


WATERWISE ON THE FARM
CARING FOR OUR COUNTRY
This project is supported by Perth Region NRM, through funding from the Australian Government's Caring for our Country.

Irrinote Factsheet 6

SCHEDULING IRRIGATIONS WITH MICRO-SPRAYS/JETS

Micro-spray/jet irrigation is a popular way to irrigate orchard crops. Micro-spray/jet irrigation is cheap, simplistic, has no moving parts and delivers water directly to small areas adjacent to individual trees.

Pressure and Flow

Micro-spray irrigation can operate at low pressures of between 100kPa – 200kPa (15-30psi) and can deliver application volumes of 18 – 260 L/hr.

Micro sprays/jets are not pressure or flow regulated so it is important to know the normal operating pressure of your irrigation system as flow from microjets can fluctuate at different pressures. In most cases, higher operating pressures result in higher flow rates.

Performance or 'Spec' Charts

Most manufactures of micro irrigation sprays/jets supply performance or 'spec' charts which can be used as a guide to gauge emitter flow and possible wetting patterns. The performance sheet below is an extract from a strip spray or 'bow tie' emitter, commonly used to irrigate confined areas under the canopy of tree or vine crops. Emitter flows at different pressures and wetting patterns are the two important components of this table and can be used as a first step to schedule irrigations.

Model and Nozzle Colour	Pressure		Flow Rate	Strip Radius	Width
	kPa	PSI	lph		
DV16T: Blue (1.6mm) Strip Spray	50	7.2	60	1.4	0.6
	75	10.8	70	1.5	0.8
	100	14.5	80	1.7	1
	125	18.1	90	1.8	1.2
	150	21.7	100	1.9	1.3

Source: Wingfield Microspray Datasheet.

Steps to Irrigation Scheduling with Micro-Sprays/Jets

1. Obtain emitter performance chart (from internet or supplier) with pressure and flow rates. If performance charts are not available, some field measurements of pressure and flow will be necessary.
2. Determine normal operating pressure at the emitter or lateral using a pressure gauge.
3. If feasible, measure flow in a graduated container from several emitters and average the flow results. Record flow in litres per minute or litres per hour. Note – you must measure flows across an irrigation station to capture possible variability.
4. Measure the wetted area of several emitters and average the results. The wetted area is measured in square metres and areas may vary due to pressure differences or emitter alignment.
5. Divide the flow rate in litres per hour (either from the field measurements or from the performance chart), with the wetted area (m^2) of the emitter. This will give you an application rate in mm/hour which is an essential component of irrigation scheduling.
6. Determine how long to run the irrigation system for based on crop water requirements, soil water holding capacity, soil moisture status or local weather conditions.

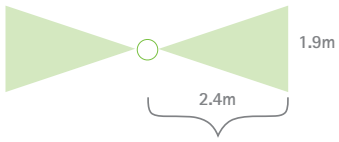
Worked Example:

This example is based research conducted at G. Casotti & Co, Waterwise on the Farm demonstration site in Karragullen, Western Australia.

1. The performance chart ***(reverse of this page)*** was obtained for the Wingfield DV16T Strip Spray/Jet. The chart details pressure, flow and wetted radius and width of emitter. Example: 90L/hr at 125 kPa, strip radius of 1.8m and a width of 1.2m.
2. Pressure in the field was tested by installing a permanent pressure monitoring station along the lateral. Several of these can be installed across the property if needed. Pressure gauges can easily be installed at the end of laterals if pressure loss is an issue. The pressure in the lateral was 213 kPa.

3. Flow from the strip spray emitters was difficult to measure due to their small size and installation directly onto the lateral tube. A flexible riser tube with the strip spray emitter attached was used to measure flow. Flow from the emitter was captured in a 3L measuring container. 2.0 L/min or 125 L/hour was captured.

4. The wetted area was measured while the irrigation system was on. An 8 metre tape measure was used to gather the wetted area dimensions. The area covered by the strip spray resembled two triangles on both sides of the emitter.



See over for Irrigation Runtime Calculations

SCHEDULING IRRIGATIONS WITH MICRO-SPRAYS/JETS (continued)

Method 1: Application Rate Method

STEP 1: Using the formula **1mm = 1L ÷ 1m²**, determine the mean application rate in mm/hr.

MAR (mm/hr) = Average Output (L/hr) ÷ Wetted Area (m^2)

Area of a triangle – half the base multiply by the height

= 0.5 X 1.9 X 2.4

= 2.28m^2 (multiply 2.28 by 2 for total of both sides of the emitter)

= 4.56m^2

Mean application rate = Flow rate (L/hr) ÷ Wetted Area (m^2)

= 125L/hr ÷ 4.56m^2

= 27.4 mm/hour

STEP 2: To calculate the system runtime, divide the daily crop water requirement by the MAR and multiply by 60 to convert to minutes.

For example, if the daily crop water requirement is 5 mm, the system runtime (in minutes) would be:

Runtime (mins) = Crop Water Requirement (mm) ÷ MAR (mm/hr) x 60

= 5 mm ÷ 27.4 mm/hr x 60 = **11 minutes**

Method 2: Storage Volume Method

STEP 1: Determine the maximum storage volume based on soil water storage capacity or Readily Available Water (RAW).

Note: Soil texture = sandy loam (60mm/m). Rootzone depth = 0.5m

Max. Storage Volume (L) = Rootzone RAW (mm) x Area (m^2)

= 30mm x 4.56m^2 = 136 L/emitter

STEP 2: Determine maximum emitter output volume based on the crop's water requirements.

For example, if the crop water requirement is 5 mm, the volume required would be:

Volume required (L) = Crop water requirement (mm) x Wetted Area (m^2)

= 5 mm x 4.56 m^2 = 22.8 L/emitter

STEP 3: Once the required volume is known, the system runtime can be calculated as follows:

Runtime (minutes) = Volume required (L) ÷ Average Output (L/hr) x 60

= 22.8 L ÷ 125 L/hr x 60

= 11 minutes

"J" SERIES PERFORMANCE CHART

Nozzle Colour	Pressure kPa	Pressure (psi)	Flow Rate lph	Flow Rate (US gal/hr)	Radius m 360°	180°	90°
					JSF 12	JSH 12	JSQ 12
GREEN 1.2mm	50	(7.2)	34	(8.9)	1.0	1.0	1.0
	75	(10.8)	42	(11.0)	1.1	1.1	1.0
	100	(14.5)	48	(12.6)	1.2	1.2	1.1
	125	(18.1)	55	(14.5)	1.2	1.2	1.2
	150	(21.7)	60	(15.8)	1.3	1.3	1.3
					JSF 16	JSH 16	JSQ 16
BLACK 1.6mm	50	(7.2)	59	(15.5)	1.1	1.1	1.1
	75	(10.8)	72	(19.0)	1.2	1.2	1.3
	100	(14.5)	83	(21.9)	1.3	1.3	1.5
	125	(18.1)	93	(24.5)	1.5	1.5	1.6
	150	(21.7)	102	(26.9)	1.5	1.6	1.6
					DV16T:	STRIP RADIUS	WIDTH
BLUE 1.6mm	50	(7.2)	60	(15.8)		1.4	0.6
	75	(10.8)	70	(18.5)		1.5	0.8
	100	(14.5)	80	(21.1)		1.7	1.0
	125	(18.1)	90	(23.7)		1.8	1.2
	150	(21.7)	100	(26.4)		1.9	1.3

TYPICAL INSTALLATIONS

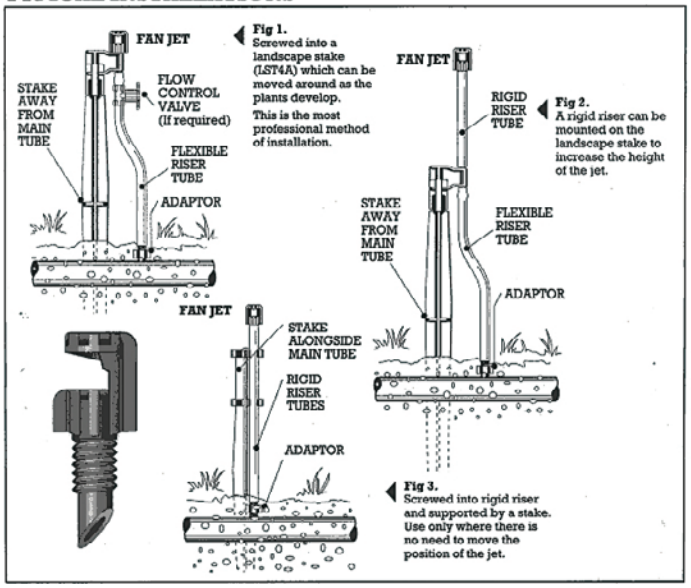


Image Source: Philmac Aquadux

Perth Region NRM

Perth Region NRM Inc.
80 Great Northern Highway (Corner Bishop Road)
MIDDLE SWAN WA 6056
Tel: (08) 9374 3333 Fax: (08) 9374 0685
Email: enquiries@perthregionnrm.com
www.perthregionnrm.com