



Horticultural  
Development  
Company

## Grower summary

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### PC 297

Protected lettuce: to investigate nitrate levels in a range of butterhead and curly lettuce cultivars

Final Report 2009

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## **Further information**

If you would like a copy of the full report, please email the HDC office ([hdc@hdc.org.uk](mailto:hdc@hdc.org.uk)), quoting your HDC number, alternatively contact the HDC at the address below.

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## **Headline**

Lettuce varieties had variable nitrate levels with lower levels demonstrated when harvesting delayed by one week following outer leaf trimming.

## **Background and expected deliverables**

This work was initiated in response to current EC legislation concerning the maximum levels of nitrate in lettuce and in particular to undertake research for a continued derogation offered to UK Lettuce growers and to better understand nitrate variability within crops.

The aim of the work was to investigate if there were consistent differences between cultivars for butterhead and curly types when grown in the winter. Two harvest dates were used to determine if cultivars performed similarly when harvested early with minimal trimming and also 7 days later when more of the older leaves would be removed. Any differences in nitrate accumulation in cultivars could then be considered and exploited by growers. This information could be used to increase the understanding of nitrate accumulation in lettuce and how harvesting stage and trimming could be used to reduce the risk of crops exceeding the EC limits.

The second part involved intensive sampling and analysis to determine the head to head variation in trial plots. This would also help increase the understanding of nitrate levels in whole heads and compare levels in different parts of the head. If there was large head to head variation in lettuce grown adjacent to each other then the robustness of the sampling and reporting process would need to be considered and a variability factor built into any maximum nitrate levels set by the Authorities.

The third part involving intensive sampling and determining head to head variation in commercial crops would also increase the understanding of variability in nitrate levels in whole heads. If there was large head to head variation in adjacent heads grown in the soil and the deep water hydroponic (DWH) system then the robustness of the sampling and reporting process would need to be considered and a variability factor built into any maximum nitrate levels set by the Authorities.

## Summary of project and main conclusions

Lettuce was planted on 12 January 2009 into soil where nitrogen fertiliser had been applied to achieve 100ppm nitrogen. Conventional overhead irrigation was used. At the first harvest for the six butterhead cultivars on 30 March 2009 the heads were cut with only the lower soiled leaves removed, heads weighed and sent for nitrate analysis. A second harvest was taken 7 days later when the same plots were harvested but more of the older leaves were removed. This was carried out for the curly lettuce which was harvested on 6 April and also 8 days later.

The results showed that there were no consistent differences between the cultivars of butterhead lettuce. Mean nitrate levels ranged from 2985 to 3471ppm at the first harvest and 2268 to 2620ppm at the second harvest. For the curly types the mean nitrate levels ranged from 3148 to 3917ppm at the first harvest and 2391 to 2856ppm at the second harvest. Mean nitrate levels decreased between the first and second harvest date for both lettuce types. All samples were below the EC limit of 4500ppm.

The head to head variation study showed large variation between the 10 heads grown adjacent to each other. This confirms previous results where the variation between 3 samples of 10 heads taken from plots that were only 4m<sup>2</sup> was considerably and could exceed 1000ppm. Where leaves had been cut in half and all the left hand side and right hand sides had been analysed separately as 2 samples per head there was variation in the nitrate levels. This again demonstrates that nitrate content is naturally very variable even within heads. Nitrate content in the ribs and the remaining leaf material was compared and found to be much higher in the rib material.

The final part of the project involved looking at head to head variation in soil and the deep water hydroponic grown lettuce on a commercial site in West Sussex. The results showed that head to head variation was large. For the deep water hydroponic crop the range between the highest and the lowest was 50% of that observed in the soil grown crop. However, nitrate levels were higher in the deep water hydroponic crop and the reason for this requires further study as mean head weights were similar.

## **Financial benefits**

Cultivar selection appears to offer growers only very limited opportunity to minimise crop nitrate levels. Nitrate levels in high risk winter planted crops could be lowered by delaying harvesting by a week so that 40-60g of the older leaves can be removed during trimming. However, this will affect cropping timetables and reduce productivity in the glasshouse. The work has highlighted the high head to head and within head variability in nitrate levels and this needs to be considered by the Authorities when setting maximum nitrate levels. Growers should therefore continue to closely follow the current Code of Good Agricultural Practice to minimise the risk of crops exceeding the EC levels.

## **Action points for growers**

- Continue to adhere to the Code of Good Agricultural Practice and in particular the guidance on sampling.
- For high risk crops delay harvesting until heads weigh at least 220-240g allowing for at least 2 or 3 of the oldest leaves to be removed whilst still achieving heads that are above the 160-180g minimum weight.
- During trimming remove those leaves which contain a high proportion of rib material as this contains more nitrate than the leaf material.