AHDB

AGRICULTURE & HORTICULTURE DEVELOPMENT BOARD

Grower Summary

PO BOF 003

Nutrient management for protected ornamentals, bulbs and outdoor flowers

Final 2020

Project title:	Nutrient management for protected ornamentals, bulbs and outdoor flowers
Project number:	PO BOF 003
Project leader:	Hilary Papworth, NIAB
Report:	Annual report, March 2020
Previous report:	Not applicable
Key staff:	Hilary Papworth Benjamin Tea
Location of project:	Cambridge
Industry Representative:	
Date project commenced:	01/09/2018
Date project completed (or expected completion date):	Not applicable **31/12/2022**

DISCLAIMER

While the Agriculture and Horticulture Development Board seeks to ensure that the information contained within this document is accurate at the time of printing, no warranty is given in respect thereof and, to the maximum extent permitted by law the Agriculture and Horticulture Development Board accepts no liability for loss, damage or injury howsoever caused (including that caused by negligence) or suffered directly or indirectly in relation to information and opinions contained in or omitted from this document.

The results and conclusions in this report are based on an investigation conducted over a one-year period. The conditions under which the experiments were carried out and the results have been reported in detail and with accuracy. However, because of the biological nature of the work it must be borne in mind that different circumstances and conditions could produce different results. Therefore, care must be taken with interpretation of the results, especially if they are used as the basis for commercial product recommendations.

AUTHENTICATION

We declare that this work was done under our supervision according to the procedures described herein and that the report represents a true and accurate record of the results obtained.

Hilary Papworth

Senior Technical Manager, Ornamentals

NIAB

Signature  Date *31/03/2020*

Benjamin Tea

Glasshouse Manager

NIAB

Signature  Date *31/03/2020*

Report authorised by:

[Name]

[Position]

[Organisation]

Signature ..... Date .....

[Name]

[Position]

[Organisation]

Signature ..... Date .....

GROWER SUMMARY

Headline

In Primula both Calcium and Boron nutrition can be improved by adjusting the growing media pH and by reducing humidity at crop height.

In bedding crops grown with overhead irrigation systems nutrient leaching and pH increases occur and can lead to loss of availability of key nutrients.

The delivery method for liquid fertilizer can have a greater impact on plant growth than the composition of the growing media, when using peat reduced mixes with coir, perlite or wood fibre.

Background

The target of this project is to make nutritional recommendations for key crops in the protected ornamental, bulb and outdoor cut flower industry which will form part of the guidance available in RB209. In order to make nutritional recommendation for different crops it is important to understand not only the nutritional requirements of the plants but also how the different variables in the production system will alter the availability of different nutrients.

In year one of this four-year project the target was to obtain data on the interactions between pot size, growing media, irrigation system, pH and environment by running experimental work on three key bedding species. The focus for the experiments was determined by the outcome of the scoping study in which we identified the most prevalent types of production setup and the problem crops for nutrition.

Three trials were undertaken in this year, one each on Petunia, Pansy and Primula.

The longer-term study on Nitrogen nutrition in field grown Narcissus was also established during this year the aim of which is to review the current advice available in RB209. Trials have been established in Cornwall and Lincolnshire and in year 1 base line observations have been taken. The first findings from these trials will be available in 2021 and be presented in the next annual report.

Summary

In order to investigate the different variables, a bespoke table system was set up in the glasshouses at the NIAB trial site in Cambridge to look at the impact of using different irrigation systems to delivery liquid feed to Petunia and Pansy plants. The Petunia trial was run during spring/summer of 2019, using F1 hybrid ‘Frenzy Blue Vein’ grown in 13cm 5deg pots using three different peat reduced growing media mixes. The mixes were 70:30 peat and perlite mix, 70:30 peat and wood fibre mix and 70:30 peat and coir mix, none had wetter or base feed incorporated. The trial was repeated in the autumn for Pansy using ‘Matrix® Blue Blotch’ using a 12-cell bedding pack and the same growing media mixes.

In the trial set up we compared irrigation delivered by overhead, ebb and flood and trickle tape onto capillary matting. Two tables of each irrigation systems were used, and feed was introduced to only one of those.

Plants in each of the three different growing media mixes were put on each of the different set ups and grown to flowering stage.

Figure 1. Trial setup with Petunia in 13cm pots

Figure 2: Trial setup with Pansy in 12-cell packs

To assess the performance of each combination of growing media x irrigation type x feed, observations on fresh weight were made. Weekly monitoring of growing media pH and EC was carried out, and laboratory testing of growing media and leaf tissue was done at the end of the trial.

In both trials good results were achieved from all growing media mixes when feed was applied via the overhead or ebb and flood irrigation. However, the peat and perlite and peat and coir mixes performed better than the peat and wood fibre mix, which showed early symptoms of Phosphorus deficiency which was confirmed by the tissue analysis.

In the summer trial the petunia plants grown on capillary matting were visually acceptable but had lower fresh weight than the other two systems. In the autumn pansy trial, the plants grown using capillary matting were very poor due to accumulation of salts in the growing media and a degree of waterlogging.

From our records on water usage it was possible to see that the capillary matting system had used most water, which resulted in overwatering at that period of the year. The lowest water input (and consequently lowest feed) was on the overhead irrigation system, and statistically these performed as well as the ebb and flood system which received more water and therefor more feed.

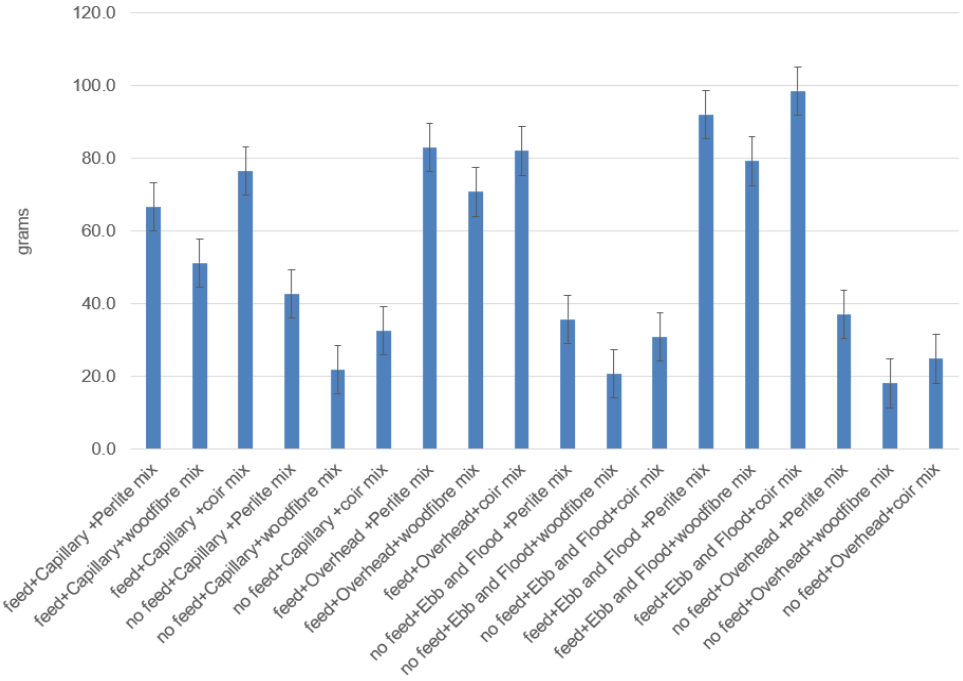

Figure 3: Fresh weight results for Petunia plants grown under the different irrigation x growing media x feed combinations. Bars represent least significant difference between treatments at a 95% confidence interval

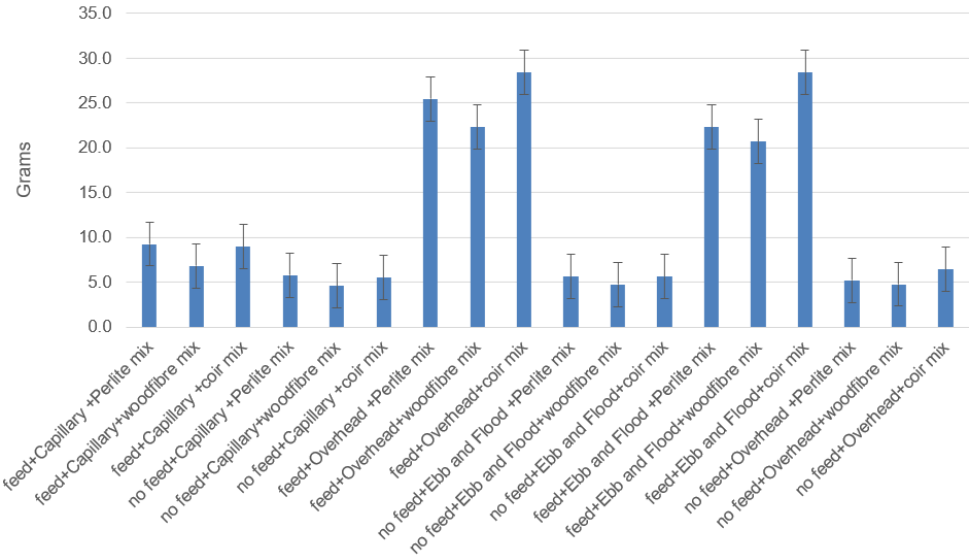

Figure 4: Fresh weight results for Pansy plants grown under the different irrigation x growing media x feed combinations. Bars represent least significant difference between treatments at a 95% confidence interval

By monitoring the pH of the growing media every week, we could see that pH altered with the different irrigation systems as the trial progressed, pH increased where overhead irrigation was used, and all the growing media mixes were affected in the same way.

We also monitored the pH of the run-off from the ebb and flood irrigation system and the overhead irrigation system.

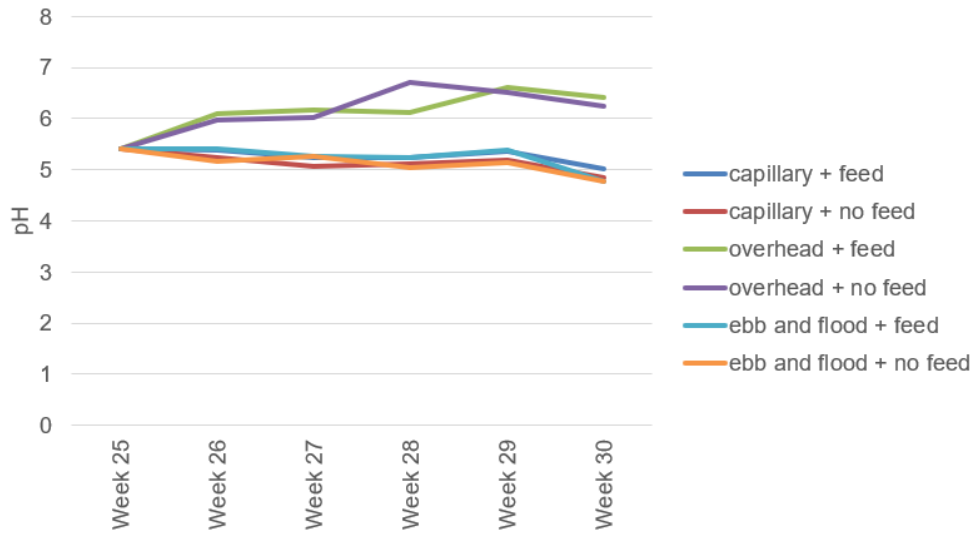

Figure 5. pH over duration of trial in peat and wood fibre mix growing media treatments

From the experimental work carried out we have seen a direct interaction between the irrigation water added through an overhead system and the amount of nutrients flushed out of the growing media (run-off). The high alkalinity of this irrigation water has raised the pH of the growing media through the life of the crop meaning elements such as P, Fe, Mn and Boron are less available. Acidifying the irrigation water to correct the high alkalinity will prevent pH movement and allow all nutrients to be available reducing the potential need to increase certain nutrients and use a more balanced (if not reduced) liquid feed.

The investigations into Primula focussed on the symptoms of ‘leaf edge scorch’ to see how the nutrition could be improved to reduce this problem. Deficiency symptoms for both Boron and Calcium can be seen as tissue necrosis, and work in other crops (Collier, G.F & Tibbitts, T.W. 1984) suggest this is made worse under conditions that reduce transpiration. Growing media pH is also a factor in the availability of the nutrients, with Boron and Calcium being more available in different parts of the pH scale.

The experimental work compared Primula plants grown under lower and higher humidity conditions in a range of growing media pH, in order to try and force the expression of tissue necrosis. Tissue and growing media analysis at the end of the trial was used to see what the impact of the different conditions had been.

Table 1. Treatments for Primula 'leaf edge scorch' investigation

Code	Description	Growing media spec.	Feed specification
A	'Optimal'*	Levington M2, pH 6.3	125ppm N plus TE
B	High EC	Peat reduced mix, pH 6.9	190ppm N plus TE
C	High pH	Peat reduced mix, pH 7.2	125ppm N plus TE
D	Low pH	Peat and coir mix, pH 6.3	125ppm N plus TE (and added Nitric Acid)

Figure 6. Marginal necrosis observed in high humidity conditions

Marginal necrosis was seen, but only where there was good growth and leaves were expanding rapidly.

The results of the analysis show that Calcium is present in the leaf tissue in higher amounts under the lower humidity conditions. For Boron the same is true for treatments A and B however, in D the 'low pH' treatment the opposite has been observed with higher levels of B in high humidity conditions and to a lesser extent the same is true for treatment C.

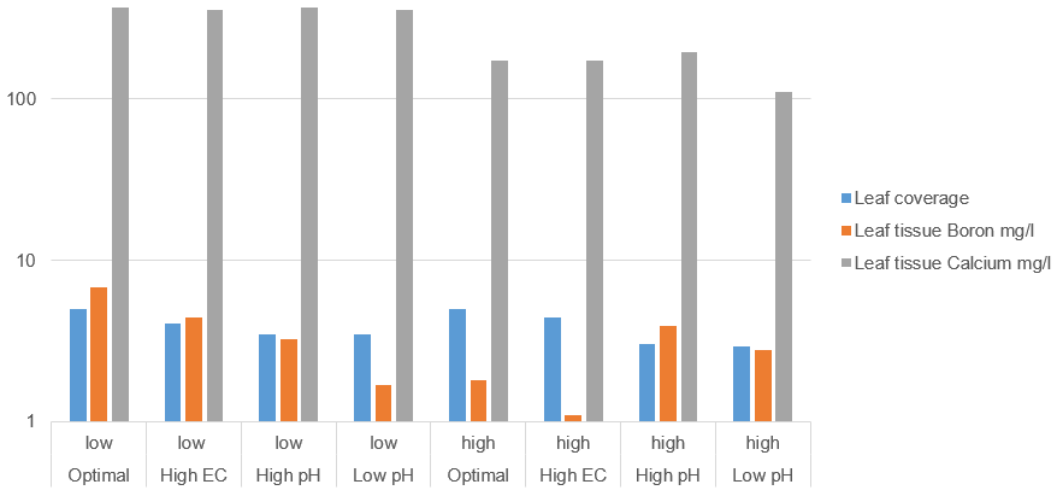

Figure 7. Comparison of observations for leaf coverage the tissue analysis results for Boron and Calcium

The environmental data obtained shows an average difference in humidity of around 10% between the high and low treatments, this reduction appears enough to improve Calcium and Boron content in the tissue.

Where Calcium levels were low in the leaf tissue under high humidity conditions, analysis shows that it was present in the growing media in significant quantities.

Financial Benefits

By adapting irrigation methods to time of year savings on water and fertilizer use can be made. Results indicate that during summer a reduction in water and fertilizer cost of 35% could be made using capillary matting.

Action Points

- In period of low transpiration be vigilant of overwatering and accumulation of salts (nutrients) in irrigations systems using capillary matting.
- Reduce humidity in the glasshouse to improve calcium and boron content in plants. This may reduce the risk of scorch symptoms
- EC is only a method for measuring total ions. Undertake sampling and laboratory testing of irrigation water to get a clear understanding of the amount and type of nutrient ions that are present in the water supply. This can prevent unnecessary fertilizer use and avoid potential nutrient toxicity.