POSTER 20

Effect of Elevated Temperature and CO_2 Concentration on The Incidence of Hot Pepper Bacterial Spot

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I. Introduction

Climate change due to global warming is bringing phenological changes in agricultural ecosystems. It is expected to have a significant impact on crop pest occurrence. According to the RCP scenarios of climate change while increasing the concentration of carbon dioxide in the atmosphere and air temperature rise up to 5.7°C and rainfall is predicted to increase by 20.4% in 2100. In order to minimize disease damage due to the future climate change, assessment impact on crop disease occurrence in advance is important.

Bacterial spot occurrence of hot pepper from July to August in Korea resulted in yield loss. This study was conducted to analyze the incidence patterns after artificial inoculation in four different temperature and CO_2 concentration treatment after inoculating with *X. euvesicatoria* on pepper seedlings.

II. Materials and Methods

'Millenium Promise' and 'PR Cheolbyuk' varieties were sowed after soaking to disinfect the seed for 30 minutes in 52°C hot water. Seedlings were grown in a nursery bed soil until having eight leaves. The experiment was carried out using precisely controlled large growth chamber for 15 days in four treatments such as 30°C + 400 ppm (Ambient), 30°C + 800 ppm (Elevated CO_2), 35°C + 400 ppm (Elevated temp.), 35°C + 800 ppm (Elevated). After bacterial spot pathogen (*X. euvesicatoria*) cultured for 48 hours at 25°C using sterile water was adjusted to a concentration of 10^8 cfu/ml level. After spray inoculating with 10 ml pathogen per plant was covered with a plastic bag for 24 hours in four controlled large growth chamber.

Disease incidence and severity, expression of PR1 gene were investigated. Leaf samples were taken for measuring stomata size after 24 hours. Collected samples were fixed in 2.5% Glutarldehyde (1st) and 1% Osmium tetraoxide (2nd) in turn. And then washed the primary and secondary fixatives with 0.05M Cocodylate buffer solution. And then were dehydrated

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using a series of ethanol solution from 10% to 100%. Samples were analyzed by SEM (N-2460, Hitachi) after coating using CPD (Critical Point Dryer).

A portable photosynthesis meter (LI-6400, Licor) were measured in pepper leaf stomatal conductance and transpiration.

III. Results

Table 1. Bacterial spot incidence of hot pepper in four different temperature and CO_2 concentration treatment after inoculating with *X. euvesicatoria* (%)

Treatment	PR Cheolbyuk (10 DAI)		Millenium Promise (10 DAI)	
	Leaf Incidence	Leaf severity	Leaf Incidence	Leaf severity
30°C+400ppm (Ambient)	15.4	5.3	28.5	10.9
30°C+800ppm (Elevated CO_2)	14.4	4.3	24.8	9.4
35°C+400ppm (Elevated temp.)	57.6	29.8	84.8	67.0
35°C+800ppm (Elevated temp.+CO_2)	21.3	6.3	41.6	30.9

Disease incidence and severity of the two hot pepper varieties were increased in 35°C+400 ppm (Elevated temp.) and showed differences between breeds (Table 1). Hot pepper bacterial spot were increased in 5°C elevated temperature conditions and were decreased in CO_2 concentration rise.

30°C, 400ppm **30°C, 800ppm** **35°C, 400ppm** **35°C, 800ppm**

Fig. 1. Symptoms of hot pepper bacterial spot in four different temperature and CO_2 concentration treatment.

Table 2. Stomatal conductance and transpiration rate of hot pepper 'Millenium Promise' in four different temperature and CO_2 concentration treatment after inoculating with *X. euvesicatoria*

Treatment	Stomatal conductance (mmol H_2O $m^{-2}s^{-1}$)	Intercellular CO_2 con. (μmol CO_2 mol^{-1})	Transpiration rate (mmol H_2O $m^{-2}s^{-1}$)
30°C+400ppm (Ambient)	0.75	395.9	5.6
30°C+800ppm (Elevated CO_2)	0.73	801.2	5.4
35°C+400ppm (Elevated temp.)	1.09	390.1	8.9
35°C+800ppm (Elevated temp.+CO_2)	1.43	792.2	9.4

Stomatal conductance and transpiration rate was increased in 5°C elevated temperature (35°C) and did not show significantly different by CO_2 concentrations treatment (Table 2). Expression of PR1 disease resistance gene was collapsed in 5°C elevated temperature treatment (Fig. 2).

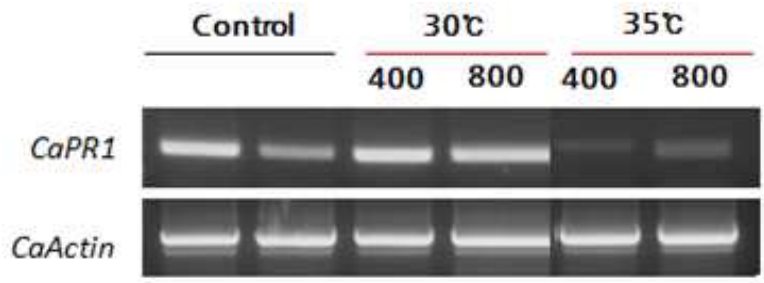

Fig. 2. Expression of PR1 gene in hot pepper leaves after 24 hours.