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บัณฑิตวิทยาลัย

มหาวิทยาลัยแม่โจ้

วันที่ 27 เดือน สิงหาคม พ.ศ. 2557

บัณฑิตวิทยาลัย
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เรื่อง การเผยแพร่ผลงานดุษฎีนิพนธ์/วิทยานิพนธ์

เรียน คณบดีบัณฑิตวิทยาลัย

ข้าพเจ้า นางสาวกรรณิการ์ จันทรส รหัส 5401302001

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[/] ปริญญาโท [ก(2)]

สาขาวิชา พืชสวน คณะ ผลิตกรรมการเกษตร

ได้ดำเนินการเผยแพร่ผลงาน ดังนี้

1. การเผยแพร่ผลงานโดยการตีพิมพ์ในวารสารหรือสิ่งพิมพ์ทางวิชาการ [ ] ลงพิมพ์แล้ว [ ] ได้รับการตอบรับให้ลงพิมพ์

1.1 ชื่อบทความ Evaluation on Heat Tolerant of Cultivated Strawberry Plants (Fragaria x ananassa Duch)

ชื่อวารสาร The Journal of Interdisciplinary Networks ปีที่พิมพ์ 2013 ฉบับที่ 2 หน้า 37

1.2 ชื่อบทความ .....

ชื่อวารสาร ..... ปีที่พิมพ์ ..... ฉบับที่ ..... หน้า .....

2. การเผยแพร่ผลงานโดยการนำเสนอที่ประชุมวิชาการ

2.1 ชื่อเรื่องที่นำเสนอ Evaluation on Heat Tolerant of Cultivated Strawberry Plants (Fragaria x ananassa Duch)

ชื่อการประชุมวิชาการ The 9th Young Scientist Seminar

ชื่อหน่วยงานที่จัดประชุม Yamaguchi University

สถานที่จัดประชุม Yamaguchi-ken Seminar Park, Yamaguchi, Japan

วัน เดือน ปี ที่จัดประชุม 18 พฤศจิกายน 2013 หน้าที่ตีพิมพ์ 41

2.2 ชื่อเรื่องที่นำเสนอ .....

ชื่อการประชุมวิชาการ .....

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THE JOURNAL OF INTERDISCIPLINARY NETWORKS

Special Issue on Interdisciplinary Research and Development in ASEAN Universities

Volume 2 (Special Issue), Number 2, July-December 2013

International Conference

on Interdisciplinary Research and Development in ASEAN Universities

August 8-10, 2013 **Imperial Mae Ping Hotel, Chiang Mai, THAILAND**

CERTIFICATE OF ORAL PRESENTATION

presented to

Kannika Jantarot, Siriwat Sakornwasee and Preeda Nathewet

Evaluation on Heat Tolerant of Cultivated Strawberry Plants (Fragaria × ananassa Duch)

In appreciation of your presentation at
International Conferenceon Interdisciplinary Research and Development in ASEAN Universities

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Science and Technology — Page

Evaluation on Heat Tolerant of Cultivated Strawberry Plants (Fragaria x ananassa Duch)

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Abstract: Average global temperatures are expected continually to increase every year. It is well known that temperature is one of the most important factors for the growth of economic crops as well as strawberry plants. For strawberries, the temperature above 30°C is directly affected to reduce growth and yields. In the present study, the ability of heat tolerant in cultivated strawberry plants were examined. "Prarajchatan 60", "Prarajchatan 80", "Sachinoka", No.329 and Driscoll's strawberry cultivars were grown in heat room at 35°C for 7 days. An actual Photo System II efficiency (ØPSII), maximal efficiency of PSII photochemistry (Fv/Fm), percentage of ion leakage, Stomata conductance (gs), transpiration rate (E), net CO2 assimilation rate (A) and leaf temperature determination method (Tl) were measured. Strawberry cultivar "Prarajchatan 60" had the markedly lower of Tl (33.9°C), percentage of ion leakage (13.86%) than those other remain cultivars. Among five strawberry cultivars Driscoll's maintained the highest percentage of ion leakage. The results also revealed that there is a significant relationship between Fv/Fm and gs and E. Hence, it could be possible to use the percentage of ion leakage value together with other physiological indices for evaluating the heat tolerant in strawberry plants.

Keywords: Ion leakage, Photochemistry, Climate change, Heat stress

INTRODUCTION

Recently the average global temperatures are expected to increase every year. Heat stress becomes one of the major abiotics stress affecting agriculture worldwide. An effect of high temperature on crops production and physiology has been reported worldwide. High temperature reduces growth, reproductive and yield of many crops [8, 9, 12, 14]. At cellular membrane levels, heat stress results to disturb and injury some physiological activities in plants such as, denaturing of protein, metabolic imbalance and biochemical lesions.

The cultivated Strawberry (*Fragaria* × *ananassa* Duch) is one of the most economically small fruit crops in the world. It is widely grown in North and South America, Europe, Asia, and Australia [6]. Strawberry plants are classified as temperate crops with an optimum growth temperature range from 10 to 26 °C. However, in tropical countries such as Thailand, the cultivated strawberry plants can also be grown commercially in the highlands where temperatures range from 10 °C to 26°C [15]. For strawberry the main factors to induce flower formation for June-bearing strawberries are low temperature and shortened photoperiod [9]. The limiting factor for growing strawberry is high temperature more than 30° C. High temperature could be negatively affected to growth and yield of strawberry plants. The temperature rising higher than 30 ° C are directly affected to reduce number of inflorescences, flowers, fruits, pollen viability, fruit size, fruit weigh and overall plant growth of cultivated strawberries [8, 11, 12, 14]. Moreover, at 30 ° C the cells under suspension

cultures did not normally proliferate and grew very slow. However, information related to evaluate the heat tolerance ability of cultivated strawberry by simple and reliable method using physiological value remains obscure. Considering the implications of global climate change, it may become a serious problem in the near future for strawberry growing cultivation. Therefore, this study is aimed to evaluate the heat tolerance ability of cultivated strawberry by using electrolyte leakage value

MATERIALS AND METHODS

Plant Materials and Treatments

Five June-bearing cultivated strawberry cultivars were used in this study. Plug plants of "Akihime" "Parajchatan 60" "Sachinoka" "No.329" and "Discroll's" were grown plastic pots s (14 cm in height and 13 cm in diameter with 17.5 cm) containing coconut coir. Plants were grown under natural condition in plastic house for 4 weeks and irrigated by Half Hoagland nutrient solution twice a day. After that, eight plants of each cultivar were randomly transferred into high temperature room treatments set at 35±2 °C and under control conditions at 25±2 °C by placing on the plastics tray, 16/8 h photoperiods (day/night) with 100 µmoles m^{-2} s^{-1} PPFD for seven days. To avoid from water stress, 1 cm height of water level in the tray were kept until the end of experiment.

Cell Membrane •

Membrane thermostability was measured by modified method according to Sullivan (1972). Eight uniform fully expanded leave per treatments of each cultivar were cut into 0.5 cm in diameter. Ten Leaf discs of each cultivar from each treatment were placed into test tube and rinsed the samples with 10 ml double deionized water for three times. Each cultivar was represented by ten test tubes. Then, 10 ml of double deionized water were added to each tube and covered the test tube by aluminum foils. The samples were incubated at room temperature for 16 h. After that, electrical conductivity of each sample solutions were measured using a conductivity meter (SUNTEX conductivity meter SC-170), assigned as (E0). Subsequently, the test tubes with same solution were autoclaved to kill the leaf discs, and cooled down at 25 °C for 1 h. Total electrical conductivity (Et) was then measured. Percentage of electrolyte leakage was calculated as (E0/Et) x 100.

Leaf chlorophyll fluorescence of young fully expanded leaflet at seven day of heat treatment were measured under 25±2 °C and 35±2 °C with 100 µmoles m^{-2} s^{-1} PPFD. Leaf Chlorophyll fluorescence was measured with pulse-modulated fluorometer (Fluorescence Monitoring System [FMS-1] Hansatech Instruments Ltd., Norfolk, U.K.). Parameter for Initial chlorophyll fluorescence yield (Fo), variable chlorophyll fluorescence yield, (Fv) and maximum chlorophyll fluorescence yield (Fm) were recorded from pulse-modulated fluorometer LCD display. These fluorescence parameters were used for determine maximum photochemical efficiency of the photosystem II in dark adapted leaves (Fv/Fm) using following equations:

$$\text{Photosystem II } (Fv/Fm) = (Fm - F0)/ Fm$$

Data in this study were used to analyze the analysis for of variance, and means were compared by least significant difference (LSD). To examine Relationships between

percentage of ion leakage and photosystem II in dark adapted leaves (Fv/Fm), regression was analyzed.

RESULTS AND DISCUSSION

Membrane Injury

Membrane injury of cultivated strawberry plants were evaluated through out electrolite leakge from the leave cell. There were significant differences in percentage of inon leakage among the cultivars. Under high temperature stress at 35 °C, strawberry plants cultivar "Driscoll's" had a significantly higgher in the percentage of inon leakage than other cultivars. The significant lowest mean value for percentage of inon leakage was found in No.60, No.329 and Akihime, repectively. This result indicated that the strawberry cultivars of Prarajchaţan 60 No.329 and "Akihime" have the best performance and were tolerant to heat stress better than those "Driscoll's" and "Sachinoka". Significant differences in percentage of inon leakage among straberry genotypes reported here may offer partial explanations for the degree of difference tolerence to heat stess observed in these cultivars. Although it can not be accurately indicated how much membrane capability may contibute to heat tolerance in strawberry plants, this result suggests that it may by an important component. The ion leakage have been used as index for evaluating abiotic stress to qualify cell thermostabily in many plants species [9, 10].

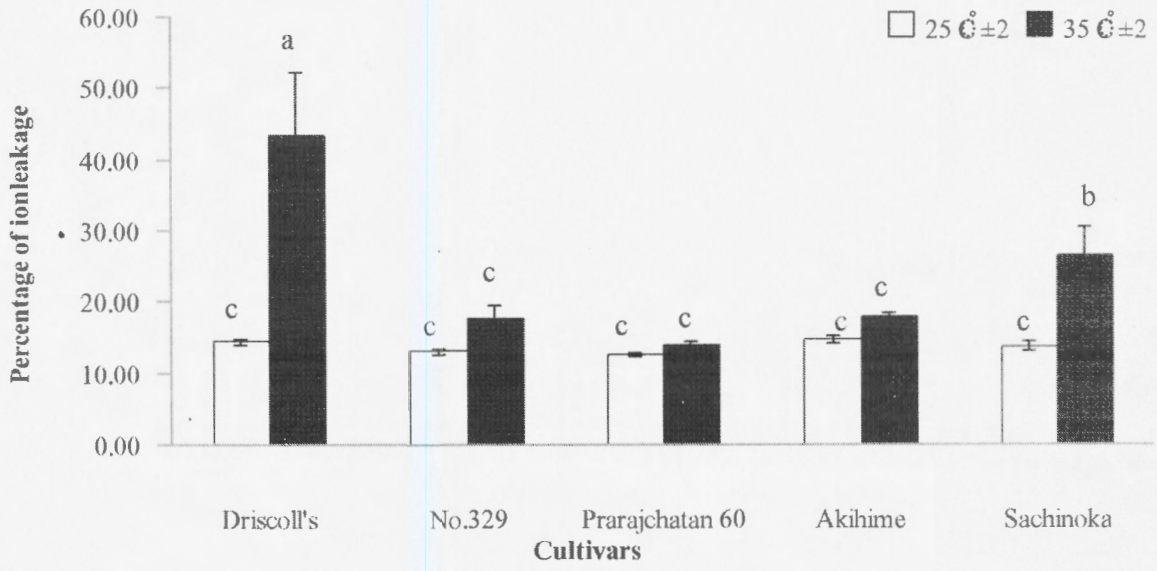

Figure 1 A Effects of heat stress on percentage of ion leakage in cultivated strawberry plants.

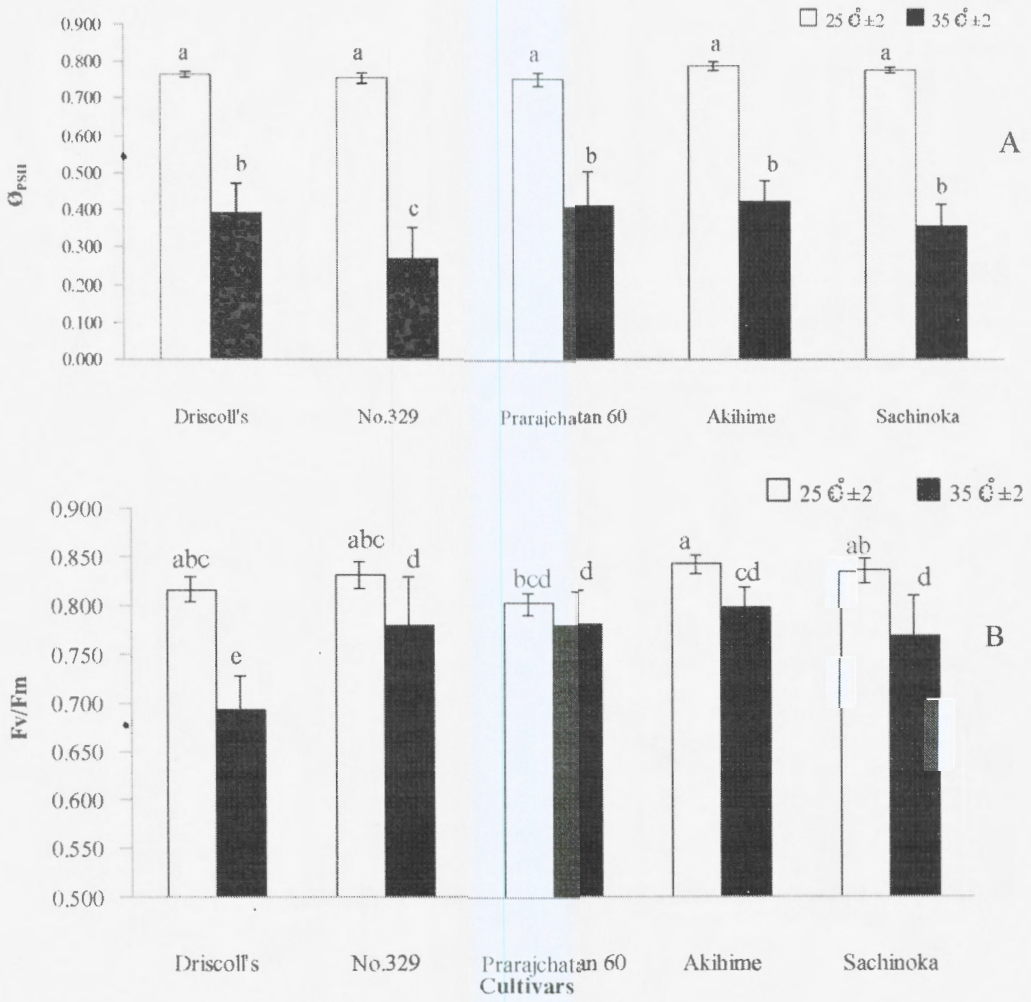

Figure 1 B Effects of heat stress treatment on photosystem II (PSII) and maximum fluorescence (Fv/Fm) in cultivated strawberry plants.

Effects of heat stress treatment on photosystem II (PSII) and maximum fluorescence (Fv/Fm) of five strawberry cultivars after explored to high temperature at 35±2 °C for seven days were shown in Figure 1 A. Both PSII and Fv/Fm explored to high temperature at 35±2 °C were significantly different among the cultivars. PSII under high temperature at 35±2 °C for all cultivars was significantly declined compared with plants under control (25±2 °C). The lowest PSII was observed in strawberry cultivar No.329. Decline in PSII efficiency for these five strawberry cultivars under heat stress condition might be attributed to the damage to oxygen-evolving apparatus [5] and impairment of electron transfer within PSII reaction centers [3, 4, 10]. There was significant change in Fv/Fm of five strawberry cultivars explored to high temperature. "Driscoll's" had lowest of Fv/Fm among five strawberry cultivars (Figure 1 B). Our results showed that heat stress had effect to decrease in PSII and Fv/Fm. Decreasing of Fv/Fm during the heat stress suggested a reduction of the rate of energy-trapping by PSII centers, which might be the result of a damaging in PSII reaction center [7]. Significantly negative relationships between Fv/Fm and percentage of ion leakage was observed (Figure 2) for all cultivars. This result was consistent with Xu et al. (2008) found that percentage ion leakage from maize's leaf under drought stress was significantly negative correlated with Fv/Fm.

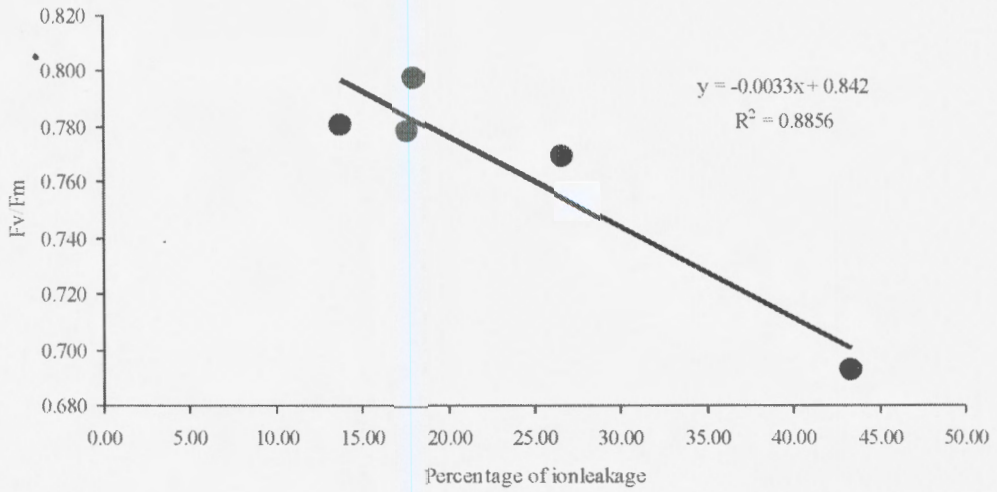

Figure 2 The relationships between fluorescence parameters and percentage of ion leakage in leaves of five cultivated strawberry.

CONCLUSION

The electrolyte leakage in leave of five strawberry cultivars in this study can be used as one of parameter by combing with other physiological value such as Fv/Fm ratio and PS II values to evaluate the heat tolerance. Considering to parameter investigated, Driscroll's would be the most susceptible strawberry cultivar to heat stress (highest value for percentage and lowest decline in Fv/Fm ratio), whereas the highest tolerance to heat stress would be No.329 and 'Prarajchatan 60' (highest value in Fv/Fm and lowest value for percentage).

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The 9 th Young Scientist Seminar

Establishment of International Network for Tropical Bioresources and Their Utilization

NOVEMBER 18 th-19 th , 2013
SEMINAR PARK, YAMAGUCHI, JAPAN

SUPPORTED BY
YAMAGUCHI UNIVERSITY

The 9th Young Scientist Seminar

Aio, Yamaguchi, Japan

18th - 19th November 2013

First Circular

Establishment of International Network for Tropical Bioresources and Their Utilization

YAMAGUCHI UNIVERSITY
山口大学

Invitation

On behalf of the Organizing Committee, we are pleased to invite you to the 9th Young Scientist Seminar 2013 in Yamaguchi, Japan. This event will be held on 18th – 19th November 2013. The 9th YSS will be the result of establishment of international network among students and young researchers, who would make every effort to provide excellent results in the area of utilization of tropical bioresources for a stimulating and enjoyable scientific seminar.

Venue

The 9th Young Scientist Seminar 2013 will be held during middle of November 2013 at the Yamaguchi-ken Seminar Park, Yamaguchi, Japan. This place is a prefectural facility offering a unique environment to meet with colleagues in a relaxing atmosphere.

The temperatures in November ranging from 5°C in the morning, to the afternoons averaging 17°C.

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Master of ceremony	Kanaporn Sujarit Abdul Jabar Jordana Kalfat
Secretary and finance	Takayuki Ishiguchi Junpei Kawaguchi Takahiro Kariya Kazuya Fujiyama Katuaki Emoto
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Assoc. Prof. Dr. Takaya Higuchi
Assist. Prof. Dr. Tomoyuki Kosaka
Assist. Prof. Dr. Naoya Kataoka

Language of the Seminar

The official language of the Seminar will be English and no translation facilities will be available.

Seminar theme

Establishment of international network for tropical bioresources and their utilization

Social Program

An icebreaker party will be taken place on the evening of the 18th November 2013

Insurance

All delegates are advised to take out their own private medical cover and personal insurance for the duration of the Seminar.

YAMAGUCHI
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Certificate of Completion

is Proudly Granted to:

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For satisfactorily completing attended Young Scientist Seminar,
on November 18 – 19, 2013
At Yamaguchiken Seminar Park, Yamaguchi Prefecture

Dr. Mamoru YAMADA
Dean, Professor, Faculty of Agriculture and
Graduate School of Medicine, Yamaguchi University, Japan

Evaluation on Heat Tolerant of Cultivated Strawberry Plants (*Fragaria* × *ananassa* Duch)

Kannika Jantarot [1], Siriwat Sakornwasee [1], Preeda Nathewet [1,*]
[1] *Faculty of Agricultural Production, Maejo University, Nong-Han, San-Sai, Chiangmai, 50290, THAILAND*

Average global temperatures are expected continually to increase every year. It is well known that temperature is one of the most important factors for the growth of economic crops as well as strawberry plants. For strawberries, the temperature above 30 °C is directly affected to reduce growth and yields. In the present study, the ability of heat tolerant in cultivated strawberry plants was examined. "Akihime", Driscoll's, "Prarajchatan 60", "Sachinoka" and No.329 strawberry cultivars were grown in control and heat room at 25±2 °C and 35±2 °C, respectively for 7 days. An actual Photo System II efficiency (ØPSII), maximal efficiency of PSII photochemistry (Fv/Fm), percentage of ion leakages was measured. Strawberry cultivar "Prarajchatan 60" had the markedly lower of percentage of ion leakage (13.86%) than those other remain cultivars. Among five strawberry cultivars Driscoll's maintained the highest percentage of ion leakage. The results also revealed that there is a significant relationship between Fv/Fm and percentage of ion leakage. Hence, it could be possible to use the percentage of ion leakage value together with other physiological indices for evaluating the heat tolerant in strawberry plants.

Key words: photochemistry, climate change, heat stress, strawberry