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Sprinkler layout and selection for igloos and poly houses

To achieve even watering in poly houses many systems are installed with a single line of inverted sprinklers so close together that the application rates are well in excess of the potting media absorption rate. This leads to excessive water use and leaching of nutrients that both affect the bottom line. This paper provides some recommendations on sprinkler selection and layouts, based on sprinkler testing, for a range of crops and structure sizes.



A single row of inverted sprinklers produces high application rates or dry edges

When irrigating containers with overhead sprinklers in poly houses it is important to

- select sprinklers that apply water at a rate that suits your crop
- match mean application rate (MAR) to the absorption rate of the potting media
- select a layout and sprinkler that achieves even watering
- select a layout that eliminates dry spots around the edges

What crop are you growing?

Small seedlings and plug trays are best watered at application rates less than 5 mm/hour. General stock lines are better watered closer to the potting media absorption rate at between 7 and 10 mm/hour.

Potting media absorption rate

Your application rate should match the absorption rate of your potting media. For most pine bark mixes this is between 10 and 12 mm/hour. The new edition of “Managing Water in Plant Nurseries” details a simple field test to allow you to determine the water absorption rate of your mix.

Layout design and sprinkler selection

When selecting a sprinkler layout always ensure that each plant/container receives water from four sprinklers matched to give an even coverage. This is the only way you can achieve even watering and reduce dry spots, over watering and excessive leaching. The Coefficient of Uniformity of the selected sprinkler and spacing measures how evenly water is applied to the area. It is measured as a percentage. Your selected sprinklers should have a coefficient number higher than 85%

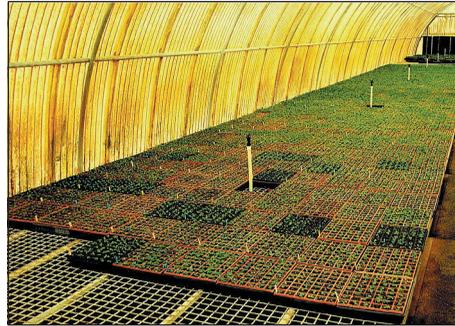
Eliminate dry spots

Correct sprinkler selection, operating pressure and layout should also eliminate dry spots in the poly house. To check that you have selected a good combination examine the Scheduling Coefficient. This is used as a multiplier to determine how long to run the sprinkler system to apply enough water to the driest 2% of the area (for nurseries). Your selected sprinklers should have a value of 1.1 to 1.5.

Overhead sprinkler layouts

For each plant/container to receive water from four sprinklers full circle sprinklers will be located around the outside edge of the poly house with additional rows installed internally on the large structures. Most of the excess water around the edges will mist off the poly house sides and end up in the drainage system.

Although this seems like a waste of water, the even watering produced will reduce your irrigation time and save you substantial water overall. If the outside row of plants is receiving excess from water deflected from the sides then install some hessian or shade cloth along the spray line. This will absorb the spray pattern and return a small amount of water to the drains.

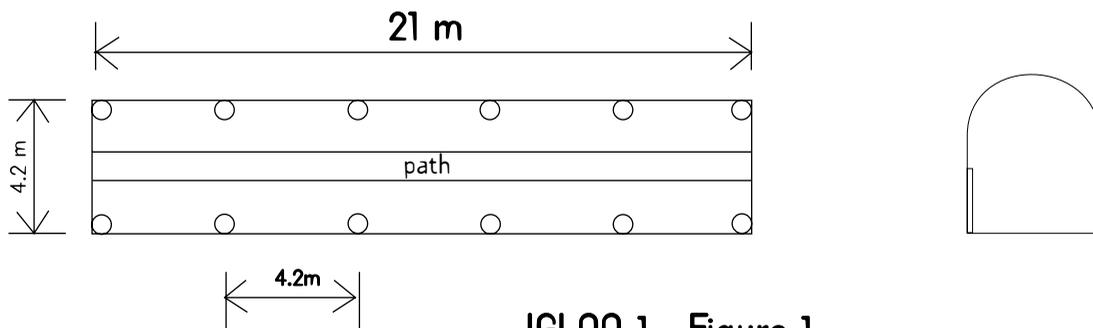


A single row of sprinklers down the middle causes dry edges

Lets look at some typical poly houses and igloos

Igloo 1

Tunnels 4.2 metre wide x 21 metres long. Select a sprinkler spacing of 4.2 metres x 4.2 metres with a row of sprinklers down each side of the tunnel as shown. This will require 12 sprinklers installed on risers of suitable height. Circles in the diagrams are sprinklers.



IGLOO 1 - Figure 1

Some recommended sprinkler options suitable for seedlings or plug trays for this 4.2m x 4.2m sprinkler spacing

Sprinkler make and model	jet	Discharge in lph	Pressure kPa	MAR mm/hr	Cu(%)	Sc
Wingfield Challenger II	1.3	82	200	4.4	92	1.2
Hardie waterbird V	1.25	89	200	4.8	92	1.2
Eindor 84 I	green	90	200	5.1	92	1.2

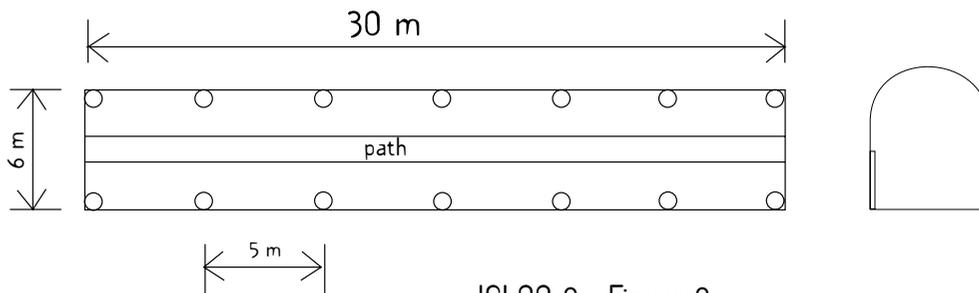
Some recommended sprinkler options suitable for general nursery lines for this 4.2m x 4.2m sprinkler spacing

Sprinkler make and model	jet	Discharge in lph	Pressure kPa	MAR mm/hr	Cu(%)	Sc
Naan mini	Light green	160	150	7.3	91	1.3
Antelco Rotor Rain	blue	145	200	7.5	98	1.2
Plastro Rondo AA	1.6	132	200	7.6	92	1.2

Correct pressure is critical to meeting these performance targets. You must be able to measure and adjust sprinkler operating pressure or you'll be disappointed

Igloo 2

Tunnel or poly house with vertical sides 6 metres wide and 30 metres long. Select a sprinkler spacing of 5 metres down each side of the length of the structure as shown. This will require 14 sprinklers installed on risers of a height to suit the crop. Circles in the diagrams are sprinklers.



IGLOO 2 - Figure 2

Some recommended sprinkler options suitable for seedlings or plug trays for this 6m x 5m sprinkler spacing

Sprinkler make and model	jet	Discharge in lph	Pressure kPa	MAR mm/hr	Cu(%)	Sc
Wingfield Challenger II	1.8	171	200	5.5	92	1.3
Plastro Rondo AA	1.8	173	200	5.7	86	1.4
Antelco Rotor Rain	grey	202	250	6.3	93	1.3

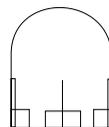
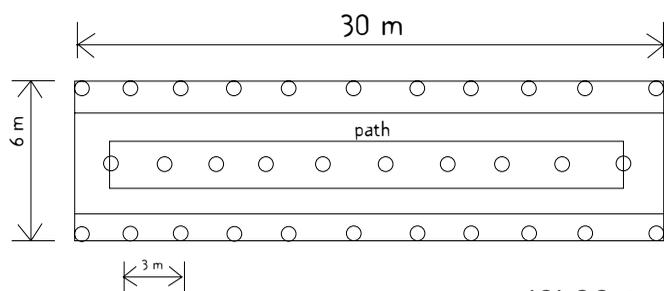
Some recommended sprinkler options suitable for general nursery lines for this 5m x 6m sprinkler spacing

Sprinkler make and model	jet	Discharge in lph	Pressure kPa	MAR mm/hr	Cu(%)	Sc
Plastro Rondo AA	2.2	256	200	8.4	91	1.3
Dan big orange swivel	red	257	200	8.5	91	1.3
Hardie Waterbird V	2.3	304	200	9.7	93	1.2

Correct pressure is critical to meeting these performance targets. You must be able to measure and adjust sprinkler operating pressure or you'll be disappointed

Igloo 3

A poly house with 3 metre vertical sides 6 metres wide and 30 metres long could be fitted out with benches as shown and irrigated with a 3metre x 3metre layout with the middle row offset by 1.5 metres. This will require 33 sprinklers installed on rigid risers of a height to suit the crop, fixed to the benches.



IGLOO 3 - Figure 3

Some recommended sprinklers options suitable for seedlings or plug trays for this 3m x 3m triangular sprinkler spacing

Sprinkler make and model	jet	Discharge in lph	Pressure kPa	MAR mm/hr	Cu(%)	Sc
Dan one sided black swivel	brown	43	200	4.8	91	1.1
Eindor 841	olive	50	200	5.2	95	1.1
Wingfield Challenger II	1.1	56	150	6.3	90	1.3



Sprinklers recommended sprinkler options suitable for general nursery lines for this 3m x 3m triangular sprinkler spacing

Sprinkler make and model	jet	Discharge in lph	Pressure kPa	MAR mm/hr	Cu(%)	Sc
Philmac micro spin	1.3	82	200	9.5	92	1.5
Hardie Waterbird V	1.25	89	200	9.4	93	1.2
Eindor 862	green	90	200	9.4	98	1.1

Correct pressure is critical to meeting these performance targets. You must be able to measure and adjust sprinkler operating pressure or you'll be

Calculating run times from performance data

The calculation is as follows using the last sprinkler (Eindor 862) from the table above as an example; Amount to be applied (5mm) divided by MAR (9.4 mm/hr) multiplied by Sc (1.1) multiplied by 60 equals run time in minutes (35 minutes). Increasing the MAR will reduce the run time until you exceed the potting mixes ability to absorb water. Few mixes absorb water faster than 10-12 mm/hour. The Sc is also critical to **run time** and many systems in common use have a Sc of over 2.5.

The Bottom line

Conventional layouts that have a single inverted row of sprinklers along the middle of the poly tunnel are usually placed at 0.5 to 1.0metre centres to achieve even watering at the edges. This produces mean application rates more than twice the absorption rate of most potting media. This uses double the water, produces double the nutrient leaching and requires two to three times as many sprinklers as the layout shown above. Changing your layouts and sprinklers can save you money in water, fertiliser, dispatch costs, producing plants faster for a higher turnover.