Evaluation of Primocane Fruiting **Raspberry** Cultivars under Elevated **Temperature** Regimes

Tek Prasad Gotame[1], Karen Koefoed Petersen[1], Hanne Lindhard Pedersen[1], Carl-Otto Ottosen[1], Julie Graham[2] and Michelle Williams[1]

[1]**Department of Food Science**, Aarhus University, Kirstinebjergvej 10, Dk-5792 Aarslev, Denmark
[2] James Hutton Institute, Invergowie, Scotland

Tek.Gotame@agrsci.dk
Tel: +4589993350

Summary

Effect of temperature during flower initiation and development on primocane raspberry physiology was investigated. Five cultivars were grown in greenhouse at 20° C and long day for seven weeks and thereafter transferred to growth chambers at 27, 32, and 37° C for 7 days. Quantum efficiency (F_v/F_m) decreased with increased stress period and temperature. The decreased in quantum efficiency varied from 10 to 18% as compared with control. Similarly, chlorophyll a decreased as stress period increased.

Introduction

Cultivated raspberry (*Rubus idaeus*) cultivars are poorly adapted to warm temperature, but heat stress is one of the most important abiotic stresses affecting plant physiology, yield and quality of raspberry fruit (Ballington and Fernandez, 2008). In the North Sea Region (NSR), the problem of fluctuating temperature is expected to be one of the constraints to the raspberry industry. To address this issue, this experiment was designed to study the effect of high temperatures on photosynthetic efficiency of primocane raspberry cultivars at the flower initiation stage.

> ***The temperature stress decreased chlorophyll content and expressed as yellowing of newly growing leaves in Autumn Bliss and Fall Gold.***

Results

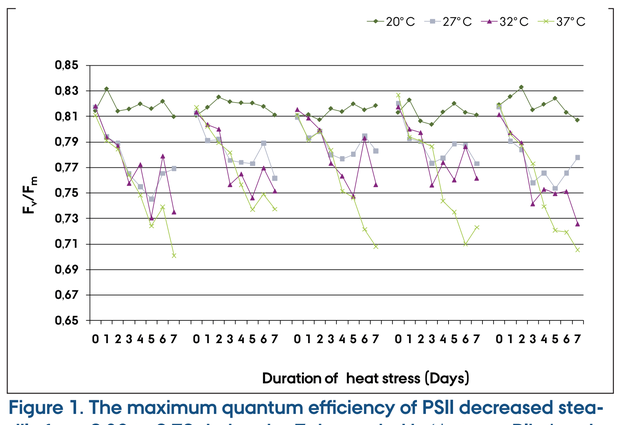

Figure 1. The maximum quantum efficiency of PSII decreased steadily from 0.83 to 0.70 during the 7 day period in 'Autumn Bliss' and 'Fall Gold' grown at 37° C. Whereas the Fv/Fm for the cultivar Polka stopped decreasing from day five, indicating some degree of heat tolerant (n = 6).

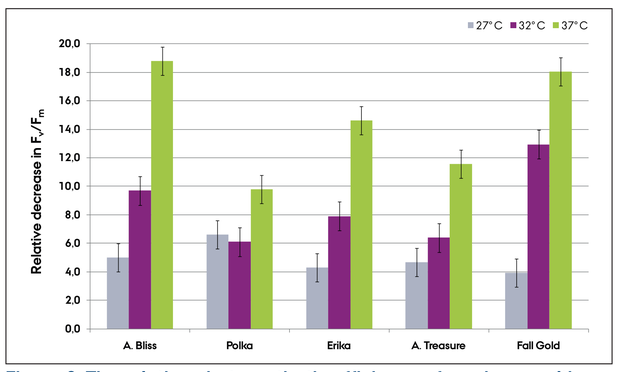

Figure 2. The relative photosynthetic efficiency of raspberry cultivars decreased between 10 to 18% after 7 days at 37° C as compared to control. Data are presented as averages (n = 6), with standard error bars.

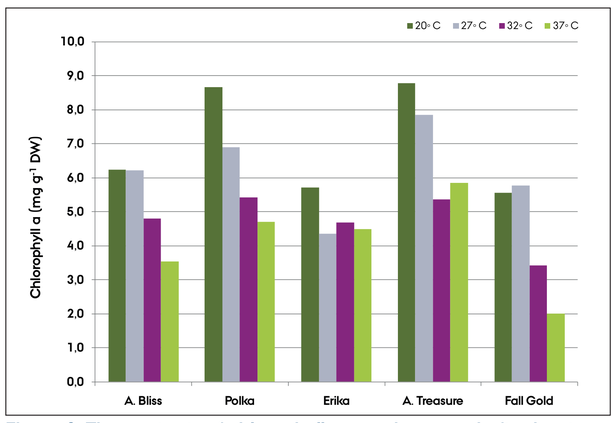

Figure 3. The contents of chlorophyll a was decreased after heat stress in all cultivars. However, cv A. Bliss and Fall Gold showed clear yellowing of the top leaves as compared with other cultivars investigated and temperature regimes.

Materials and methods

One year old plants of five primocane raspberry cultivars, 'Autumn Bliss', 'Autumn Treasure', 'Fall Gold', 'Erika' and 'Polka' were potted in a 3.5 l pot. Nine plants were used per treatment and divided into three replications over time. The plants were grown in greenhouse at 20° C and long day (14/10 h D/N) conditions until flower induction occurred. Plants were cut back and only one shoot per pot was maintained during the experimental period. When plants reached the stage of flower induction (7 weeks), they were transferred to climate chambers at 27, 32 and 37° C and 350 µmol m^{-2} s^{-1} PAR. A control group remained at 20° C in the greenhouse. Every day chlorophyll fluorescence was measured by using a MiniPam at 11:00 -14.00 h of the day on a 30 min dark adapted leaf. Photosynthetic pigments was analysed at the end of the experiment.

> ***The apparent quantum efficiency reflected both effects of stress period and temperature.***

We gratefully acknowledge financial support for this research from Interreg IVB North Sea Region Programme (2007-2013) through Project ID: 35-2-05-09 ('ClimaFruit').

References

Ballington, J.R. and G.E. Fernandez. 2008. Breeding raspberries adapted to warm humid climates with fluctuating temperature in winter. Proceeding of the Ninth International Rubus and Ribes Symposium. Acta Horticulture. No 777. Pp. 87-90.

DEPARTMENT OF FOOD SCIENCE
FACULTY OF SCIENCE AND TECHNOLOGY
AARHUS UNIVERSITY

European Union The European Regional Development Fund
The Interreg IVB North Sea Region Programme
Investing in the future by working together for a sustainable and competitive region

The James Hutton Institute