LIPID METABOLISM IN SOYBEAN SEEDS DURING DROUGHT STRESS

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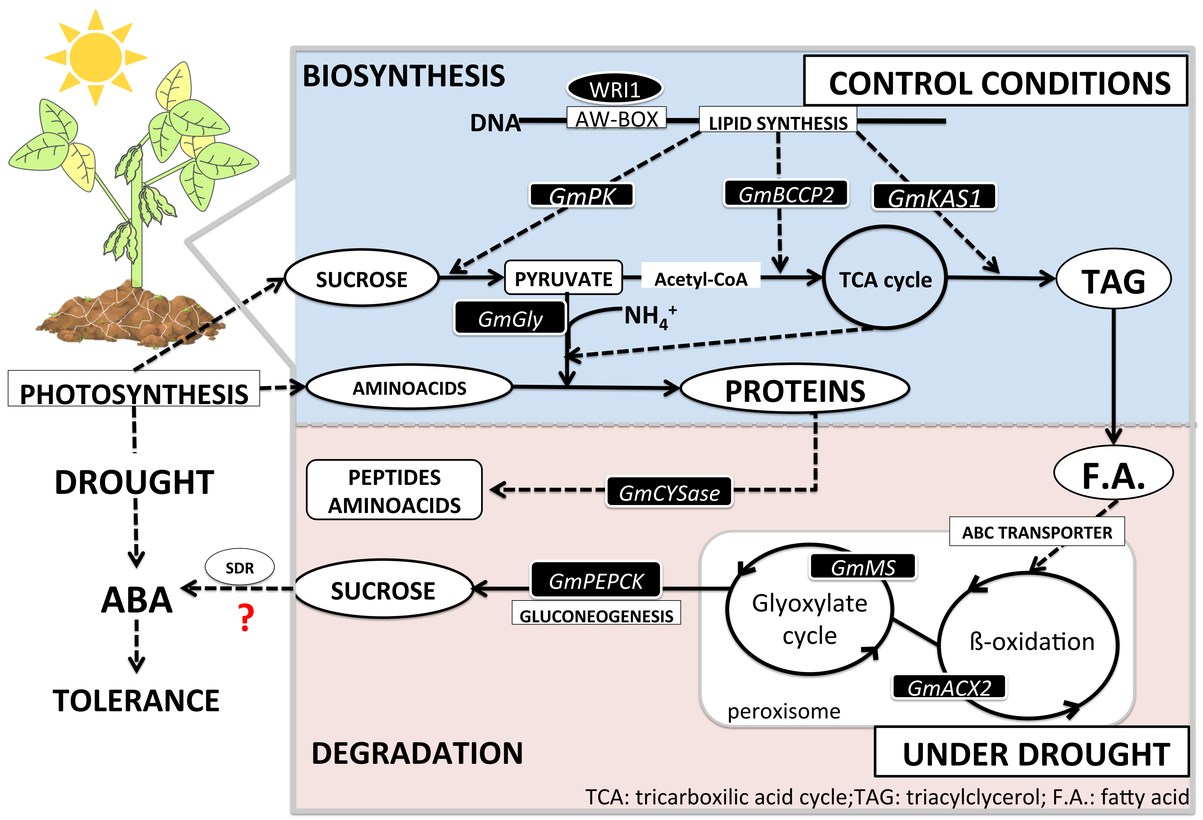
INTRODUCTION

Soybean (*Glycine max* (L.) Merr.) seeds are widely used in food industry due of their high protein and lipid contents being a crucial crop for oil production and raw material for biodiesel. However, climate changes such as drought, may alter seed storage compounds, limiting growth, agricultural yield by decreasing photosynthesis rate in plants (Ohashi et al.2006). It has been known the response of plants during drought is regulated by plant hormones such as abscisic acid (ABA) that plays important roles like stomata, regulation of seed maturation and promoting desiccation tolerance in embryo (Taiz & and Zaiger 2013). Therefore, more studies about the relationship between drought, ABA signaling and seed storage compounds in soybean are necessary, since the increase of lipid and other storage compounds would contribute to raise the values of soybean commodity cultivated in drought areas.

MATERIAL AND METHODS

- **Plant material:** Soybean seeds [*Glycine max* (L.) Merrill] cv. Fukuyutaka
- **Drought treatment:** Well watering (control) 50% of pot weight watering (drought) in greenhouse
- **Lipid content measurement:** Using hexane to extract lipid from grounded soybean seed flour. After samples were rotated end-over-end at room temperature for 2h, the solution was centrifuged. Hexane was evaporating by heating on a hot plate. (Saldivar et al. 2011).
- **Protein content measurement:** Protein content was measured by Kjeldahl method.
- **Quantitative Real Time –PCR:** qRT-PCR was performed using cDNA synthetized from mRNA of control, heat and drought treatment developing seeds (R5 stage).



Nunez and Tiessen (2011) adapted

RESULTS AND DISCUSSION

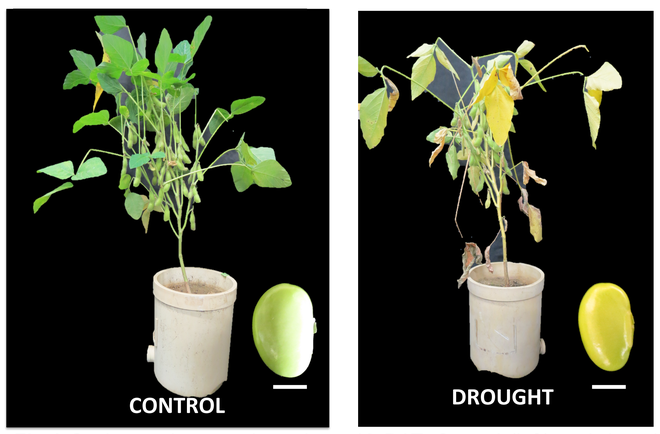


Fig.1 Soybean plants and seeds at 19 DAT. Control (left) and drought (right) treatments. White bars represent 5mm scale. DAT: days after treatment.

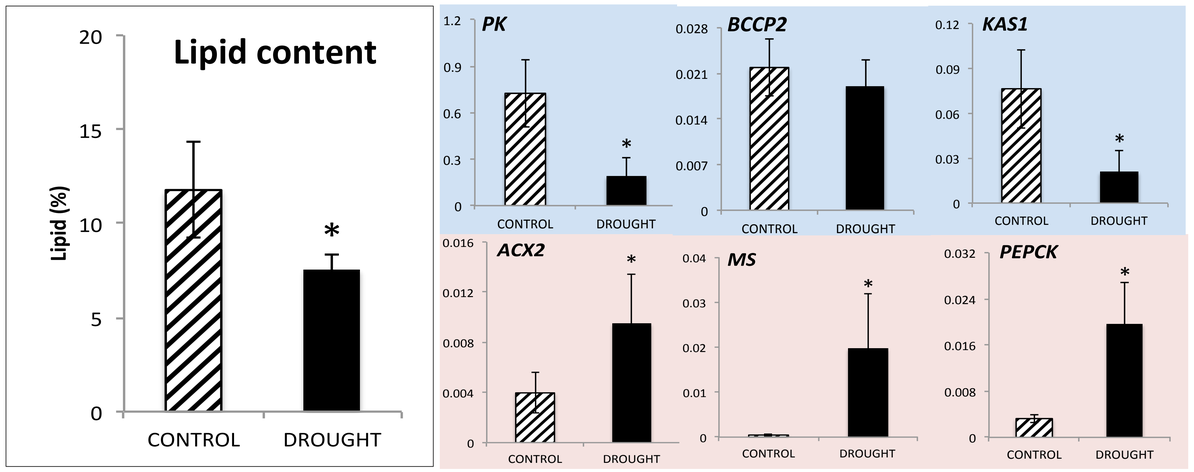


Fig.3 One seed lipid and protein content; and their respective expression of biosynthesis (light blue) and degradation (light pink) key genes relative to *GmEF1b* at 19 DAT.

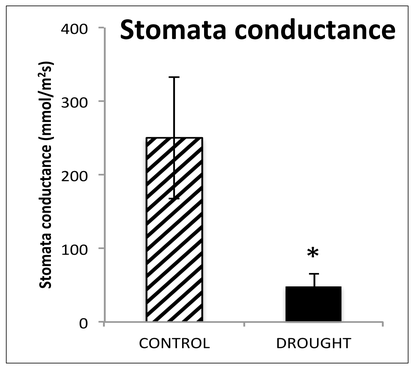


Fig.2 Soybean leaf stomata conductance measured by SC-1 Porometer* at 19 DAT . * .**: 5% and 1% of significant difference respectively (Figs. 2, 3 and 4)
*DECAGON DEVICES,WA, USA.

❖ **19 days of water deficit led to decrease leaf stomata conductance of soybean plants.**
- Low levels of stomata conductance may reduce photosynthesis rate in leaves.

❖ **Lipid, protein contents and biosynthesis gene expression levels of them were decreased by drought in contrast to lipid while protein degradation genes increased during the drought stress.**
- The low levels of lipid and protein biosynthesis related-genes and high levels of degradation ones led to a decrease in seed lipid and protein contents under water deficit.

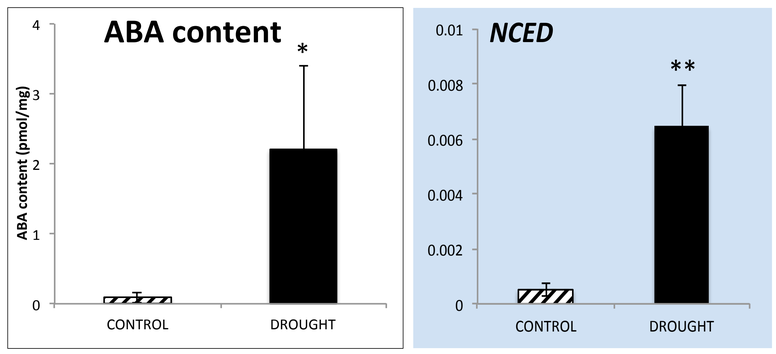
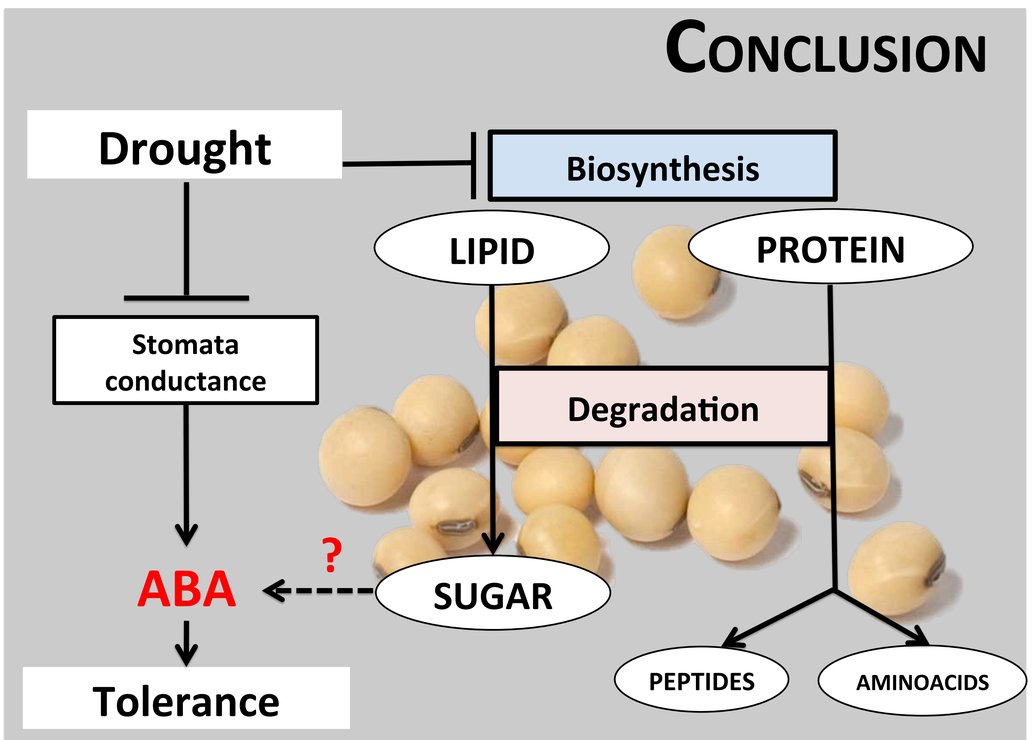


Fig.4 Seed ABA content and *GmNCED* (ABA biosynthesis enzyme) expression at 19 DAT relative to *GmEF1b.*

❖ **ABA content and ABA biosynthesis related-gene levels were risen by drought stress in seeds.**
- Low levels of leaf stomata conductance may cause the increase of ABA content in seeds.

CONCLUSION



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