Factsheet 02/12

Field Vegetables

Irrigation in vining peas

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A soil water deficit in any crop means that irrigation at the appropriate time will be beneficial. Although originating from relatively dry Mediterranean regions and the Near East, vining peas are no exception. This factsheet highlights factors to consider, the optimum timings for irrigating crops and the potential drawbacks of irrigation (Figure 1).

Background

Irrigation is defined as the supplementation of precipitation by storage and transportation of water to fields for the proper growth of agricultural crops. Lack of water is a severe environmental constraint to plant productivity. Drought-induced loss of crop yield probably exceeds losses from all other causes.

Today, 689 million acres of agricultural land are equipped with irrigation facilities across the whole world. Of this, 68% is in Asia, 17% in North America, 9% in Europe, 5% in Africa and 1% in Oceania.

With increasing concern regarding climate change, irrigation of vining peas may be worth considering. However, traditional farming systems in the UK give priority to crops such as potatoes and high value vegetable crops for available water resources and equipment.

It must be remembered that irrigation may both encourage and help in the fight against disease. For example, a wet environment can promote the development of *Botrytis cinerea* in vining peas (Figure 2) but dry conditions encourage scab in potatoes. However, a more vigorous, less stressed crop is generally able to defend itself against disease more effectively.

The rooting depth of vining peas can be up to 80cm. It is influenced by soil structure and compaction and this fundamentally affects the plant's access to any available water. The effects of water stress can be minimised by ensuring peas are drilled into well structured soils that encourage optimal root development.

1. **The timing of irrigation is crucial to get the most out of the pea crop**

2. **A wet environment can promote the development of *Botrytis cinerea* in vining peas**

Effects of water stress

A restricted water supply reduces leaf size, stem extension and root development. It upsets plant water relations and reduces the efficiency of overall water use. At a cellular and whole plant level there are various physiological and biochemical responses. Stomata close and carbon dioxide assimilation is reduced because of decreased enzyme function. The associated production of reactive oxygen causes further damage to plant macromolecules and this is one of the major factors that reduces plant development.

Plants have mechanisms to cope with a degree of water stress and crop growth stage and duration of the dry spell are important factors. Equally, crop development stage is a critical factor determining the most effective time to irrigate. Prolonged dry weather can ultimately cause excessive wilting and plant death.

Irrigating vining peas

Vining peas are very responsive to irrigation but timing is crucial and should be related to both specific crop growth stages and soil water deficit.

Irrigation at the vegetative stage

Soils are usually near to field capacity when peas are sown, and irrigation applied before the start of flowering increases haulm weight but rarely increases yield. In several experiments, irrigation during vegetative growth depressed pea yields. Irrigation should not be carried out during this period unless the seedbed is very dry and adequate germination would not otherwise occur or the crop is severely wilted because of drought.

Irrigation at the start of flowering

Peas are most responsive to irrigation when the first flowers are opening (Figure 3). If a single application is to be made, it should be at this stage. The plant is thought to be most responsive at this stage because the root system has ceased to grow, making the plant more vulnerable to a lack of water.

3. Peas are most responsive to irrigation when the first flowers are opening

Yield increases from irrigation at this time are often very substantial and can be up to 50% as more peas per pod are formed. Haulm weight also increases.

Irrigation at late flowering or 'petal fall'

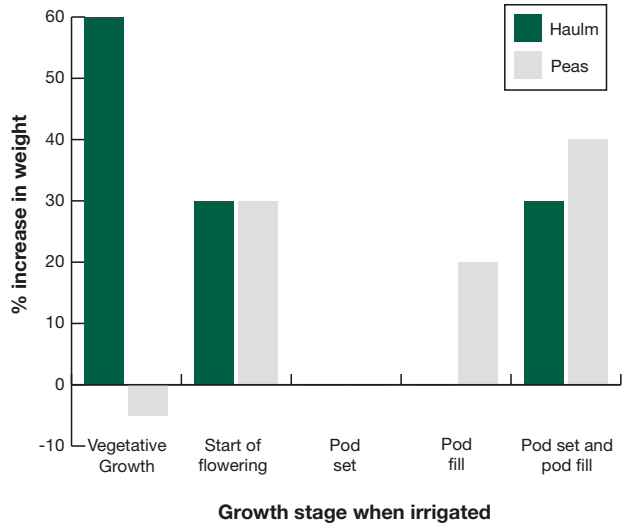
Irrigation at this stage does not result in yield increases, there being no effect on the weight, the number of pods per plant or the number of peas per pod. Haulm weight is also unlikely to be affected. A slight renewal of rot growth occurs during this period which may explain the lack of response. Irrigation at petal fall may increase the likelihood of *Botrytis cinerea* (Figure 2) infection in the damp, moribund petals. If inoculum is present, there may also be a greater risk of *Sclerotinia sclerotiorum* (Figure 4) with the increase in humidity.

4. The risk of Sclerotinia is increased with increased humidity if inoculum is present.

Irrigation at pod fill

Crops irrigated during pod fill, when vining pea crops are at tenderometer (TR) readings of between 70 and 90, have shown considerable increases in yield, sometimes up to 20%. The number of peas per pod and the mean weight of peas are increased by irrigating at this time. The weight of haulm is not affected.

The average increases in the total weight of haulm and of shelled peas are shown in Figure 5, a summary of results from nine years of experiments carried out at Wellesbourne.



5. Response to irrigation in vining peas

Irrigation at pod set and fill

Although irrigation at pod set appears to have little influence alone, in combination with a second amount of water at pod fill this can increase yields and haulm weight by an additional 15-20% compared to only irrigation at pod fill. This approach, however, puts an increased pressure on irrigation equipment which may be required elsewhere on farm.

Irrigating during vegetative growth and early flowering has been found to have little effect on the rate of maturation, but applications during pod fill, when the average TR is approximately 80, delay the maturity of vining peas by approximately two days. This effect is predictable and consistent and must be taken into account in relation to vining pea crop succession during vining.

How much water?

It is suggested that during vegetative growth and at the commencement of flowering, 25mm of water can be applied. At the pod fill stage the amount should not exceed 30mm.

Note that the best increases in yield are seen when the crop is under moisture stress at the points of development outlined. When adequate moisture is available, there will be little advantage to using irrigation. It is also important to realise that too much water can suppress yields. Roots bathed in water for prolonged periods of time mean that plants do not function properly and this can adversely affect crop development and, at the extreme, lead to plant death. Waterlogged conditions for periods of 24 hours will cause pea plant stomata to close and transpiration to stop, if these conditions should continue for a further 24 hours then leaves begin to desiccate and roots begin to breakdown. At this point the damage is non-reversible and plants exhibit typical foot rot symptoms which reduces yield significantly.

Further information

HDC projects on irrigation

HDC has funded various projects on irrigation over the years. To obtain full copies of any of the project reports listed, contact HDC on 024 7647 8661 or visit the HDC website www.hdc.org.uk.

FV 363 HortLink: developing precision irrigation for field scale vegetable production, linking in-field moisture sensing, wireless network

FV 326a Impact of irrigation practices on Rijnsburger bulb onion husbandry, quality and storability

FV 187 Evaluation of trickle irrigation on horticultural crops using celery as a model crop

FV 140 Improving irrigation scheduling using infrared thermometry (LINK)

FV 39a The influence of press wheel compaction and irrigation timing on crop establishment

References

Salter, P.J. and Williams, S.J.B. (1967). The effect of irrigation on pea crops grown at different plant densities. *Journal of Horticultural Science* **42**, 59-66.

Notes

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

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