09-14	14.9	8.2	11.6	18	6.55
08-09-14	12.2	5.4	8.8	18.6	3.8
09-09-14	10.4	5	7.7	15	2.7
10-09-14	13.7	6.1	9.9	0.8	4.9

11-09-14	15.9	4.6	10.3	0	5.25
12-09-14	14.7	4.4	9.6	0	4.55
13-09-14	16	3.4	9.7	0	4.7
14-09-14	13.2	5.3	9.3	0	4.25
15-09-14	16.6	3.4	10.0	0	5
16-09-14	16.3	5.4	10.9	0	5.85
17-09-14	15.9	3.8	9.9	0	4.85
18-09-14	11.1	8.7	9.9	6.2	4.9
19-09-14	14	10.3	12.2	4.2	7.15
20-09-14	14.4	9.4	11.9	1.8	6.9
21-09-14	10.3	3.4	6.9	9.8	1.85
22-09-14	13.2	5.6	9.4	3.6	4.4
23-09-14	13.3	7.9	10.6	24.8	5.6
24-09-14	7.7	3.2	5.5	29.4	0.45
25-09-14	12.4	2.9	7.7	1.6	2.65
26-09-14	13.4	4.8	9.1	0.8	4.1
27-09-14	11.5	7.6	9.6	13.4	4.55
28-09-14	13.4	6.3	9.9	1.8	4.85
29-09-14	14.9	5.7	10.3	3.8	5.3
30-09-14	16.9	8.5	12.7	0.6	7.7

Month	T ° average monthly	° C accumulated days	pp monthly
August	9.6	144,1	136,02
September	10.0	149,05	217,8
October	12.3	211,95	83,20