

研究报告

# 春小麦对大气CO<sub>2</sub>浓度升高的响应及其对麦长管蚜生长发育和繁殖的影响

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## 摘要

通过开顶式气室研究了春小麦对大气CO<sub>2</sub>浓度升高(542.1±24.8和738.8±25.7 μl·L<sup>-1</sup> vs. 382.4±24.8 μl·L<sup>-1</sup>)的响应及其对麦长管蚜生长发育和繁殖的影响.结果表明, 大气CO<sub>2</sub>浓度升高有利于春小麦的生长.与对照相比, 5月5日~6月14日, 550和750 μl·L<sup>-1</sup> CO<sub>2</sub>浓度处理春小麦的株高分别增加2.80%~14.92%和6.30%~17.56%; 4月30日~6月9日, 叶面积分别增加5.68%~50.52%和6.14%~83.45%; DC<sub>50</sub>分别提前了0.39和0.90 d, DC<sub>75</sub>也分别提前了0.53和1.02 d; 茎、叶、穗以及整个地上部组织的鲜、干重均有不同程度的增加.大气CO<sub>2</sub>浓度升高可显著提高春小麦的穗长和穗粒数, 降低千粒重.与对照相比, 550和750 μl·L<sup>-1</sup> CO<sub>2</sub>浓度处理的麦穗长分别增加0.56%和3.20%; 单株穗粒数分别增加12.5%和18%; 而千粒重分别降低了2.23%和6.34%.随着大气中CO<sub>2</sub>浓度增加, 麦穗中葡萄糖、二糖、多糖、总糖、总糖与总氮的比值都显著增加, 而果糖、三糖和总氮含量都显著降低.大气CO<sub>2</sub>浓度升高可缩短麦长管蚜的产卵前期和世代历期, 提高繁殖量和平均相对生长率.与对照相比, 550和750 μl·L<sup>-1</sup> CO<sub>2</sub>浓度处理麦长管蚜的平均相对生长率分别提高33.26%和74.34%.麦长管蚜种群的平均相对生长率与寄主麦穗中总糖和总氮的比值相关显著.

## 关键词

[开顶式气室](#) [春小麦](#) [CO<sub>2</sub>](#) [麦长管蚜](#) [生长](#) [发育](#) [繁殖](#) [平均相对生长率](#)

## 分类号

responses of spring wheat to elevated CO<sub>2</sub> and their effects on *Sitobion avenae* aphid growth, development and reproduction

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## Abstract

The study on the responses of spring wheat (*Triticum aestivum*) potted in open-top chamber

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to elevated CO<sub>2</sub> (542.1±24.8 and 738.8±25.7 μl·L<sup>-1</sup> vs. 382.4±24.8 μl·L<sup>-1</sup>) and their effects on *Sitobion avenae* aphid growth, development and reproduction showed that elevated CO<sub>2</sub> was advantageous for spring wheat growth. In treatments 550 and 750 μl CO<sub>2</sub>·L<sup>-1</sup>, the plant height during May 5~June 14 increased by 2.80%~14.92% and 6.30%~17.56%, and leaf area per plant during April 30~June 19 increased by 5.68%~50.52% and 6.14%~83.45%, respectively, compared with CK. The DC<sub>50</sub> and DC<sub>75</sub> were brought forward about 0.39 and 0.53 d for treatment 550 μl CO<sub>2</sub>·L<sup>-1</sup>, and 0.90 and 1.02 d for treatment 750 μl CO<sub>2</sub>·L<sup>-1</sup>, respectively. Moreover, the stem, leaf, ear and above-ground biomass also had some increase under elevated CO<sub>2</sub>. Compared with CK, a significant increase of ear length (0.56% and 3.20%) and grain number per ear (12.5% and 18%), but a significant decrease of 1000-grain dry weight (2.23% and 6.34%) were observed for treatments 550 and 750 μl CO<sub>2</sub>·L<sup>-1</sup>, respectively. With increasing CO<sub>2</sub>, the chemical constituents in ear, such as glucose, disaccharide, amylose and TSCs/nitrogen ratio increased significantly, while fructose, trisaccharide and total nitrogen decreased significantly. CO<sub>2</sub> elevation shortened the preoviposition duration and longevity of *S. avenae*, and increased the number of offspring per female aphid and mean relative growth rate (MRGR). Compared with CK, the MRGR increased 33.26% in treatment 550 μl CO<sub>2</sub>·L<sup>-1</sup>, and 74.34% in treatment 750 μl CO<sub>2</sub>·L<sup>-1</sup>. Furthermore, there was a significant correlation between the MAGR of *S. avenae* and the TSCs/nitrogen ratio of spring wheat ear.

**Key words**

[Open-top chamber](#) [Spring wheat](#) [CO<sub>2</sub>](#) [Sitobion avenae](#) [Growth](#) [Development](#)  
[Reproduction](#) [Mean relative growth rate](#)

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