Basic tests for automatic nutrient monitoring for hydroponic crop production system

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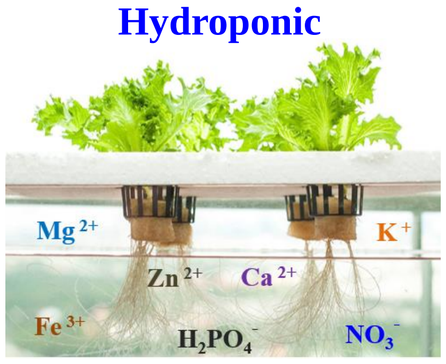
Introduction

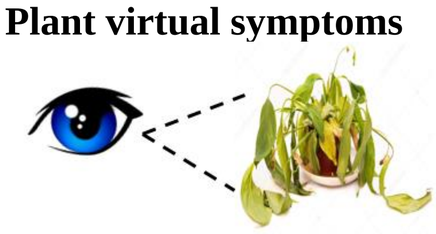
Hydroponic



A soilless cultivation system

Traditional hydroponic nutrient monitoring methods

Plant virtual symptoms



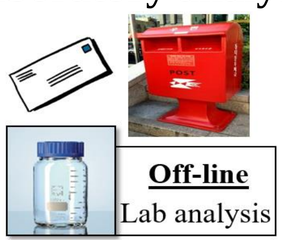
Manifested after prolong period of malnutrition

EC and pH method

On-line
EC & pH method

Can't distinguish individual ion condition & quantity

Laboratory analysis



Off-line
Lab analysis

Time consuming & Costly

Ion based monitoring

- On line
- Robust
- High fidelity feedback
- Ion specific control

Materials and Methods

❖ **Sensing issues:** Measurement Error, Signal drift, Calibration, Data acquisition interval and Solution temperature.

❖ **Schematic diagram**

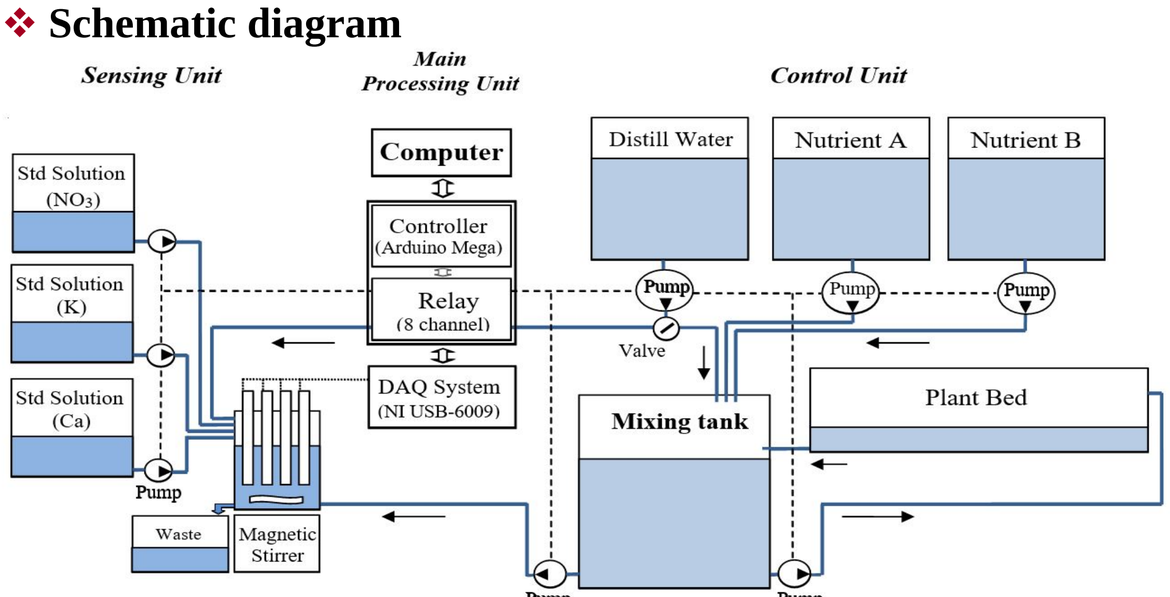


Fig. 1: Diagram of automated nutrient monitoring and supply system

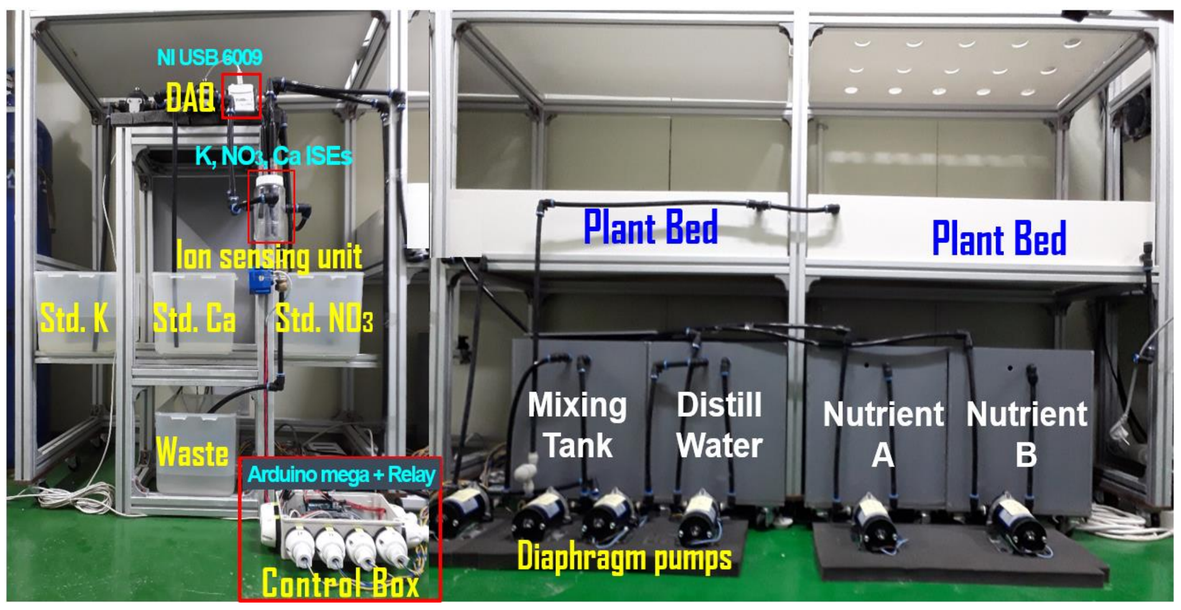
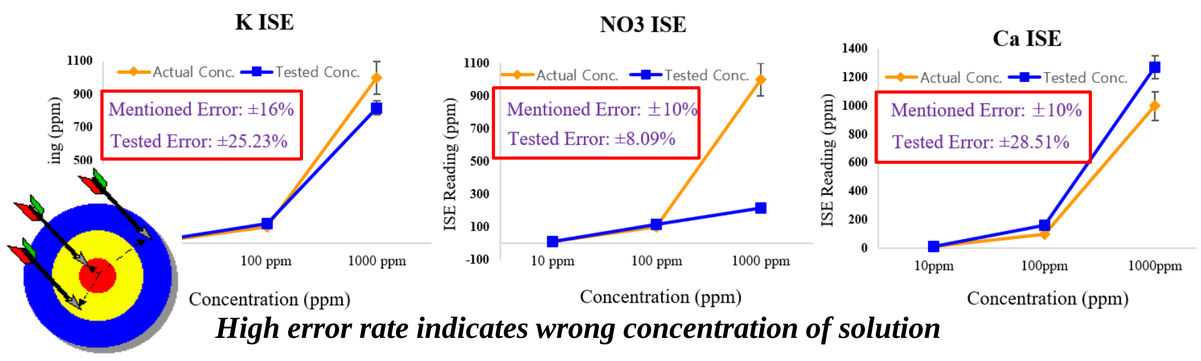


Fig. 2: : Pictorial view of the system developed in this research

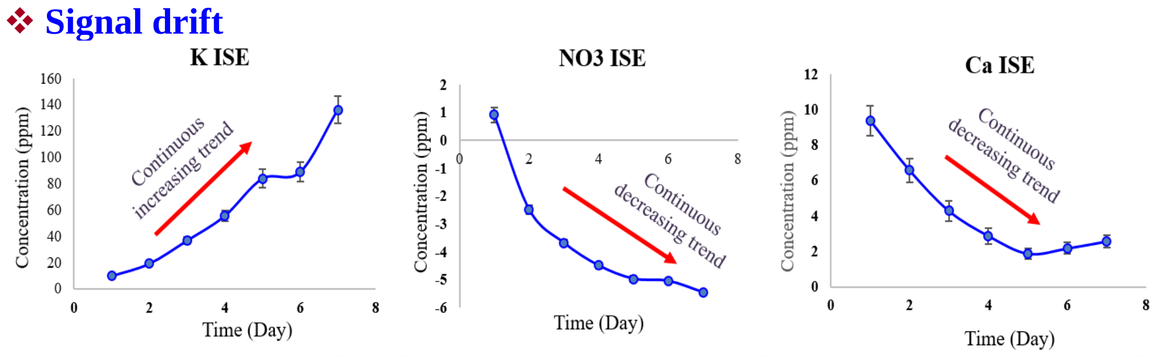
Results and discussion

❖ **Measurement error**



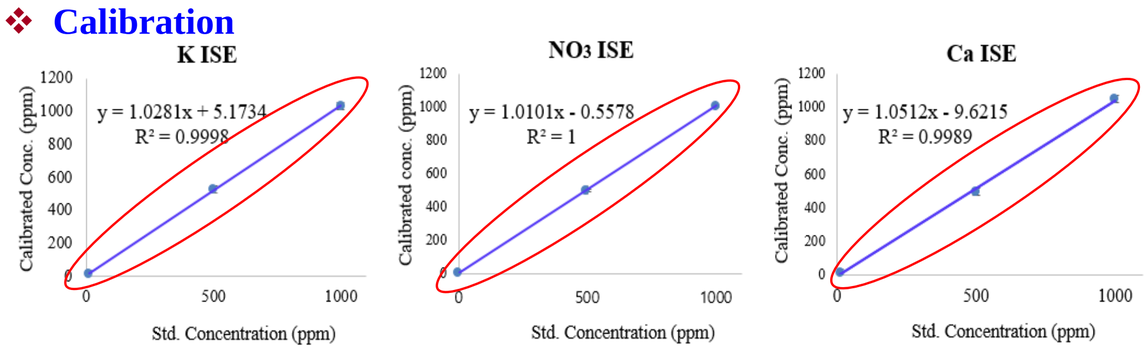
High error rate indicates wrong concentration of solution

❖ **Signal drift**



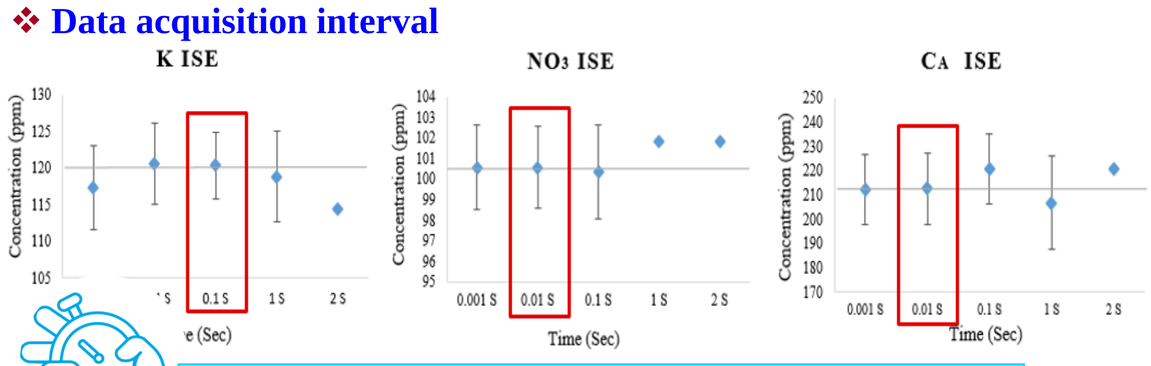
Increased or decreased reading of same concentrated solution affects nutrients control

❖ **Calibration**



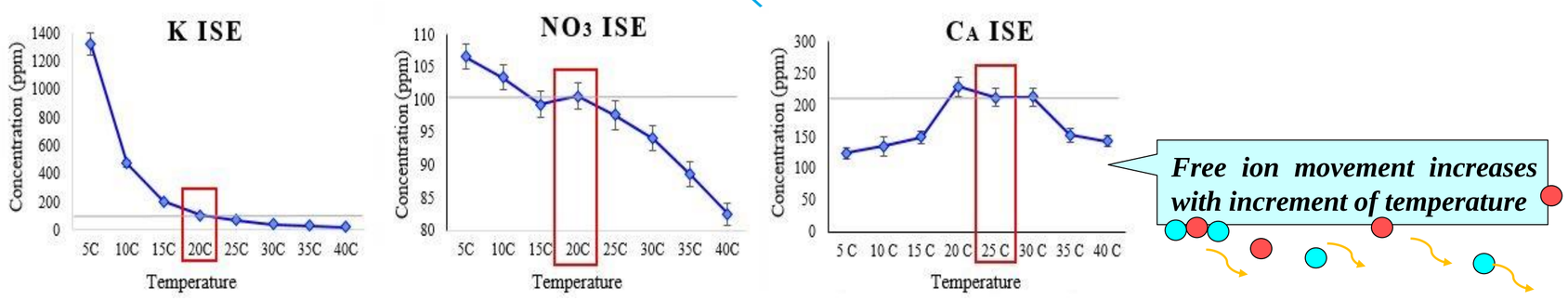
Regular calibration is always important for proper reading

❖ **Data acquisition interval**



0.1 or 0.01s acquisition interval gave accurate concentration data

❖ **Solution temperature**



Conclusions

- Measurement error gradually increased with usage
- Regular rinsing could prevent signal drift
- Calibration removed measurement error and signal drift
- Proper data acquisition interval helped to take accurate readings
- Appropriate solution temperature was good for real data acquisition as well as plant growth

Acknowledgement

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