ABSTRACT
With global warming and climate change, high temperature stress has become a major factor affecting crop growth and yield. Cotton (Gossypium hirsutum L.) crops in the U.S.A. experience periods of extreme high temperatures during flowering and boll development, but information is lacking on the physiological response of cotton to high temperatures stress and appropriate techniques to ameliorate this response. The objective of this growth chamber study was to determine the effects of high temperature alone, and in combination with applications of the anti-ethylene compound 1-Methylcycloprone (1-MCP) on cotton reproductive organs. Treatments consisted of two temperature regimes, 38°C and 30°C, and 1-MCP applications made to flowers on the day of anthesis. High temperature and 1-MCP had significant effect, on ethylene production of cotton reproductive organs. High temperature decreased ethylene synthesis by 2.5 fold at 2 days after the white flower stage. The 1-MCP treatment caused a 1.5 fold decrease in ethylene concentration 1 day after the application at the white flower stage. Both high temperature and 1-MCP treatment increased the weight of cotton bolls collected 8 days after the white flower stage with an increase of 0.7 and 1 g, respectively. Glutathione reductase (GR) activity showed higher values in the high temperature regime, whereas 1-MCP treatment significantly decreased GR activity in flowers collected two days after the white flower stage. These results indicated that although high temperature decreased ethylene production and increased the size of cotton bolls, high temperature treatment increased GR activity and the stress levels of cotton reproductive organs, whereas 1-MCP application had positive amelioration effects of decreasing ethylene and increasing boll size.