

# High-throughput phenotyping for Non-Photochemical Quenching and its association with heat stress tolerance in Bread Wheat (*Triticum aestivum* L.)

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## Abstract

Reduction the size of agriculture land and increasing global temperature are emerging as a very worst situation for scientist and farmer to feed the uncontrolled growing population of the world. The aim of current study to determine the open access **PhotosynQ** photosynthesis phenotyping platform ([www.photosynq.org](http://www.photosynq.org)) that worked on the bases of **MultispeQ V 2.0** device is useful for detecting genotype difference for heat stress tolerances in **Bread Wheat (*Triticum aestivum* L.)** lines in order to meet the demand of growing population. The experimental design comprised of 20 advances breeding lines grown in Randomized Complete Block Design with two replications during Rabi 2018-19 at BISA. After aanalysis we found that Non-Photochemical quenching (NPQs) are highly correlated with grain yield and plant biomass under heat stress condition. Therefore on the bases of NPQs; we can select the elite genotypes and in future, this technique can be apply on the large scale for high-throughput plant phenotyping. Eventually; the selected lines can be use for further GWP (Global Wheat Breeding Program) for achieving the target of developing climate resilient wheat variety.

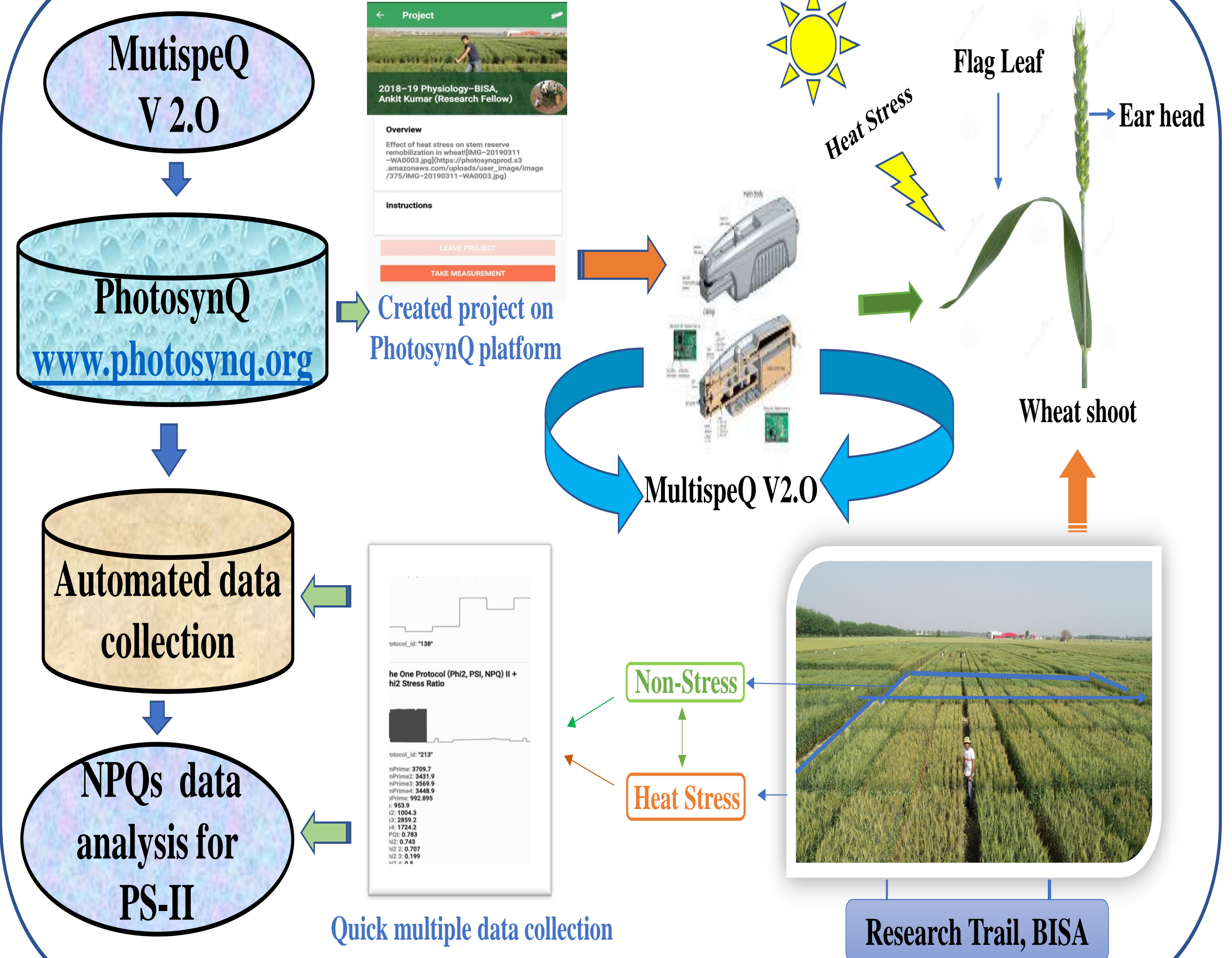
## Background

Modern plant breeding and biotechnological technique are rapidly increasing day by day for the development of elite wheat genotype. But visually it's very difficult to identify higher plant biomass and grain yield lines on the bases of key physiological traits on a large scale under adverse environment condition. Modern breeding technique are being used for the field phenotyping of photosynthetic trait in plants (Kulgert et al., 2016); Wheat is a winter crop but grain yield and biomass are highly effected by heat stress. Therefore, we are using multispeq device based on photosynq platform ([www.photosynq.org](http://www.photosynq.org)) for accessed the ability of heat tolerance based on NPQs.

## Objectives

- To evaluate the advance wheat breeding lines for multiple physiological traits like NPQs, Photosynthetic rate and Quantum yield under heat stress.
- To measure the NPQs for evaluation of climate resilient Wheat breeding lines.
- Testing new MultispeQ V 2.0 high-throughput plant phenotyping tools for higher grain yield and plant biomass under heat stress condition.

## Methodology



## Results

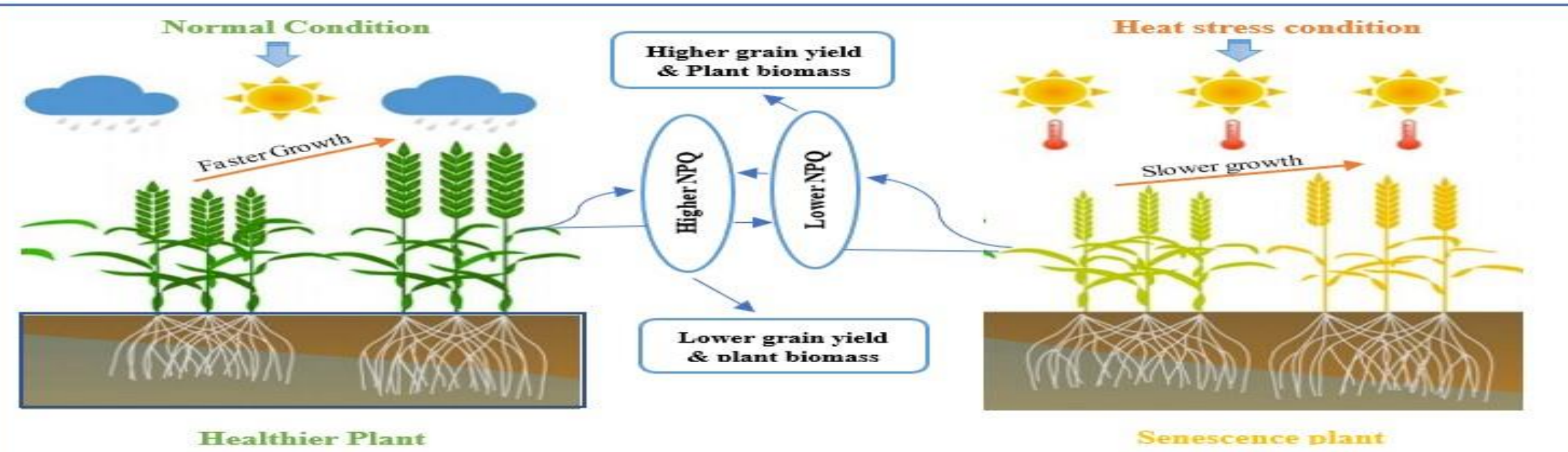
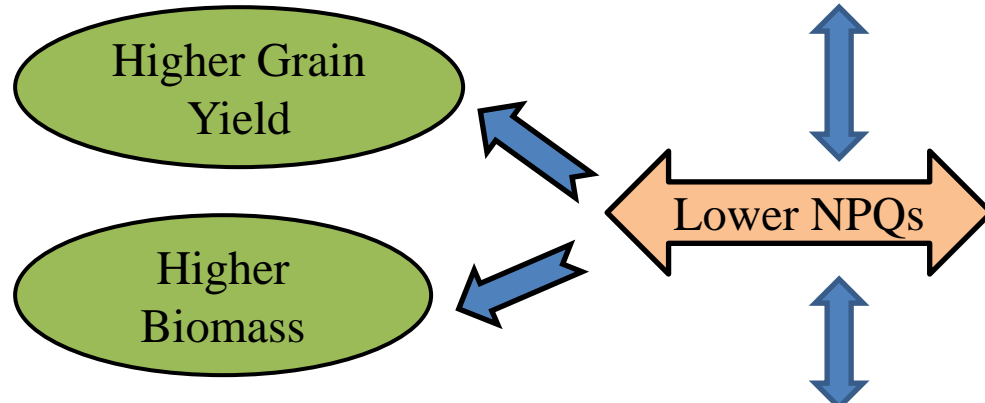
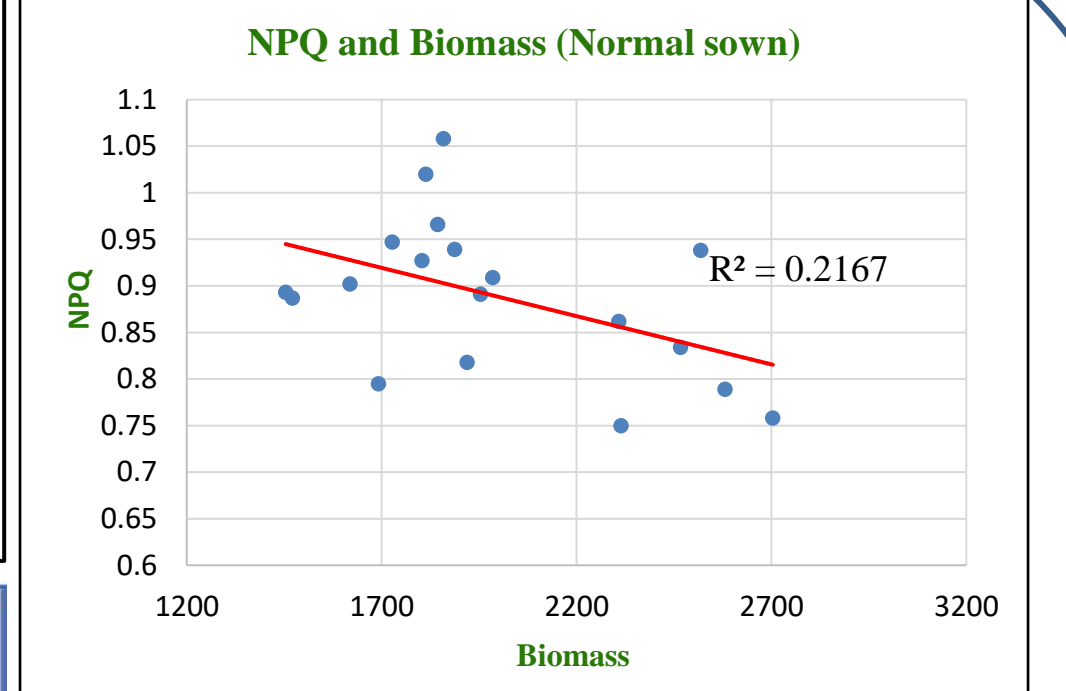
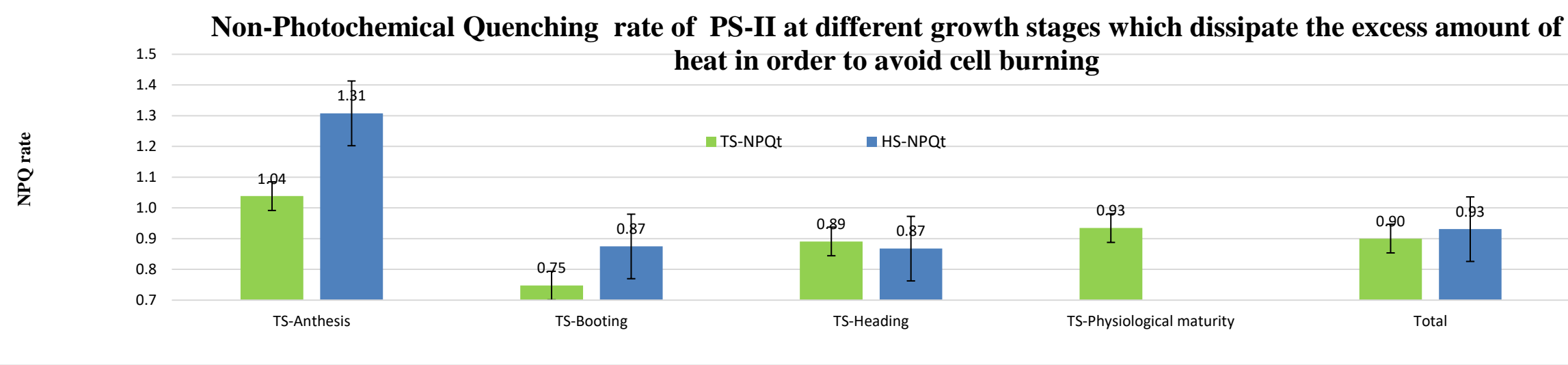
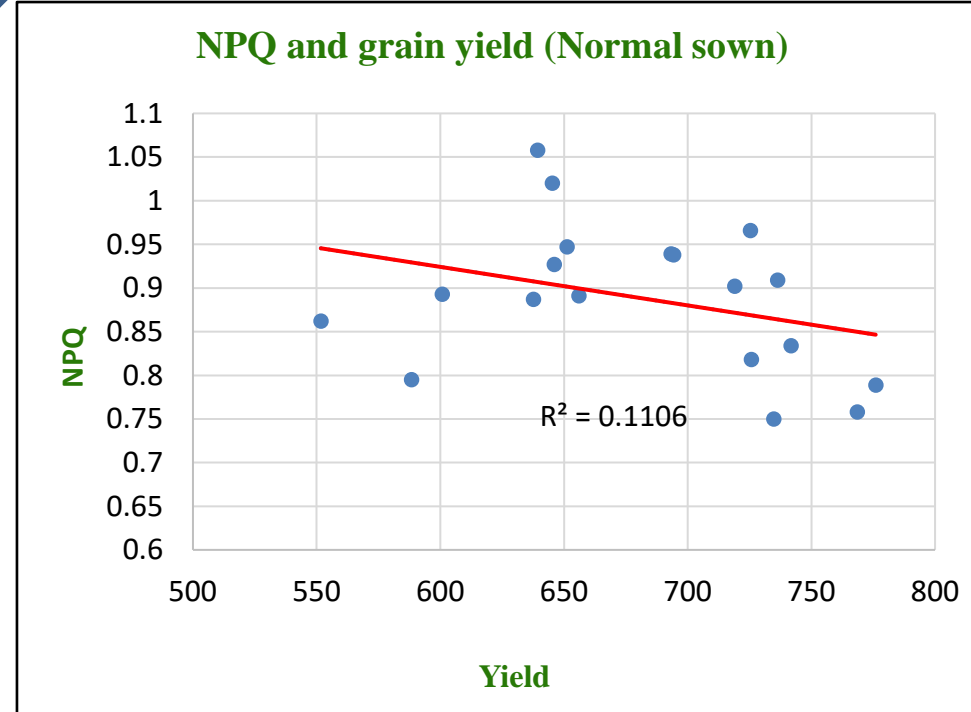
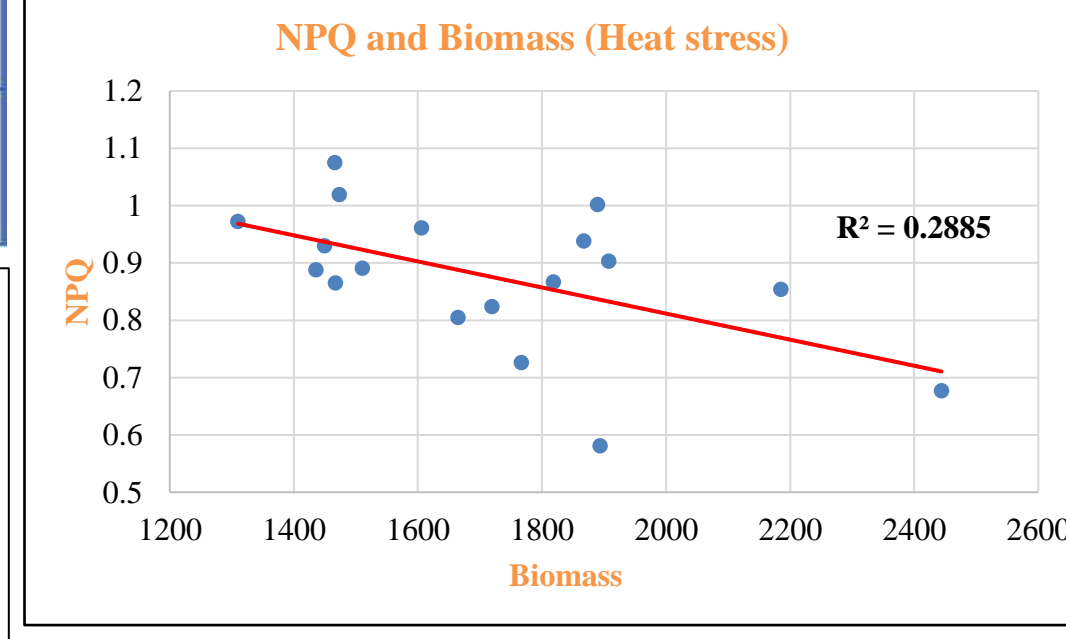
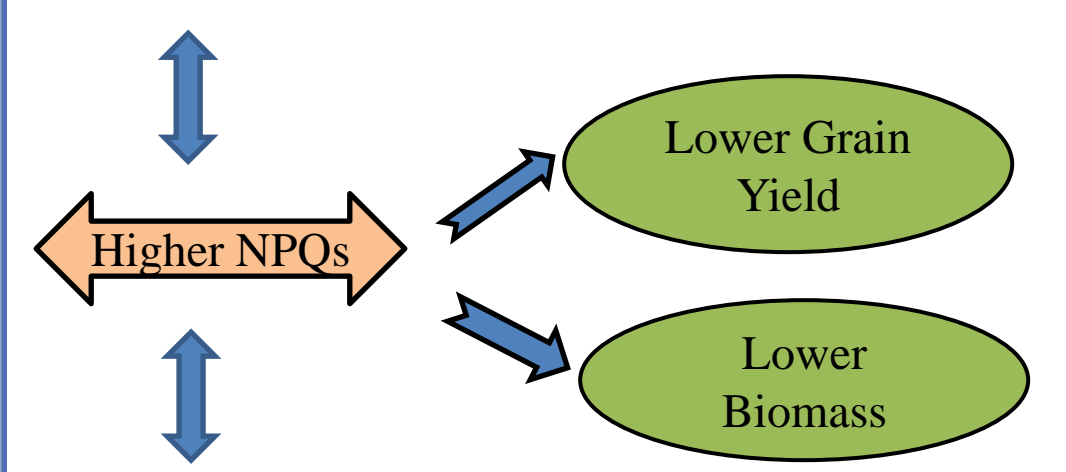
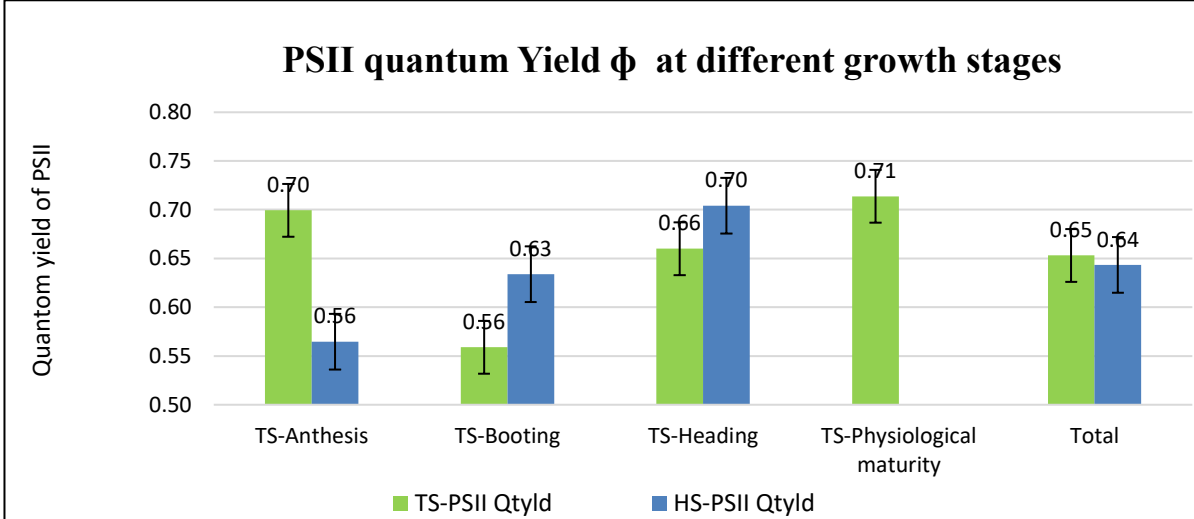
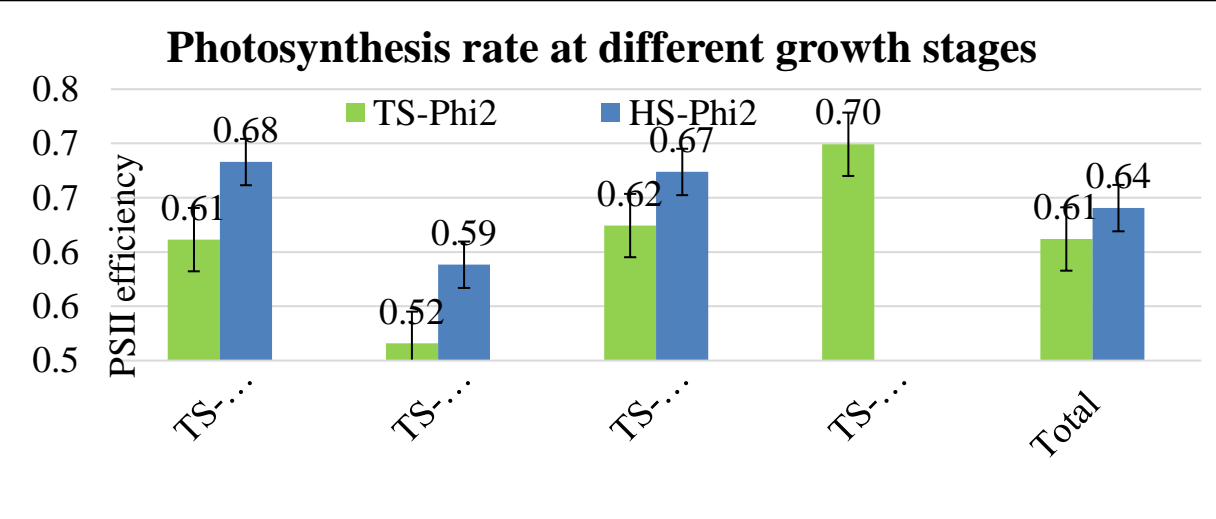
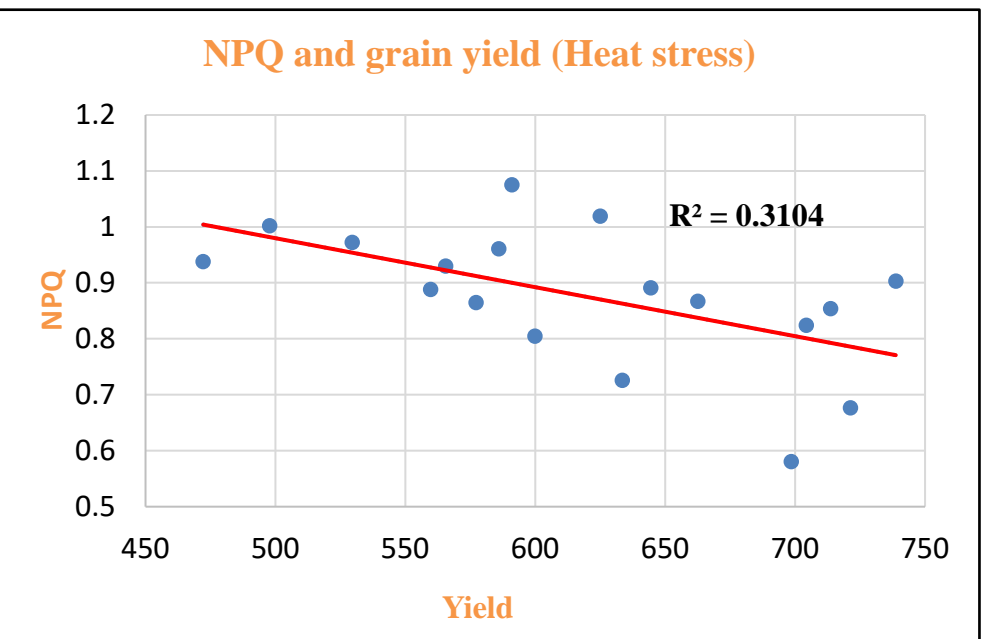


Fig 1: A flow chart in order to understand NPQ (Non-photochemical quenching) of PSII on the bases high-throughput phenotyping for heat stress tolerance and its association with grain yield and plot biomass in Bread wheat lines



## Conclusion

- ❖ Non Photochemical Quenching (NPQs) can be use to phenotype heat stress tolerance lines in wheat for higher grain yield and plant biomass.
- ❖ MultispeQ V 2.0 device can be use on the large scale phenotyping under the field condition.
- ❖ The Selected lines could be useful in further GWP (Global Wheat Breeding) program.

## References

- ❖ Kuhlert, Sebastian, et al. "MultispeQ Beta: a tool for large-scale plant phenotyping connected to the open PhotosynQ network." *Royal Society open science* 3.10 (2016): 160592.
- ❖ Tietz, Stefanie, et al. "NPQ (T): a chlorophyll fluorescence parameter for rapid estimation and imaging of non-photochemical quenching of excitons in photosystem-II-associated antenna complexes." *Plant, cell & environment* 40.8 (2017): 1243-1255.

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