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Study on foliar photosynthetic physiology characteristics of *Setaria sphacelata*

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Key words: *Setaria sphacelata*; leaf; photosynthetic physiology; physiological parameter; time interval variations

Introduction The origins of *Setaria sphacelata* (*Setaria anceps* Stapf ex Massey) was tropic Africa (L. Jank et al., 2002). It was introduced in Lin Chang area of Yunnan province in 1991 and was widely planted as forage in this province. This paper describes the relationship of foliar photosynthetic physiology parameters of *Setaria sphacelata* and environment factors. Reasonable and scientific basis were provided for agriculture production in Yunnan areas of China.

Materials and methods A field experiment was conducted in experiment field of Pasture Science department in Yunnan agricultural university. This area located $21^{\circ}9' \sim 29^{\circ}15'$ northern latitude and $97^{\circ}39' \sim 106^{\circ}12'$ eastern longitude. Yearly rainfall was between 1000mm and 1500mm and yearly radiation averages 17.7 MJ/m^2 . The soil of the field was red soil which pH value was 5. *Setaria sphacelata* has been planted in the experiment field 3 years and was cut to 5 cm on 8 March 2007. On 18 May 2007 (sunny), the air temperature (Tar), air relative humidity (RH), air CO_2 concentration (ACi), photosynthesis active radiation (Par), photosynthesis rate (Pr), stomatal conductance (Gs), the intercellular CO_2 concentration (Ci), transpiration rate (Tr), the wave length (λ) and the index of reflection (R) were recorded by Ci-310 portable photosynthetic determination system. From the top, the 2nd, 3rd and 6th leaves of healthy and growing well plant was selected for the experiment with 3 replications.

Results The time interval variation of photosynthesis rate was expressed as two-humped curve and reached the top point at around 11:30 and 13:56, while the time interval change of transpiration rate was a two-humped curve and reached the top point at around 13:56 and 13:59 during 11:00 and 14:00 point period (Table 1 and Figure 1).

Table 1 Variations of environment factors and photosynthetic characteristics during 11:30 and 13:59.

Time	Tar (°C)	RH (%)	ACi ($\mu\text{mol} \cdot \text{m}^{-2} \cdot \text{s}^{-1}$)	Par ($\mu\text{mol} \cdot \text{m}^{-2} \cdot \text{s}^{-1}$)	Pr ($\mu\text{mol} \cdot \text{m}^{-2} \cdot \text{s}^{-1}$)	Gs ($\mu\text{mol} \cdot \text{m}^{-2} \cdot \text{s}^{-1}$)	Ci ($\mu\text{mol} \cdot \text{m}^{-2} \cdot \text{s}^{-1}$)	Tr ($\mu\text{mol} \cdot \text{m}^{-2} \cdot \text{s}^{-1}$)
11:30	27.78	24.03	185.63	1119.36	7.42	16.64	213.4	0.72
13:21	32.09	23.42	194.43	1134.87	10.18	24.04	202.8	1.34
13:56	33.00	23.83	184.23	1260.40	11.63	32.87	196.17	1.77
13:57	33.60	22.58	192.93	925.93	7.97	15.47	201.63	0.97
13:59	33.97	23.23	207.40	1233.77	13.7	31.2	200	1.9

Conclusions the leaves of *Setaria sphacelata* significantly affected by environment, the photosynthesis physiology characteristics of *Setaria sphacelata* leaves changed regularly. Stomatal conductance lead the decisive function the environment factor is the atmospheric humidity, but they have the remarkable relevance. The photosynthetic rate's decline is caused mainly by the non-blowhole factor at noon.

Reference

L. Jank, K. H. Quesenberry, A. R. S. Blount, P. Mislevy (2002). Selection in *Setaria sphacelata* for winter survival. *New Zealand Journal of Agricultural Research*, 273-287.

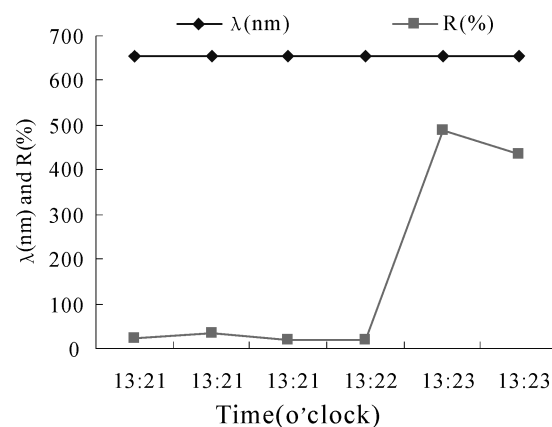


Figure 1 Variations of photosynthetic active radiation and air CO_2 concentration.