

APPENDIX

Data and statistical analysis of data presented in **Chapter 2**.

Table A2.1 Influence of level of water availability on the water use (mm) of five perennial grasses in 1996/97.

Grass species (G)	Level of water availability (I)*				Mean
	W1	W2	W3	W4	
<i>C. ciliaris</i>	470.0	688.0	874.0	1095.3	781.8
<i>Cynodon</i> hybrid	423.0	612.0	752.3	960.3	686.9
<i>D. eriantha</i>	421.0	600.3	745.0	931.3	674.4
<i>P. maximum</i>	417.3	596.0	727.7	923.7	666.2
<i>P. clandestinum</i>	468.7	672.3	863.7	1094.7	774.8
Mean	440.0	633.7	792.5	1001.1	
LSD _T (G) = 46.8					
LSD _T (I) = 39.3					

* W1 -severely water stressed level, W4 - control

Table A2.2 Shortened ANOVA for the water use (mm) of five perennial grasses at four levels of water availability in 1996/97.

Source	df	F value	Pr > F
Grass species (G)	4	23.91	< 0.0001
Level of water availability (I)	3	527.47	<0.0001
GxI	12	1.38	0.2176
Mean Square Error	1612.05		
CV %	5.6		
R ²	0.98		

Table A2.3 Influence of level of water availability on the water use (mm) of five perennial grasses in 1997/98.

Grass species (G)	Irrigation level (I)*				Mean
	W1	W2	W3	W4	
<i>C. ciliaris</i>	521.2	719.5	856.6	1096.9	798.6
<i>Cynodon</i> hybrid	488.1	659.5	781.1	975.3	726.0
<i>D. eriantha</i>	530.4	729.1	953.8	1265.1	869.6
<i>P. maximum</i>	606.8	906.7	1149.8	1475.2	1034.6
<i>P. clandestinum</i>	542.0	643.2	902.8	1154.0	810.5
Mean	537.7	731.6	928.8	1193.3	
LSD _T (G x I) = 43.4					

* W1 -severely water stressed level, W4 - control

Table A2.4 Shortened ANOVA for the water use (mm) of five perennial grasses at four levels of water availability in 1997/98.

Source	df	F value	Pr > F
Grass species (G)	4	41.28	< 0.0001
Level of water availability (I)	3	299.99	<0.0001
GxI	12	3.53	0.0013
Mean Square Error	3927.031		
CV %	7.4		
R ²	0.97		

Table A2.5 Influence of level of water availability on the leaf areas (m²) of five perennial grasses in 1996/97.

Grass species (G)	Level of water availability (I)*				Mean
	W1	W2	W3	W4	
<i>C. ciliaris</i>	0.76	0.88	1.13	0.96	0.93
<i>Cynodon</i> hybrid	0.44	0.45	0.57	0.71	0.54
<i>D. eriantha</i>	0.38	1.00	0.87	1.16	0.93
<i>P. maximum</i>	0.42	0.69	0.72	0.76	0.65
<i>P. clandestinum</i>	0.42	0.44	0.60	0.55	0.50
Mean	0.54	0.69	0.78	0.83	
LSD _T (G) = 0.18					
LSD _T (I) = 0.15					

* W1 -severely water stressed level, W4 - control

Table A2.6 Shortened ANOVA for the leaf areas (m²) of five perennial grasses at four levels of water availability in 1996/97.

Source	df	F value	Pr > F
Grass species (G)	4	22.65	< 0.0001
Level of water availability (I)	3	10.37	<0.0001
GxI	12	1.18	0.3282
Mean Square Error	0.02265987		
CV %	21.2		
R ²	0.77		

Table A2.7 Influence of level of water availability on the leaf areas (m²) of five perennial grasses in 1997/98.

Grass species (G)	Level of water availability (I)*				Mean
	W1	W2	W3	W4	
<i>C. ciliaris</i>	0.95	0.99	1.02	1.01	0.99
<i>Cynodon</i> hybrid	0.64	0.61	0.85	0.89	0.75
<i>D. eriantha</i>	0.76	0.97	1.05	1.22	1.00
<i>P. maximum</i>	0.88	1.10	0.86	0.87	0.93
<i>P. clandestinum</i>	1.04	1.20	1.32	1.15	1.18
Mean	0.85	0.97	1.02	1.02	
LSD _T (G) = 0.22					
LSD _T (I) = 0.18					

* W1 -severely water stressed level, W4 - control

Table A2.8 Shortened ANOVA for the leaf areas (m²) of five perennial grasses at four levels of water availability in 1997/98.

Source	df	F value	Pr > F
Grass species (G)	4	8.31	< 0.0001
Level of water availability (I)	3	2.83	0.0505
GxI	12	1.12	0.3711
Mean Square Error	0.034688		
CV %	19.2		
R ²	0.58		

Table A2.9 Influence of level of water availability on the root mass (g) of five perennial grasses in 1999.

Grass species (G)	Level of water availability (I)*	Soil depth increment (m) (D)				
		0 - 0.21	0.21 - 0.42	0.42 - 0.63	0.63 - 0.84	0.84 - 1.05
<i>C. ciliaris</i>	W1	2.50	0.59	0.32	0.27	0.25
	W4	2.21	0.74	0.37	0.28	0.29
<i>Cynodon hybrid</i>	W1	1.84	0.86	0.43	0.56	0.55
	W4	1.33	0.42	0.30	0.26	0.27
<i>D. eriantha</i>	W1	1.40	0.40	0.30	0.27	0.21
	W4	3.72	1.00	0.57	0.49	0.42
<i>P. maximum</i>	W1	2.95	0.70	0.53	0.39	0.28
	W4	2.15	0.62	0.51	0.33	0.23
<i>P. clandestinum</i>	W1	2.61	0.85	0.42	0.45	0.41
	W4	3.33	0.79	0.53	0.46	0.45
LSD _T (G x I x D) = 0.57						

* W1 -severely water stressed level, W4 - control

Table A2.10 Shortened ANOVA for the root mass (g) of five perennial grasses at four levels of water availability in 1999.

Source	df	F value	Pr > F
Grass species (G)	4	5.40	0.0006
Level of water availability (I)	1	1.96	0.1648
GxI	4	13.79	< 0.0001
Depth (D)	4	253.31	< 0.0001
GxD	16	3.24	0.0002
IxD	4	1.30	0.2746
GxIxD	16	4.10	< 0.0001
Mean Square Error	0.091968		
CV %	35.8		
R ²	0.92		

Data and statistical analysis of data presented in **Chapter 3**.

Table A.3.1 Shortened ANOVA for the dry matter yield ($t\ ha^{-1}$) of five perennial grasses at four levels of water availability in 1996/97

Source	df	F value	Pr > F
Grass species (G)	4	28.31	< 0.0001
Level of water availability (I)	3	9.64	< 0.0001
GxI	12	0.86	0.5933
Mean Square Error	5.917824		
CV %	16.8		
R ²	0.79		

Table A3.2 Shortened ANOVA for the dry matter yield ($t\ ha^{-1}$) of five perennial grasses at four levels of water availability in 1997/98

Source	df	F value	Pr > F
Grass species (G)	4	39.15	< 0.0001
Level of water availability (I)	3	12.61	< 0.0001
GxI	12	1.00	0.4642
Mean Square Error	3124003.6		
CV %	22.7		
R ²	0.84		

Table A3.3 Influence of level of water availability on the contribution of the leaf (tha^{-1}) component to the production of five perennial grasses in 1996/97.

Grass species (G)	Level of water availability (I)*				Mean
	W1	W2	W3	W4	
<i>C. ciliaris</i>	5.66	7.58	8.88	8.61	7.68
<i>Cynodon</i> hybrid	4.23	5.07	6.71	6.55	5.64
<i>D. eriantha</i>	4.26	6.72	6.14	5.97	5.77
<i>P. maximum</i>	3.07	4.18	3.57	4.36	3.80
<i>P. clandestinum</i>	2.73	3.17	3.90	3.56	3.34
Mean	3.99	5.34	5.84	5.81	
LSD _T (G) = 1.15					
LSD _T (I) = 0.97					

* W1 -severely water stressed level, W4 - control

Table A3.4 Shortened ANOVA for the contribution of the leaf (t ha^{-1}) component to the production of five perennial grasses in 1996/97.

Source	df	F value	Pr > F
Grass species (G)	4	37.18	< 0.0001
Level of water availability (I)	3	11.57	< 0.0001
GxI	12	1.17	0.3366
Mean Square Error	0.9773167		
CV %	18.84		
R ²	0.83		

Table A3.5 Influence of level of water availability on the contribution of the stem (t ha⁻¹) component to the production of five perennial grasses in 1996/97.

Grass species (G)	Level of water availability (I)*				Mean
	W1	W2	W3	W4	
<i>C. ciliaris</i>	5.92	9.15	11.09	10.33	9.12
<i>Cynodon</i> hybrid	2.65	3.03	5.05	4.92	3.91
<i>D. eriantha</i>	3.24	6.95	6.43	5.66	5.57
<i>P. maximum</i>	3.10	4.36	5.42	5.86	4.69
<i>P. clandestinum</i>	0.79	0.37	1.10	1.19	1.92
Mean	3.24	5.08	6.09	5.76	
LSD _T (G) = 1.78					
LSD _T (I) = 1.47					

* W1 -severely water stressed level, W4 - control

Table A3.6 Shortened ANOVA for the contribution of the stem (t ha⁻¹) component to the production of five perennial grasses in 1996/97.

Source	df	F value	Pr > F
Grass species (G)	4	36.06	< 0.0001
Level of water availability (I)	3	10.37	< 0.0001
GxI	12	1.00	0.4678
Mean Square Error	2.3374617		
CV %	30.33		
R ²	0.82		

Table A3.7 Influence of level of water availability on the contribution of the inflorescence (t ha^{-1}) component to the production of five perennial grasses in 1996/97.

Grass species(G)	Level of water availability (I)*				Mean
	W1	W2	W3	W4	
<i>C. ciliaris</i>	0.11	0.27	0.00	0.23	0.15
<i>Cynodon</i> hybrid	0.47	0.66	0.37	0.52	0.51
<i>D. eriantha</i>	1.07	0.93	0.32	0.81	1.26
<i>P. maximum</i>	0.70	1.66	1.32	2.02	0.14
<i>P. clandestinum</i>	none	none	none	none	none
Mean	0.26	0.46	0.43	0.49	

LSD_T(G) = 0.37

* W1 -severely water stressed level, W4 - control

Table A3.8 Shortened ANOVA for the contribution of the inflorescence (t ha^{-1}) component to the production of five perennial grasses in 1996/97.

Source	df	F value	Pr > F
Grass species (G)	4	31.30	< 0.0001
Level of water availability (I)	3	1.60	0.2050
GxI	12	1.15	0.3527
Mean Square Error	0.10022333		
CV %	76.68		
R ²	0.78		

Table A3.9 Influence of level of water availability on the contribution of the leaf (t ha^{-1}) component to the production of five perennial grasses in 1997/98.

Grass species(G)	Level of water availability (I)*				Mean
	W1	W2	W3	W4	
<i>C. ciliaris</i>	7.49	7.20	8.20	6.47	7.34
<i>Cynodon</i> hybrid	5.10	7.12	9.26	8.90	7.59
<i>D. eriantha</i>	4.72	6.25	6.44	7.18	6.15
<i>P. maximum</i>	4.36	3.94	4.40	6.16	4.72
<i>P. clandestinum</i>	5.38	6.44	4.83	7.02	5.92
Mean	5.41	6.19	6.63	7.15	
LSD _T (G) = 1.71					
LSD _T (I) = 1.44					

* W1 -severely water stressed level, W4 - control

Table A3.10 Shortened ANOVA for the contribution of the leaf (t ha^{-1}) component to the production of five perennial grasses in 1997/98.

Source	df	F value	Pr > F
Grass species (G)	4	7.54	0.0001
Level of water availability (I)	3	3.76	0.0181
GxI	12	1.56	0.1451
Mean Square Error	2.1589725		
CV %	23.17		
R ²	0.60		

Table A3.11 Influence of level of water availability on the contribution of the stem (t ha⁻¹) component to the production of five perennial grasses in 1997/98.

Grass species(G)	Level of water availability (I)*				Mean
	W1	W2	W3	W4	
<i>C. ciliaris</i>	4.83	6.48	5.69	7.22	6.05
<i>Cynodon</i> hybrid	4.54	5.90	4.90	6.85	5.55
<i>D. eriantha</i>	2.01	1.84	2.34	2.44	2.16
<i>P. maximum</i>	2.64	3.08	3.27	3.25	3.06
<i>P. clandestinum</i>	2.30	2.23	4.51	4.81	3.46
Mean	3.27	3.91	4.14	4.91	
LSD _T (G) = 1.09					
LSD _T (I) = 0.92					

* W1 -severely water stressed level, W4 - control

Table A3.12 Shortened ANOVA for the contribution of the stem (t ha⁻¹) component to the production of five perennial grasses in 1997/98.

Source	df	F value	Pr > F
Grass species (G)	4	38.08	< 0.0001
Level of water availability (I)	3	7.90	0.0003
GxI	12	1.62	0.1245
Mean Square Error	0.8800839		
CV %	23.13		
R ²	0.83		

Table A3.13 Influence of level of water availability on the contribution of the inflorescence ($t\ ha^{-1}$) component to the production of five perennial grasses in 1997/98.

Grass species(G)	Level of water availability (I)*				Mean
	W1	W2	W3	W4	
<i>C. ciliaris</i>	0.07	0.21	0.003	0.00	0.07
<i>Cynodon</i> hybrid	0.05	0.17	0.49	0.08	0.20
<i>D. eriantha</i>	1.00	0.62	0.34	0.00	0.22
<i>P. maximum</i>	none	none	none	none	none
<i>P. clandestinum</i>	none	none	none	none	none
Mean	0.06	0.10	0.15	0.07	

LSD_T(G) = 0.13

* W1 -severely water stressed level, W4 - control

Table A3.14 Shortened ANOVA for the contribution of the inflorescence ($t\ ha^{-1}$) component to the production of five perennial grasses in 1997/98.

Source	df	F value	Pr > F
Grass species (G)	4	10.94	< 0.0001
Level of water availability (I)	3	2.18	0.1059
GxI	12	2.80	0.0072
Mean Square Error	0.01194776		
CV %	112.81		
R ²	0.68		

Data and statistical analysis of data presented in **Chapter 4**.

Table A4.1 Correlation (r^2) between plant yield components and *in vitro* dry matter digestibility of five annual fodder crops in 1996/97.

Yield component	<i>In vitro</i> dry matter digestibility of				
	<i>C. ciliaris</i>	<i>Cynodon</i> hybrid	<i>D. eriantha</i>	<i>P. maximum</i>	<i>P. clandestinum</i>
Leaf	0.1	- 0.3	- 0.4	- 0.7	0.6
Stem	0.2	- 0.3	- 0.6	- 0.6	0.5
Inflorescence	- 0.2	0.3	- 0.3	- 0.2	-

Table A4.2 Correlation (r^2) between plant yield components and *in vitro* dry matter digestibility of five annual fodder crops in 1997/98.

Yield component	<i>In vitro</i> dry matter digestibility of				
	<i>C. ciliaris</i>	<i>Cynodon</i> hybrid	<i>D. eriantha</i>	<i>P. maximum</i>	<i>P. clandestinum</i>
Leaf	- 0.01	0.4	0.1	0.2	- 0.03
Stem	- 0.6	0.1	- 0.2	0.4	0.4
Inflorescence	0.03	0.3	0.7	-	-

Table A4.3 Correlation (r^2) between plant yield components and crude protein content of five annual fodder crops in 1996/97.

Yield component	Crude protein content of				
	<i>C. ciliaris</i>	<i>Cynodon</i> hybrid	<i>D. eriantha</i>	<i>P. maximum</i>	<i>P. clandestinum</i>
Leaf	0.3	0.1	- 0.6	0	0.4
Stem	0.4	0.4	- 0.6	- 0.5	0.5
Inflorescence	- 0.2	- 0.5	- 0.1	- 0.1	-

Table A4.4 Correlation (r^2) between plant yield components and crude protein content of five annual fodder crops in 1997/98.

Yield component	Crude protein content of				
	<i>C. ciliaris</i>	<i>Cynodon</i> hybrid	<i>D. eriantha</i>	<i>P. maximum</i>	<i>P. clandestinum</i>
Leaf	0.5	0.4	0.1	0.1	0.03
Stem	0.6	0.1	- 0.2	- 0.6	- 0.3
Inflorescence	- 0.1	0.3	0.7	-	-

Table A4.5 Influence of level of water availability on the whole plant digestible dry matter (%) of five perennial grasses in 1996/97.

Grass species(G)	Level of water availability (I)*				Mean
	W1	W2	W3	W4	
<i>C. ciliaris</i>	50.81	50.44	54.19	55.51	52.74
<i>Cynodon</i> hybrid	58.60	54.68	54.25	54.18	55.43
<i>D. eriantha</i>	62.57	58.32	58.58	60.00	59.87
<i>P. maximum</i>	68.71	64.89	62.68	50.63	61.73
<i>P. clandestinum</i>	60.77	63.99	63.17	65.61	63.38
Mean	60.29	58.46	58.58	57.19	

LSD_T(G) = 3.72
LSD_T(GxI) = 6.86

* W1 -severely water stressed level, W4 - control

Table A4.6 Shortened ANOVA for the whole plant digestible dry matter (%) of five perennial grasses in 1996/97.

Source	df	F value	Pr > F
Grass species (G)	4	23.17	< 0.0001
Level of water availability (I)	3	2.39	0.0827
GxI	12	5.26	< 0.0001
Mean Square Error	10.196358		
CV %	5.45		
R ²	0.80		

Table A4.7 Influence of level of water availability on the whole plant digestible dry matter (%) of five perennial grasses in 1997/98.

Grass species(G)	Level of water availability (I)*				Mean
	W1	W2	W3	W4	
<i>C. ciliaris</i>	60.33	58.67	60.67	55.33	58.75
<i>Cynodon</i> hybrid	55.0	54.0	60.5	60	57.38
<i>D. eriantha</i>	62.0	56.0	57.67	58.33	58.50
<i>P. maximum</i>	50.67	50.33	54.0	54.33	52.33
<i>P. clandestinum</i>	47.5	28.5	40.33	48.67	41.25
Mean	55.10	49.50	54.63	55.33	
LSD _T (G) = 5.10					
LSD _T (I) = 4.28					
LSD _T (GxI) = 9.57					

* W1 -severely water stressed level, W4 - control

Table A4.8 Shortened ANOVA for the whole plant digestible dry matter (%) of five perennial grasses in 1997/98.

Source	df	F value	Pr > F
Grass species (G)	4	26.87	< 0.0001
Level of water availability (I)	3	3.84	0.0180
GxI	12	2.44	0.0205
Mean Square Error	18.848039		
CV %	8.07		
R ²	0.81		

Table A4.9 Influence of level of water availability on the leaf digestible dry matter (%) of five perennial grasses in 1996/97.

Grass species(G)	Level of water availability (I)*				Mean
	W1	W2	W3	W4	
<i>C. ciliaris</i>	63.02	62.89	58.82	70.50	63.81
<i>Cynodon</i> hybrid	52.57	48.82	43.40	45.65	47.61
<i>D. eriantha</i>	64.50	61.24	58.45	61.24	61.36
<i>P. maximum</i>	49.42	59.49	47.06	56.96	53.23
<i>P. clandestinum</i>	45.18	60.33	44.57	51.20	50.32
Mean	54.94	58.55	50.46	57.11	
LSD _T (G) = 4.44					
LSD _T (I) = 3.72					

* W1 -severely water stressed level, W4 - control

Table A4.10 Shortened ANOVA for the leaf digestible dry matter (%) of five perennial grasses in 1996/97.

Source	df	F value	Pr > F
Grass species (G)	4	37.22	< 0.0001
Level of water availability (I)	3	10.74	< 0.0001
GxI	12	3.39	0.0027
Mean Square Error	14.187361		
CV %	6.86		
R ²	0.87		

Table A4.11 Influence of level of water availability on the leaf digestible dry matter (%) of five perennial grasses in 1997/98.

Grass species(G)	Level of water availability (I)*				Mean
	W1	W2	W3	W4	
<i>C. ciliaris</i>	49.51	61.36	54.34	51.39	54.15
<i>Cynodon</i> hybrid	58.84	54.65	44.07	57.82	53.84
<i>D. eriantha</i>	60.82	55.38	61.15	60.04	59.35
<i>P. maximum</i>	52.37	56.56	53.52	52.95	53.85
<i>P. clandestinum</i>	43.20	33.62	38.36	58.9	43.52
Mean	52.95	52.32	50.29	56.22	
LSD _T (G) = 6.92					
LSD _T (GxI) = 19.91					

* W1 -severely water stressed level, W4 - control

Table A4.12 Shortened ANOVA for the leaf digestible dry matter (%) of five perennial grasses in 1997/98.

Source	df	F value	Pr > F
Grass species (G)	4	11.32	< 0.0001
Level of water availability (I)	3	2.58	0.0668
GxI	12	3.69	0.0009
Mean Square Error	35.228052		
CV %	11.21		
R ²	0.71		

Table A4.13 Influence of level of water availability on the stem digestible dry matter (%) of five perennial grasses in 1996/97.

Grass species(G)	Level of water availability (I)*				Mean
	W1	W2	W3	W4	
<i>C. ciliaris</i>	46.62	46.10	43.94	48.47	46.28
<i>Cynodon hybrid</i>	45.78	49.72	48.78	48.65	48.23
<i>D. eriantha</i>	56.25	63.26	55.99	55.93	55.35
<i>P. maximum</i>	52.70	56.52	57.58	52.27	54.77
<i>P. clandestinum</i>	56.61	60.03	55.79	55.09	56.88
Mean	51.59	53.13	52.42	52.08	
LSD _T (G) = 6.51					

* W1 -severely water stressed level, W4 - control

Table A4.14 Shortened ANOVA for the stem digestible dry matter (%) of five perennial grasses in 1996/97.

Source	df	F value	Pr > F
Grass species (G)	4	8.34	< 0.0001
Level of water availability (I)	3	0.21	0.8865
GxI	12	0.44	0.9382
Mean Square Error	31.078630		
CV %	10.64		
R ²	0.50		

Table A4.15 Influence of level of water availability on the stem digestible dry matter (%) of five perennial grasses in 1997/98.

Grass species(G)	Level of water availability (I)*				Mean
	W1	W2	W3	W4	
<i>C. ciliaris</i>	37.72	43.40	39.20	35.62	38.98
<i>Cynodon hybrid</i>	50.02	47.34	46.47	41.99	46.46
<i>D. eriantha</i>	51.67	52.65	53.59	46.25	51.04
<i>P. maximum</i>	44.06	52.51	49.59	54.71	50.22
<i>P. clandestinum</i>	41.52	47.71	40.27	47.39	44.22
Mean	45.00	48.72	45.83	45.19	
LSD _T (G) = 6.32					

* W1 -severely water stressed level, W4 - control

Table A4.16 Shortened ANOVA for the stem digestible dry matter (%) of five perennial grasses in 1997/98.

Source	df	F value	Pr > F
Grass species (G)	4	10.00	< 0.0001
Level of water availability (I)	3	1.32	0.2833
GxI	12	1.30	0.2627
Mean Square Error		29.034992	
CV %		11.66	
R ²		0.62	

Table A4.17 Influence of level of water availability on the whole plant crude protein content (%) of five perennial grasses in 1996/97.

Grass species(G)	Level of water availability (I)*				Mean
	W1	W2	W3	W4	
<i>C. ciliaris</i>	4.43	4.09	4.78	4.22	4.38
<i>Cynodon</i> hybrid	10.18	8.98	10.70	10.74	10.15
<i>D. eriantha</i>	5.64	4.15	5.01	6.11	5.23
<i>P. maximum</i>	6.02	5.69	4.18	4.73	5.15
<i>P. clandestinum</i>	9.22	9.11	9.64	8.84	9.20
Mean	7.10	6.41	6.86	6.93	
LSD _T (G) = 0.91					
LSD _T (GxI) = 1.82					

* W1 -severely water stressed level, W4 - control

Table A4.18 Shortened ANOVA for the whole plant crude protein content (%) of five perennial grasses in 1996/97.

Source	df	F value	Pr > F
Grass species (G)	4	137.89	< 0.0001
Level of water availability (I)	3	2.06	0.1211
GxI	12	2.21	0.0310
Mean Square Error	0.6102936		
CV %	11.43		
R ²	0.94		

Table A4.19 Influence of level of water availability on the whole plant crude protein content (%) of five perennial grasses in 1997/98.

Grass species(G)	Level of water availability (I)*				Mean
	W1	W2	W3	W4	
<i>C. ciliaris</i>	8.44	8.27	6.14	7.43	7.57
<i>Cynodon</i> hybrid	12.15	11.32	10.24	14.94	12.16
<i>D. eriantha</i>	5.54	4.29	6.03	5.24	5.27
<i>P. maximum</i>	7.70	6.55	5.22	6.21	6.42
<i>P. clandestinum</i>	10.10	7.99	7.19	8.89	8.55
Mean	8.87	7.69	6.97	8.54	
LSD _T (G) = 2.42					

* W1 -severely water stressed level, W4 - control

Table A4.20 Shortened ANOVA for the whole plant crude protein content (%) of five perennial grasses in 1997/98.

Source	df	F value	Pr > F
Grass species (G)	4	14.59	< 0.0001
Level of water availability (I)	3	2.07	0.1241
GxI	12	0.68	0.7578
Mean Square Error	4.2032972		
CV %	26.32		
R ²	0.70		

Table A4.21 Influence of level of water availability on the leaf crude protein content (%) of five perennial grasses in 1996/97.

Grass species(G)	Level of water availability (I)*				Mean
	W1	W2	W3	W4	
<i>C. ciliaris</i>	5.88	4.84	5.43	6.68	5.71
<i>Cynodon</i> hybrid	13.22	12.26	12.26	11.06	12.20
<i>D. eriantha</i>	7.54	6.07	5.87	6.19	6.42
<i>P. maximum</i>	5.39	6.21	4.64	5.33	5.40
<i>P. clandestinum</i>	12.54	11.66	11.09	9.30	11.15
Mean	8.91	8.21	7.86	7.71	
LSD _T (G) = 1.07					
LSD _T (I) = 0.90					
LSD _T (GxI) = 2.14					

* W1 -severely water stressed level, W4 - control

Table A4.22 Shortened ANOVA for the leaf crude protein content (%) of five perennial grasses in 1996/97.

Source	df	F value	Pr > F
Grass species (G)	4	149.57	< 0.0001
Level of water availability (I)	3	5.10	0.0044
GxI	12	2.50	0.0148
Mean Square Error		0.8415367	
CV %		11.22	
R ²		0.94	

Table A4.23 Influence of level of water availability on the leaf crude protein content (%) of five perennial grasses in 1997/98.

Grass species(G)	Level of water availability (I)*				Mean
	W1	W2	W3	W4	
<i>C. ciliaris</i>	8.40	14.68	8.06	4.31	8.86
<i>Cynodon</i> hybrid	11.74	9.80	10.58	10.99	10.78
<i>D. eriantha</i>	7.53	6.06	5.73	4.34	5.92
<i>P. maximum</i>	7.05	6.84	6.63	8.07	7.15
<i>P. clandestinum</i>	11.42	10.52	10.43	9.16	10.39
Mean	9.23	9.58	8.27	7.38	
LSD _T (G) = 2.07					
LSD _T (GxI) = 3.88					

* W1 -severely water stressed level, W4 - control

Table A4.24 Shortened ANOVA for the leaf crude protein content (%) of five perennial grasses in 1997/98.

Source	df	F value	Pr > F
Grass species (G)	4	14.71	< 0.0001
Level of water availability (I)	3	1.91	0.1481
GxI	12	2.70	0.0123
Mean Square Error	3.0715849		
CV %	19.78		
R ²	0.75		

Table A4.25 Influence of level of water availability on the stem crude protein content (%) of five perennial grasses in 1996/97.

Grass species(G)	Level of water availability (I)*				Mean
	W1	W2	W3	W4	
<i>C. ciliaris</i>	3.04	2.31	2.88	2.55	2.69
<i>Cynodon hybrid</i>	7.77	7.26	6.64	6.78	7.11
<i>D. eriantha</i>	4.41	3.06	4.53	4.64	4.16
<i>P. maximum</i>	3.32	4.29	2.88	2.85	3.34
<i>P. clandestinum</i>	7.01	6.69	6.15	7.31	6.79
Mean	5.11	4.72	4.62	4.83	
LSD _T (G) = 1.26					

* W1 -severely water stressed level, W4 - control

Table A4.26 Shortened ANOVA for the stem crude protein content (%) of five perennial grasses in 1996/97.

Source	df	F value	Pr > F
Grass species (G)	4	41.82	< 0.0001
Level of water availability (I)	3	0.56	0.6477
GxI	12	0.89	0.5620
Mean Square Error		1.16795	
CV %		22.40	
R ²		0.82	

Table A4.27 Influence of level of water availability on the stem crude protein content (%) of five perennial grasses in 1997/98.

Grass species(G)	Level of water availability (I)*				Mean
	W1	W2	W3	W4	
<i>C. ciliaris</i>	3.78	0.97	5.56	8.35	4.66
<i>Cynodon</i> hybrid	5.94	7.97	13.03	8.72	8.92
<i>D. eriantha</i>	2.92	2.37	3.12	2.79	2.80
<i>P. maximum</i>	4.21	5.44	3.76	3.18	4.15
<i>P. clandestinum</i>	7.02	6.56	6.09	7.18	6.71
Mean	4.77	4.66	6.31	6.04	
LSD _T (G) = 2.35					
LSD _T (GxI) = 4.70					

* W1 -severely water stressed level, W4 - control

Table A4.28 Shortened ANOVA for the stem crude protein content (%) of five perennial grasses in 1997/98.

Source	df	F value	Pr > F
Grass species (G)	4	13.87	< 0.0001
Level of water availability (I)	3	1.74	0.1769
GxI	12	2.52	0.0160
Mean Square Error	4.0285389		
CV %	36.72		
R ²	0.72		

Data and statistical analysis of data presented in **Chapter 5**.

Table A5.1 Shortened ANOVA for the dry matter water use efficiency (WUE_{DM}) ($\text{kg DM ha}^{-1} \text{mm}^{-1}$) of five perennial grasses in 1996/97.

Source	df	F value	Pr > F
Grass species (G)	4	35.17	< 0.0001
Level of water availability (I)	3	6.97	0.0007
Gxl	12	0.81	0.6374
Mean Square Error	11.781191		
CV %	22.14		
R ²	0.81		

Table A5.2 Shortened ANOVA for the dry matter water use efficiency (WUE_{DM}) ($\text{kg DM ha}^{-1} \text{mm}^{-1}$) of five perennial grasses in 1997/98.

Source	df	F value	Pr > F
Grass species (G)	4	42.23	< 0.0001
Level of water availability (I)	3	15.61	< 0.0001
Gxl	12	0.99	0.4734
Mean Square Error	6.159307		
CV %	18.38		
R ²	0.85		

Table A5.3 Shortened ANOVA for the digestible dry matter yield (t DDM ha⁻¹) of five perennial grasses in 1996/97.

Source	df	F value	Pr > F
Grass species (G)	4	11.34	< 0.0001
Level of water availability (I)	3	5.36	0.0034
GxI	12	0.58	0.8414
Mean Square Error	4.3392803		
CV %	36.36		
R ²	0.63		

Table A5.4 Shortened ANOVA for the digestible dry matter yield (t DDM ha⁻¹) of five perennial grasses in 1997/98.

Source	df	F value	Pr > F
Grass species (G)	4	36.69	< 0.0001
Level of water availability (I)	3	10.28	< 0.0001
GxI	12	1.70	0.1116
Mean Square Error	0.9957435		
CV %	17.30		
R ²	0.85		

Table A5.5 Shortened ANOVA for the digestible dry matter water use efficiency (WUE_{DDM}) (kg DDM ha⁻¹ mm⁻¹) of five perennial grasses in 1996/97.

Source	df	F value	Pr > F
Grass species (G)	4	28.10	< 0.0001
Level of water availability (I)	3	6.40	< 0.0001
GxI	12	0.77	0.4734
Mean Square Error	3.7083796		
CV %	21.52		

R² 0.78

Table A5.6 Shortened ANOVA for the digestible dry matter water use efficiency (WUE_{DDM}) (kg DDM ha⁻¹ mm⁻¹) of five perennial grasses in 1997/98.

Source	df	F value	Pr > F
Grass species (G)	4	52.74	< 0.0001
Level of water availability (I)	3	11.98	< 0.0001
Gxl	12	2.06	0.0492
Mean Square Error	1.9820199		
CV %	19.41		
R ²	0.89		

Table A5.7 Shortened ANOVA for the crude protein yield (t CP ha⁻¹) of five perennial grasses in 1996/97.

Source	df	F value	Pr > F
Grass species (G)	4	14.53	< 0.0001
Level of water availability (I)	3	5.62	0.0029
Gxl	12	1.04	0.4352
Mean Square Error	0.05314635		
CV %	36.28		
R ²	0.71		

Table A5.8 Shortened ANOVA for the crude protein yield (t CP ha⁻¹) of five perennial grasses in 1997/98.

Source	df	F value	Pr > F
Grass species (G)	4	41.21	< 0.0001
Level of water availability (I)	3	3.63	0.0237
Gxl	12	2.75	0.0115
Mean Square Error	0.04862742		

CV %	25.93
R ²	0.88

Table A5.9 Shortened ANOVA for the crude protein yield water use efficiency (WUE_{CP}) (kg CP ha⁻¹ mm⁻¹) of five perennial grasses in 1996/97.

Source	df	F value	Pr > F
Grass species (G)	4	14.17	< 0.0001
Level of water availability (I)	3	2.88	0.0495
GxI	12	0.37	0.9668
Mean Square Error		0.08521261	
CV %		26.51	
R ²		0.66	

Table A5.10 Shortened ANOVA for the crude protein yield water use efficiency (WUE_{CP}) (kg CP ha⁻¹ mm⁻¹) of five perennial grasses in 1997/98.

Source	df	F value	Pr > F
Grass species (G)	4	52.77	< 0.0001
Level of water availability (I)	3	15.36	< 0.0001
GxI	12	2.21	0.0374
Mean Square Error		0.08086769	
CV %		23.93	
R ²		0.90	

Data and statistical analysis of data presented in **Chapter 7**.

Table A7.1 Influence of level of water availability on the number of stomata on the adaxial leaf sides of five perennial grass species.

Grass species(G)	Level of water availability (I)*				Mean
	W1	W2	W3	W4	
<i>C. ciliaris</i>	7.80	7.40	10.60	12.40	9.55
<i>Cynodon</i> hybrid	31.40	27.60	33.80	35.00	31.95
<i>D. eriantha</i>	8.20	15.40	8.40	12.60	11.15
<i>P. maximum</i>	28.80	30.20	20.60	25.60	26.30
<i>P. clandestinum</i>	6.60	8.00	10.00	7.20	7.95
Mean	16.56	16.68	17.7	18.56	
LSD _T (G) = 2.52					
LSD _T (GxI) = 6.15					

* W1 -severely water stressed level, W4 - control

Table A7.2 Shortened ANOVA for the number of stomata on the adaxial leaf sides of five perennial grass species.

Source	df	F value	Pr > F
Grass species (G)	4	295.03	< 0.0001
Level of water availability (I)	3	2.73	0.0493
GxI	12	6.80	< 0.0001
Mean Square Error		8.15000	
CV %		16.43	
R ²		0.94	

Table A7.3 Influence of level of water availability on the number of stomata on the abaxial leaf sides of five perennial grass species.

Grass species(G)	Level of water availability (I)*				Mean
	W1	W2	W3	W4	
<i>C. ciliaris</i>	11.20	12.00	17.20	14.00	13.60
<i>Cynodon</i> hybrid	25.60	20.00	21.80	25.40	23.20
<i>D. eriantha</i>	24.80	18.80	23.40	29.00	24.00
<i>P. maximum</i>	24.00	27.00	17.80	23.60	23.10
<i>P. clandestinum</i>	8.20	6.20	9.80	7.00	7.80
Mean	18.76	16.80	18.00	19.80	
LSD _T (G) = 2.38					
LSD _T (I) = 2.00					
LSD _T (GxI) = 5.78					

* W1 -severely water stressed level, W4 - control

Table A7.4 Shortened ANOVA for the number of stomata on the abaxial leaf sides of five perennial grass species.

Source	df	F value	Pr > F
Grass species (G)	4	145.62	< 0.0001
Level of water availability (I)	3	5.49	0.0018
GxI	12	7.16	< 0.0001
Mean Square Error	7.275000		
CV %	14.71		
R ²	0.90		

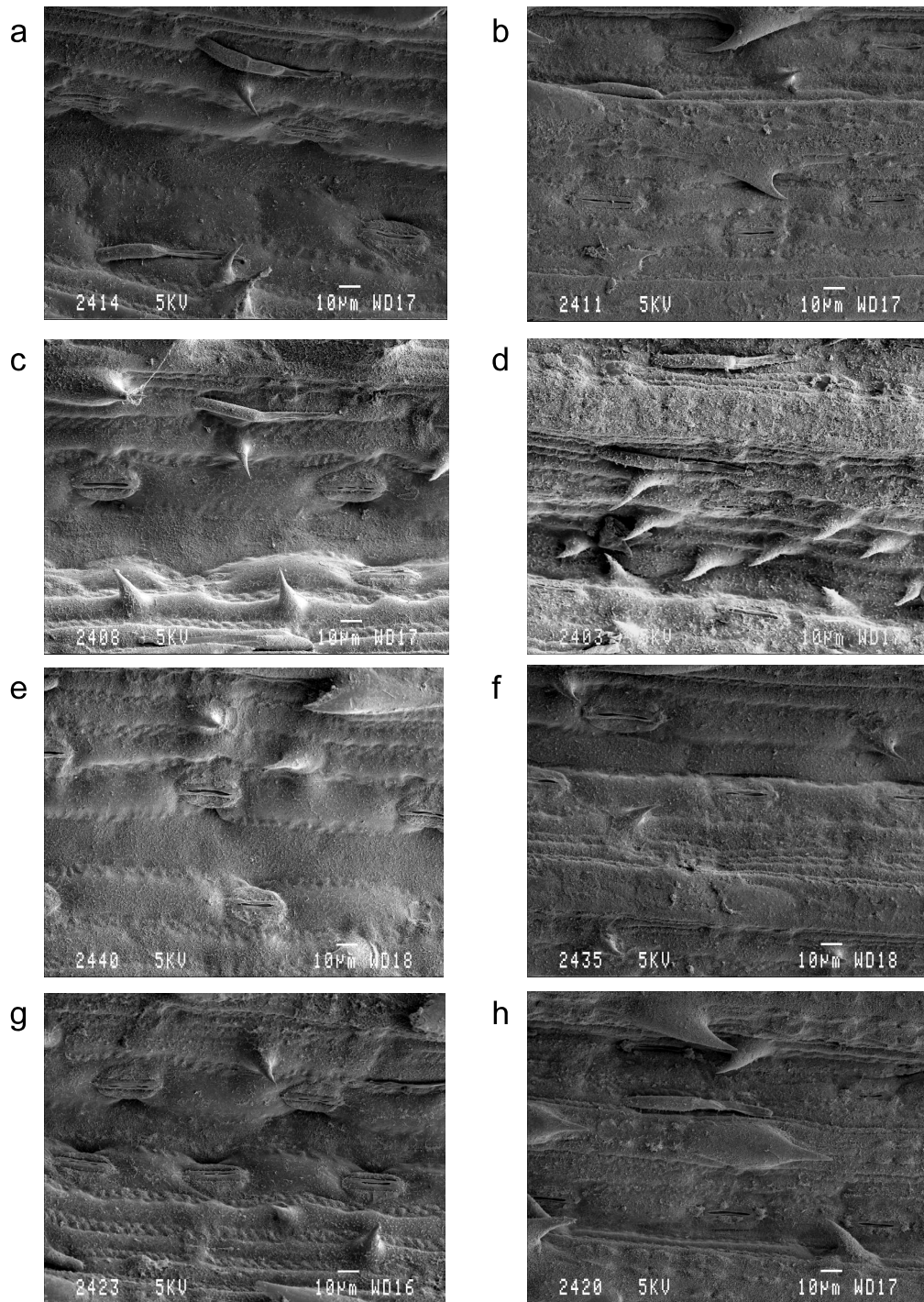


Figure A7.1 Adaxial (left) and abaxial (right) leaf surfaces of *C. ciliaris* as affected by different levels of water availability (x600). a & b - W1; c & d - W2; e & f - W3; g & h - W4

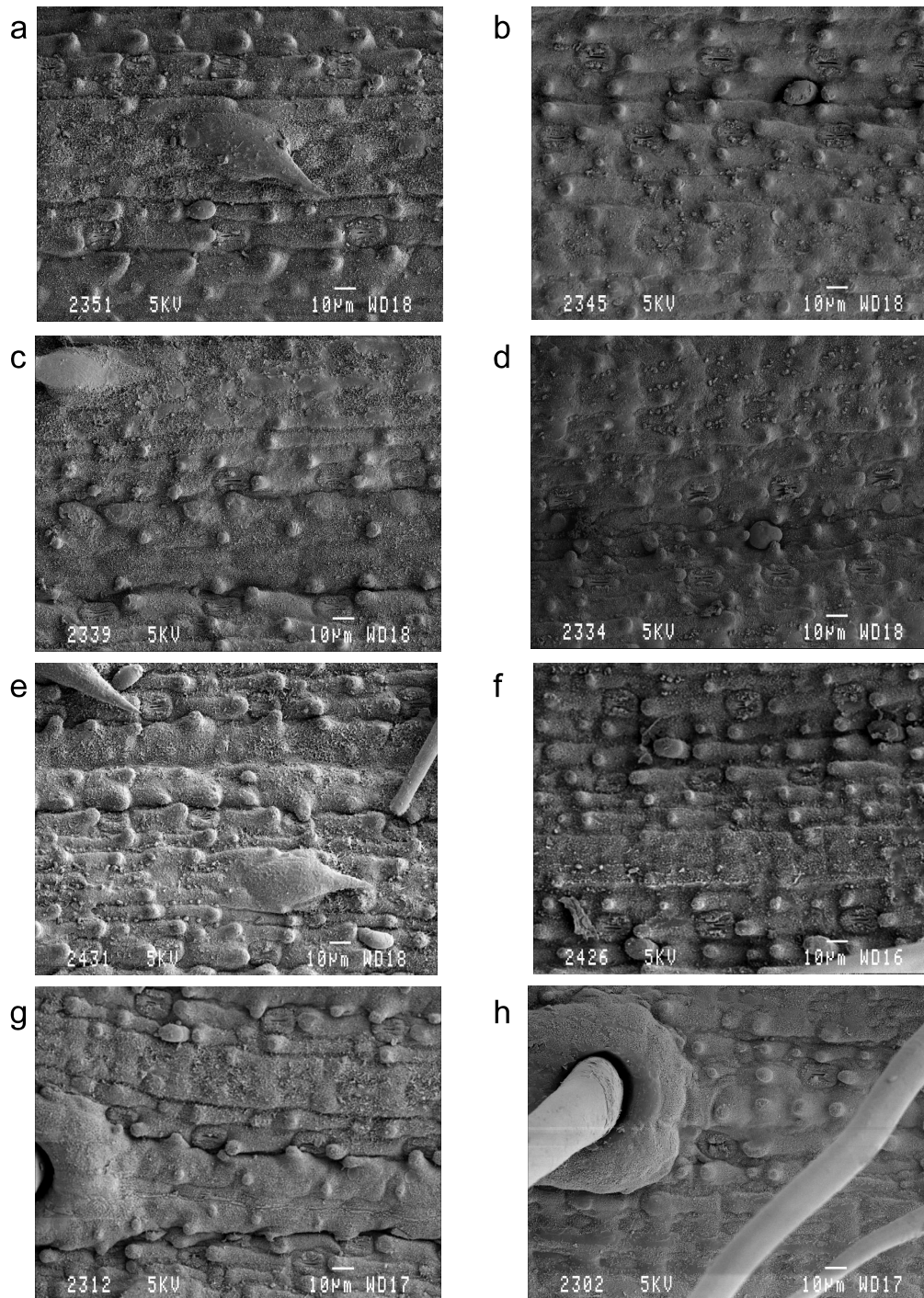


Figure A7.2 Adaxial (left) and abaxial (right) leaf surfaces of *Cynodon* hybrid as affected by different levels of water availability (x600). a & b -W1; c & d -W2; e & f - W3; g & h - W4

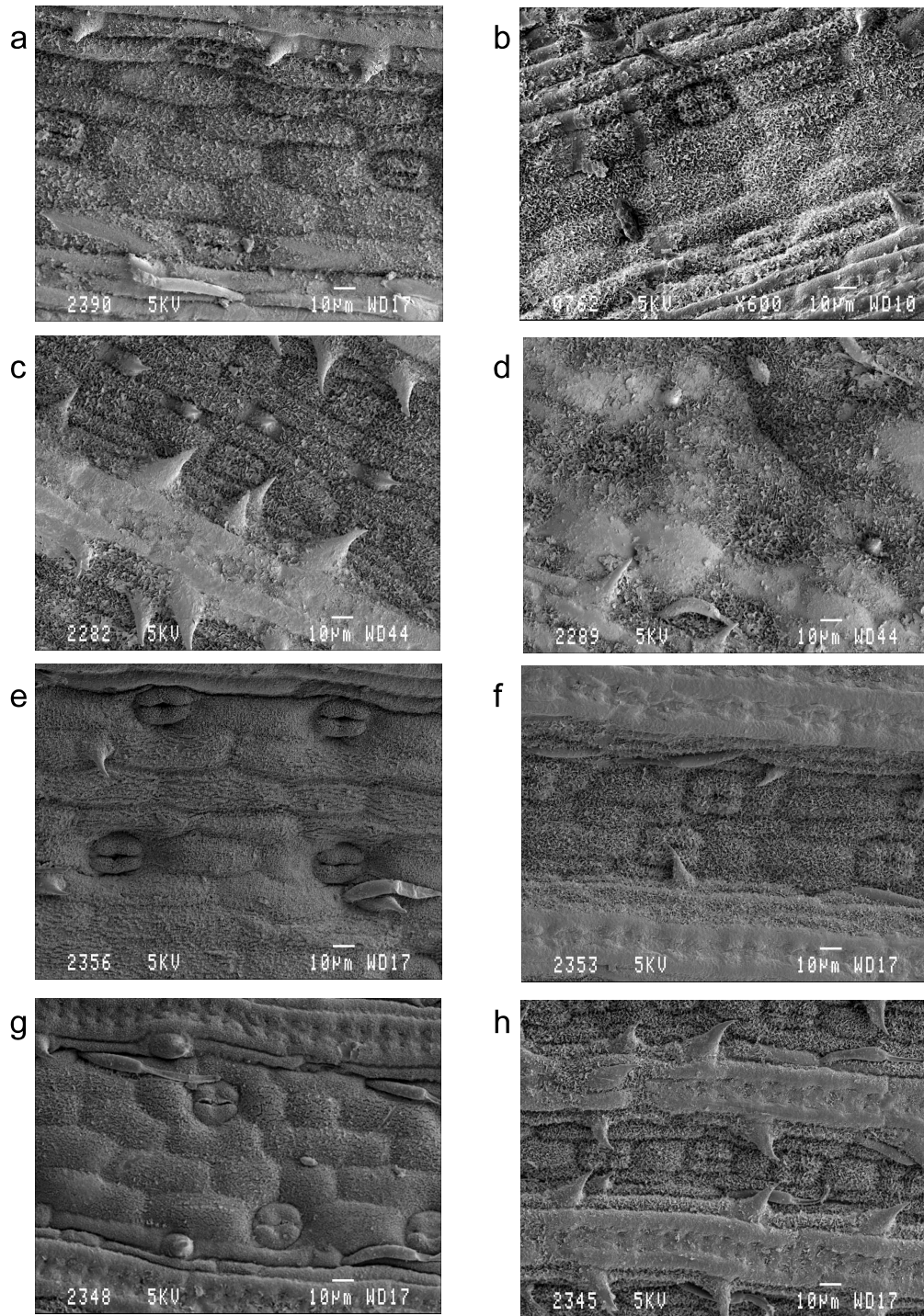


Figure A7.3 Adaxial (left) and abaxial (right) leaf surfaces of *D. eriantha* as affected by different levels of water availability (x600). a & b -W1; c & d -W2; e & f - W3; g & h - W4

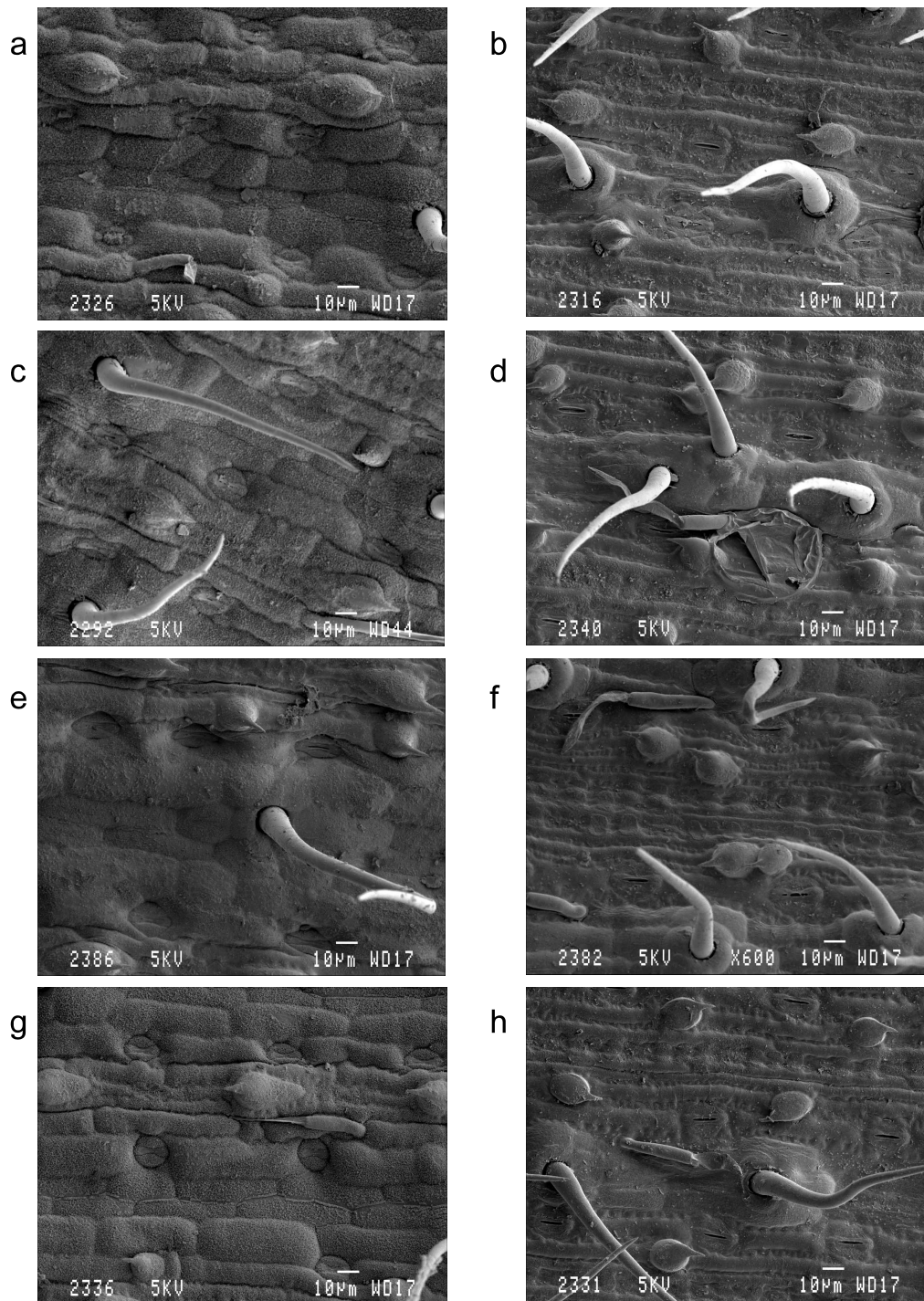


Figure A7.4 Adaxial (left) and abaxial (right) leaf surfaces of *P. maximum* as affected by different levels of water availability (x600). a & b -W1; c & d -W2; e & f - W3; g & h - W4

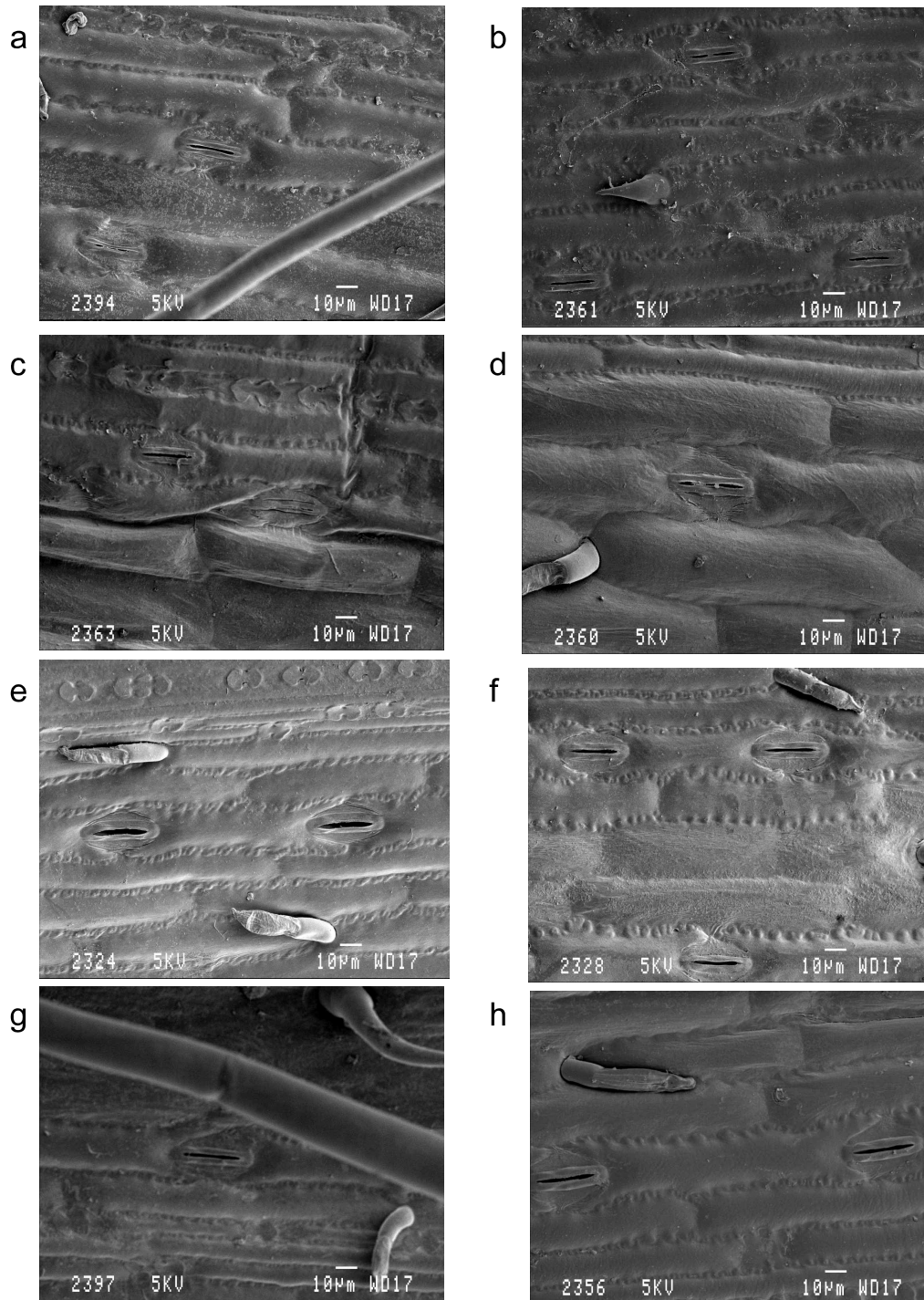


Figure A7.5 Adaxial (left) and abaxial (right) leaf surfaces of *P. clandestinum* as affected by different levels of water availability (x600). a & b - W1; c & d - W2; e & f - W3; g & h - W4

Data and statistical analysis of data presented in **Chapter 8**.

Table A8.1 Influence of level of water availability and nitrogen applied on the water use (l) of three perennial grass species.

Grass species(G)	Level of water availability (I)*			Mean
	W1	W2	W3	
<i>C. ciliaris</i>	16.32	25.25	28.37	23.31
<i>Cynodon</i> hybrid	15.21	23.93	26.86	22.00
<i>P. clandestinum</i>	15.62	24.72	28.77	23.04
Mean	15.72	24.63	28.00	
LSD _T (G) = 1.27				
LSD _T (I) = 1.27				
LSD _T (N) = 1.61				
LSD _T (GxN) = 4.39				

* W1 -severely water stressed level, W3 - control

Table A8.2 Shortened ANOVA for the water use of three perennial grass species.

Source	df	F value	Pr > F
Grass species (G)	2	3.36	0.0382
Level of water availability (I)	2	283.21	< 0.0001
GxI	4	0.39	0.8152
Level of N applied (N)	3	10.12	< 0.0001
GxN	6	2.78	0.0150
IxN	6	1.70	0.1284
GxIxN	12	0.60	0.8388
Mean Square Error	6.828818		
CV %	11.47		
R ²	0.86		

Table A8.3 Influence of level of water availability and nitrogen applied on the dry matter yield (g pot⁻¹) of three perennial grass species.

Grass species(G)	Level of water availability (I)*			Mean
	W1	W2	W3	
<i>C. ciliaris</i>	16.57	25.82	27.19	23.19
<i>Cynodon</i> hybrid	20.82	31.63	32.55	28.33
<i>P. clandestinum</i>	11.11	19.04	20.51	16.89
Mean	16.17	25.49	26.75	

LSD_T(G) = 1.57
LSD_T(GxI) = 1.57
LSD_T(N) = 3.14
LSD_T(GxIxN) = 5.43

* W1 -severely water stressed level, W3 - control

Table A8.4 Shortened ANOVA for the dry matter yield of three perennial grass species.

Source	df	F value	Pr > F
Grass species (G)	2	150.91	< 0.0001
Level of water availability (I)	2	153.53	< 0.0001
GxI	4	0.90	0.4653
Level of N applied (N)	3	29.30	< 0.0001
GxN	6	1.59	0.1559
IxN	6	0.48	0.8183
GxIxN	12	2.16	0.0186
Mean Square Error		10.453183	
CV %		14.18	
R ²		0.87	

Table A8.5 Influence of level of water availability and nitrogen applied on the water use efficiency ($\text{g } \ell^{-1}$) of three perennial grass species.

Grass species(G)	Level of water availability (I)*			Mean
	W1	W2	W3	
<i>C. ciliaris</i>	1.01	1.04	0.97	1.01
<i>Cynodon</i> hybrid	1.37	1.34	1.23	1.31
<i>P. clandestinum</i>	0.72	0.78	0.73	0.74
Mean	1.03	1.05	0.98	

LSD_T(G) = 0.08
LSD_T(GxN) = 0.29
LSD_T(GxIxN) = 0.29

* W1 -severely water stressed level, W3 - control

Table A8.6 Shortened ANOVA for the water use efficiency of three perennial grass species.

Source	df	F value	Pr > F
Grass species (G)	2	130.58	< 0.0001
Level of water availability (I)	2	2.26	0.1096
GxI	4	0.76	0.5540
Level of N applied (N)	3	12.32	< 0.0001
GxN	6	1.79	0.1081
IxN	6	1.87	0.0926
GxIxN	12	2.50	0.0062
Mean Square Error		0.03008258	
CV %		17.02	
R ²		0.77	