

# Reducing transplant shock in lettuce

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## What is transplant shock?

Transplant shock is a check in growth that can occur when seedlings are transplanted from the seedling tray into the field. Stresses due to root damage, changed environment or water stress can all contribute to transplant shock. Significant transplant shock can result in poor plant stands and a lower percentage cut of good quality lettuce.

## How old should transplants be?

The timing at which lettuce seedlings are transplanted is critical to controlling transplant shock. Transplanting lettuce seedlings while they are small minimises injury to the developing roots and potentially allows the plants to establish quickly. However, young plants are fragile and are therefore difficult to handle without damage.

Transplanting when lettuces are further developed means they are more robust. However, if the roots are compacted or have started to circle the cell in the tray they may fail to

develop a good structure after planting in the field. They are also likely to be damaged during transplanting.

Ideally, lettuce seedlings should be grown in an environment similar to that in which they are to be planted. For example, transplant shock is more likely if seedlings grown under heavy shading are planted in a hot field with strong sunlight. Similarly, seedlings that have been grown rapidly using strong nutrient solutions are more likely to develop transplant shock than those grown more slowly.

One of the key factors for good establishment of transplants is a high root:shoot ratio. That is, the roots need to be large relative to the upper part of the plant. Nitrogen causes seedlings to grow fast, but this is often at the expense of the roots, resulting in a small root:shoot ratio. Small root systems leave the plant vulnerable to transplant shock, especially if conditions are hot, dry and/or windy.

Lettuce seedlings therefore need to be transplanted when they are not too young, or too old, but just right.

## What else can I do to avoid transplant shock?

Good soil preparation, proper planting depth and thorough irrigation in the days following transplanting can all reduce risk of transplant shock.

One new technique that has been reported as reducing transplant shock is drenching seedling trays with a solution of potassium nitrate. This can be done just before planting.

Trials in 2014 and 2015 examined growth of iceberg and cos lettuces drenched with a solution of potassium nitrate, applied at a rate of 80g per 1,000 seedlings (in 5 litres of water) compared to those left untreated. Three weeks after transplanting, the potassium nitrate drenched lettuces were larger than those left untreated in both 2014 and 2015 (Figure 1).

However, the root systems of the drenched plants were smaller than the untreated seedlings (Figure 2). This is likely due to the potassium nitrate increasing availability of nitrogen and potassium in the root zone. This favoured



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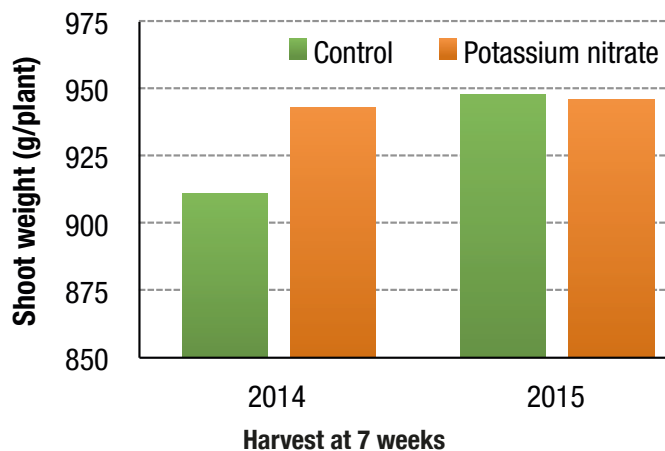
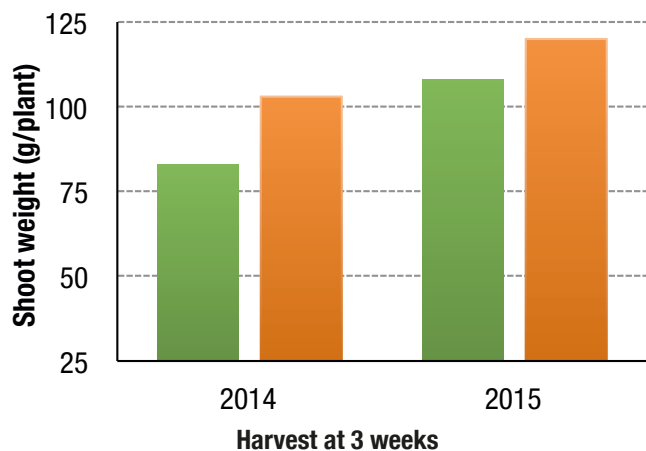


Figure 1 – Yield of lettuces drenched with potassium nitrate before transplanting compared to those left untreated. Head weights (shoot weights) were measured 3 and 7 weeks after transplanting.

growth of the leaves but as a consequence the roots did not need to search for nutrients.

In 2014 the growing conditions were good. The lettuces drenched with potassium nitrate kept growing, and were significantly larger at commercial harvest than those left untreated. However, in 2015 two heatwaves occurred. Plants with smaller root systems are less able to cope with water stress. The result was that the untreated plants caught up with those given the drench and there was no benefit from the treatment.

In summary, drenching with potassium nitrate can reduce transplant shock of lettuce seedlings and increase early growth. However, the treatment may also reduce the root:shoot ratio, which can leave plants more vulnerable to environmental stresses.

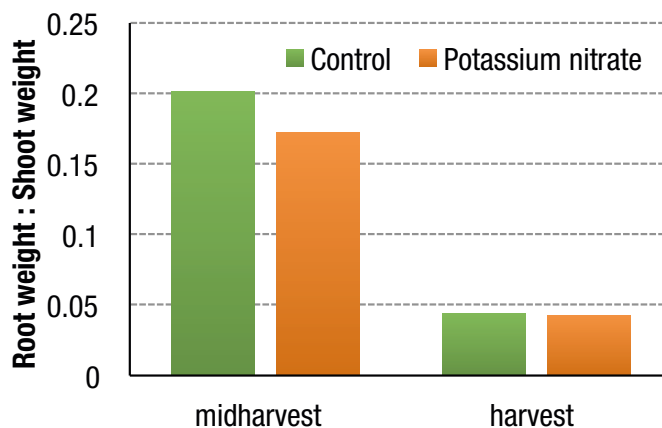


Figure 2 – Root weight divided by shoot weight for lettuces drenched with potassium nitrate before transplanting compared to those left untreated. Weights were measured 3 and 7 weeks after transplanting.



Figure 3 – Growth of untreated lettuces (left in both pictures) compared to those drenched with potassium nitrate at transplanting (right in both pictures). Plants from the 2015 trial shown, evaluated at 3 and 7 weeks after transplanting.

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