

Grower Summary

TF 179

Pear: The effect of soil moisture
on fruit storage quality

Final 2010

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HDC
Stoneleigh Park
Kenilworth
Warwickshire
CV8 2TL

Tel – 0247 669 2051

HDC is a division of the Agriculture and Horticulture Development Board.

Project Number: TF 179

Project Title: Pear: The effect of soil moisture on fruit storage quality

Project Leader: Tim Biddlecombe

Contractor: Farm Advisory Services Team Ltd

Industry Representative: Nigel Bardsley

Report: Final

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Previous report/(s): None

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Project Cost: £ 34,549

Headline

The use of irrigation successfully maintained soil moisture content and when combined with the use of compost mulch to improve soil structure, its percolation through the soil profile was improved.

Background and expected deliverables

This project arose from the experience of Dutch growers who find that the benefits of irrigation include reducing tree stress, delaying harvest, improving fruit size, quality and particularly storage life. There is therefore a need to investigate the use of water in relation to these characteristics in the UK as the potential benefits from improved pear production are significant. However, in practice, many orchards do not have irrigation and so for this reason, the testing of mulches as soil water conservation measures and the subsequent effect on crop size and quality was included in this project. The two aims of the project were to investigate the effect of irrigation and the effect of various mulches on cropping and fruit quality in pear.

Summary of the project and main conclusions

Three irrigation treatments and four mulch treatments were applied to 'Conference' pear trees in an orchard near Faversham. The irrigation treatments included a control (no irrigation), 1 inch irrigation per week and irrigation controlled using an EnviroSCAN logger to maintain a constant soil moisture content. The mulch treatments included a control (no mulch), composted bark, straw and black polythene.

The effects of the three mulches on soil structure were important and there were clear differences between the three mulches. During the experimental period, the composted bark became incorporated into the upper soil layers and as a result improved soil structure. This resulted in better percolation of water through the soil profile than either the bare soil or plastic mulch treatments. The main effect of the straw mulch was to reduce available nitrogen to the tree roots resulting in reduced leaf and fruit nitrogen. This was probably due to the straw decomposition process which involves microorganisms locking up available soil nitrogen. The mulches therefore did create very different patterns of water absorption and therefore availability to the trees. Both beneficial and negative effects of the three mulches were seen and gaining an understanding of their effects on tree growth and cropping is therefore important.

The effects of irrigation on soil water content are also quite clear and again not surprising. Irrigation clearly improved water availability to the treated areas. Managed irrigation, using EnviroSCAN data, in particular maintained soil water content. This was particularly the case where mulch was used that seemed to improve the soil structure (composted bark and straw). For the bare soil and plastic mulch treatments, the water tended to remain in the upper layers and not to move through the soil profile as readily. The irrigation and compost mulch treatments appeared to be complementary.

There have been a number of studies on irrigation of apples and pears which demonstrate clear effects on growth and fruit size. However, in the work described here on pear irrigation, there were actually only very minor effects on fruit and tree growth and no effect at all on storability of fruit. Based on previous work carried out around the world, this is perhaps surprising but there are three possible reasons for this. The irrigation treatments were applied during July and August. The rationale for this was that this was the period of fruit growth during which a limit to water supply would have been likely to reduce fruit size. In addition this is the method used by a number of growers in Holland and Belgium to increase fruit size. However, most of the published work describing irrigation effects on apples and pears has tested the effect of continuous irrigation throughout the growing season. That irrigation was only applied for two months may not have been sufficient to achieve significant effects on fruit growth. The experiment was run in a Conference orchard planted in the early 1980s with an intra row spacing of 2m. The trees were therefore mature and the tree volume was large. By implication the root system would have been well developed and would have extended to a diameter of around 2m, similar to the canopy size. Irrigation was applied using a single line of emitters as in commercial orchards and whilst the volume of irrigated soil would spread as the water moved through the soil profile, there would still have been part of the root system unaffected by the irrigation treatments. Perhaps if the experiment had been conducted in a younger orchard the effects would have been more significant. Finally, the tree to tree variation was large and would have obscured effects particularly where parameters are related such as fruit number and fruit size.

It should be noted that whilst in the experiment described here there were very few significant effects of the irrigation treatments on either fruiting or storability of fruit there are a number of reports from around the world where effects have been observed. It is therefore dangerous to conclude from these data alone that irrigation has no effect and the data presented in this report should be viewed in the light of commercial experience where irrigation is believed to significantly affect growth and yield of pears. The reasons for this difference are discussed in more detail in the Science Section of the report.

Financial Benefits

Neither the irrigation nor mulch treatments resulted in consistent, significant effects on fruit growth or storability. Therefore it is not possible to calculate the financial benefits of the results described within this report.

Action Points

- No change to current best practice is recommended based on the results described within this report.