

Update for Selecting Nozzles for Weed Seeker® Units.

Amended Guidelines based on recent field studies

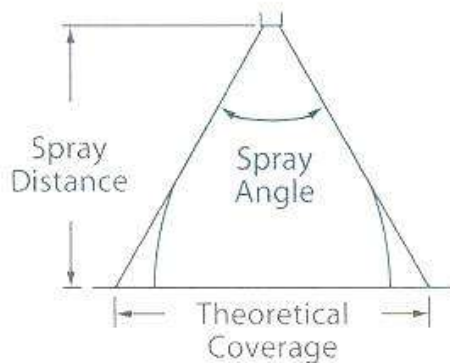
Bill Gordon Consulting



The Weed Seeker® has the ability to greatly reduce the amount of chemical applied to a paddock by detecting weeds and only spraying those areas where they are detected, hence they are operating as a spot sprayer.

The detector units are usually mounted at 38cm apart on the boom (due to the width that each unit can detect) and they need to be operated at a height of around 700 mm above the target. The operating speed of the sprayer is generally around 16 km/h (although some operators have mounted nozzles further back from the detector to increase that speed).

When selecting the most appropriate nozzle sizes for the weed seeker, we need to take into account the sprayed width (band) of each nozzle below the boom to determine the true application rate, that is the actual liters per sprayed hectare that each unit delivers.



(Source: Teejet Catalogue, 50A-M)

Increasing operating height will increase the sprayed width.

Changing the sprayed width changes the application rate (L/sprayed hectare)

Change the application rate may require a change to how much chemical you put into the tank

A common mistake with selecting nozzles for the Weed Seeker® is to simply use the nozzle spacing of 38cm (distance apart on the boom) to calculate the application volume, this would only be correct if every unit was spraying continuously, we actually need to treat each unit and nozzle as an individual spot sprayer or band sprayer.

To correctly calculate the application volume we need to know the actual sprayed width. Weed Seekers are typically fitted with 65 degree nozzles, as this best matches the width detected below the unit.

When using a 65 degree even nozzle at 700mm above the target that nozzle will spray a theoretical band of 89.2 cm wide (see the Teejet catalogue 50A-M, p.174), however in recent field trials conducted by Crop Optics and Bill Gordon Consulting, the actual sprayed width under field conditions and normal operating parameters for the unit it was determined that the TP 65 degree even nozzle produced an average width of 0.6 meters.

Height above target	Actual or Measured Sprayed widths for 65 degree nozzles
700 mm	60.0 cm

If we use the formula for calculating L/Sprayed Ha:

$$\mathbf{L/ sprayed Ha = L/min/nozzle \times 600 \div speed (km/h) \div width (m),}$$

Typically the weed seekers are fitted with **TP65-03 even nozzles and run at 16 km/h.**

At **2.5 bar** the flow rate of an 03 nozzle is 1.08 L/minute/nozzle, hence with an 03 nozzle fitted, at this pressure the L/sprayer Ha = $1.08 \times 600 \div 16\text{km/h} \div 0.6 \text{ m} = \mathbf{67.5 L/ha.}$

At **3.0 bar** the flow rate of an 03 nozzle is 1.2 L/minute/nozzle, hence with an 03 nozzle fitted, at this pressure the L/sprayer Ha = $1.2 \times 600 \div 16\text{km/h} \div 0.6 \text{ m} = \mathbf{75 L/ha.}$

Hence if you were mixing products for a 100L/ha rate this would be delivering less than half of the rate you would have expected to the target area.

Selecting a Nozzle Size to give the Application Volume You Want.

If you actually wanted to spray at 100 L/sprayed ha with the Weed Seeker you could calculate the flow rate required of each nozzle using the formulae:

$$\mathbf{L/min/nozzle = L/ sprayed Ha \div 600 \times speed (km/h) \times width (m),}$$

For **100 L/Sprayed ha** we would calculate:

$$\mathbf{L/min/nozzle = 100 \div 600 \times 16 \times 0.6 \text{ m} = \mathbf{1.6 L/min,}$$

To achieve 100 L/sprayed ha this would actually require a TP 65-04 even nozzle at 3 bar (this nozzle would meet the label requirements for a coarse spray quality).

We could also use the toolbox on the ispray.com.au and select 'create a custom spray chart', and use the correct sprayed width of each nozzle (0.6 m).

nozzle spacing in (m) enter → 0.6 (m) 10"= .254 12"=.3048 15"=.381
speed (km/h)

nozzle size	pressure (bar)	flowrate (L/min/nozzle)	speed (km/h)									
			4	6	8	10	12	14	16	18	20	22
0 2	2	0.64	160.0	106.7	80.0	64.0	53.3	45.7	40.0	35.6	32.0	29.1
	3	0.78	195.0	130.0	97.5	78.0	65.0	55.7	48.8	43.3	39.0	35.5
	4	0.90	225.0	150.0	112.5	90.0	75.0	64.3	56.3	50.0	45.0	40.9
	5	1.00	250.0	166.7	125.0	100.0	83.3	71.4	62.5	55.6	50.0	45.5
	6	1.10	275.0	183.3	137.5	110.0	91.7	78.6	68.8	61.1	55.0	50.0
	7	1.18	295.0	196.7	147.5	118.0	98.3	84.3	73.8	65.6	59.0	53.6
0 2.5	2	0.80	200.0	133.3	100.0	80.0	66.7	57.1	50.0	44.4	40.0	36.4
	3	0.98	243.8	162.5	121.9	97.5	81.3	69.6	60.9	54.2	48.8	44.3
	4	1.13	281.3	187.5	140.6	112.5	93.8	80.4	70.3	62.5	56.3	51.1
	5	1.25	312.5	208.3	156.3	125.0	104.2	89.3	78.1	69.4	62.5	56.8
	6	1.38	343.8	229.2	171.9	137.5	114.6	98.2	85.9	76.4	68.8	62.5
	7	1.48	368.8	245.8	184.4	147.5	122.9	105.4	92.2	81.9	73.8	67.0
0 3	2	0.96	240.0	160.0	120.0	96.0	80.0	68.6	60.0	53.3	48.0	43.6
	3	1.17	292.5	195.0	146.3	117.0	97.5	83.6	73.1	65.0	58.5	53.2
	4	1.35	337.5	225.0	168.8	135.0	112.5	96.4	84.4	75.0	67.5	61.4
	5	1.50	375.0	250.0	187.5	150.0	125.0	107.1	93.8	83.3	75.0	68.2
	6	1.65	412.5	275.0	206.3	165.0	137.5	117.9	103.1	91.7	82.5	75.0
	7	1.77	442.5	295.0	221.3	177.0	147.5	126.4	110.6	98.3	88.5	80.5
0 4	2	1.28	320.0	213.3	160.0	128.0	106.7	91.4	80.0	71.1	64.0	58.2
	3	1.56	390.0	260.0	195.0	156.0	130.0	111.4	97.5	86.7	78.0	70.9
	4	1.80	450.0	300.0	225.0	180.0	150.0	128.6	112.5	100.0	90.0	81.8
	5	2.00	500.0	333.3	250.0	200.0	166.7	142.9	125.0	111.1	100.0	90.9
	6	2.20	550.0	366.7	275.0	220.0	183.3	157.1	137.5	122.2	110.0	100.0
	7	2.36	590.0	393.3	295.0	236.0	196.7	168.6	147.5	131.1	118.0	107.3
0 5	2	1.60	400.0	266.7	200.0	160.0	133.3	114.3	100.0	88.9	80.0	72.7
	3	1.95	487.5	325.0	243.8	195.0	162.5	139.3	121.9	108.3	97.5	88.6
	4	2.25	562.5	375.0	281.3	225.0	187.5	160.7	140.6	125.0	112.5	102.3
	5	2.50	625.0	416.7	312.5	250.0	208.3	178.6	156.3	138.9	125.0	113.6
	6	2.75	687.5	458.3	343.8	275.0	229.2	196.4	171.9	152.8	137.5	125.0
	7	2.95	737.5	491.7	368.8	295.0	245.8	210.7	184.4	163.9	147.5	134.1

*note for larger sizes, an 06 orifice would produce double that of an 03 at the same speed and pressure, and an 08 would be double that of an 04 at the same speed and pressure.

Nozzle Types for the Weed Seeker

The most common selection would be a Teejet, TP 65 degree, even fan, in Hardened Stainless Steel (TP6503E-HSS).

Because each nozzle is turned on and off quickly by a solenoid, we must only select standard, even fan, type nozzles.

Do not use any pre-orifice type nozzles (such as; drift guard, low drift, Turbo Teejet) or any type of Air Induction Nozzle with this system, as they will not work correctly.

TP 65 degree even nozzles at orifice sizes of 03 and above, operated at 2-2.5 bar pressure, will produce coarse spray qualities according to the ASAE standard S-572.