

Spraywise®		TeeJet® ⁵							Hardi® ⁶				Lechler® ⁷		
Nozzle Size	Bar	XR	DG	TT	TT J60	AIXR	AI	TTI	F 110	LD 110	Mini Drift	Injet	AD	IDK	ID
01 Orange	1	F							F						
	2	F		M					F	M			M	C	
	3	F		F					F	M			M	M	C
	4			F						M			F	M	C
	5													M	C
	6													F	C
	7														M
	8														M
015 Green	1	F						XC	M						
	2	F	M	M		VC		XC	F	M	C		M	C	
	3	F	F	M		C	VC	XC	F	M	C	C	M	C	VC
	4		F	M		C	C	XC		M	M	C	F	M	C
	5					M	C	XC			M	C		M	C
	6						C	XC				C		F	C
	7						C	XC				C			C
	8						C	XC				C			M
02 Yellow	1	M						XC	M						
	2	F	M	C	C	VC		XC	M	M	C		M	C	
	3	F	M	M	C	C	VC	XC	F	M	C	VC	M	C	VC
	4		M	M	M	C	VC	XC		M	C	VC	M	C	C
	5				M	C	C	XC			M	VC		M	C
	6						C	XC				C		M	C
	7						C	XC				C			C
	8						C	XC				C			C
025 Lilac	1	M						XC	M						
	2	F		C	C	XC		XC	M	C	VC			VC	
	3	F		M	C	VC	VC	XC	M	M	C	VC		C	VC
	4			M	C	C	VC	XC		M	C	VC		C	VC
	5				M	C	VC	XC			M	VC		M	VC
	6						C	XC				VC		M	C
	7						C	XC				VC			C
	8						C	XC				VC			C
03 Blue	1	M						XC	M						
	2	F	C	C	C	XC		XC	M	C	VC		C	VC	
	3	F	M	C	C	VC	VC	XC	M	C	C	VC	M	C	VC
	4		M	M	C	C	VC	XC		M	C	VC	M	C	VC
	5				C	C	VC	XC			C	VC		M	VC
	6						C	XC				VC		M	C
	7						C	XC				VC			C
	8						C	XC				VC			C
04 Red	1	M						XC	M						
	2	M	C	C	C	XC		XC	M	C	VC		C		
	3	M	M	C	C	VC	VC	XC	M	C	VC	VC	C	XC	
	4		M	C	C	VC	VC	XC		C	C	VC	M	VC	
	5				C	C	VC	XC			C	VC		VC	
	6						C	XC				VC		VC	
	7						C	XC				VC		VC	
	8						C	XC				VC		VC	

Drift management without compromising efficacy

Nozzle selection	Choose the nozzle producing the coarsest spray quality without compromising efficacy. For most applications your nozzle should produce a COARSE or larger spray quality (refer to Spraywise® Boom Spray Application Guide 2012 by Nufarm).
Pressure	Use the right pressure. Conventional nozzles 1.5-3 bar, pre-orifice nozzles 2-4 bar, low pressure air induction nozzles 3-5 bar, high pressure air induction nozzles 4-8 bar.
Water/Chemical rate	On small targets, using higher water rates and robust chemical rates is usually more effective than using a finer spray quality.
Adjuvants	Avoid non-ionic surfactants where possible and use drift reducing adjuvants instead (e.g. LI 700, Bonza®).
Spray tip height	Do not spray at height greater than recommended, 50 cm for 110° spray tips, 75 cm for 85° spray tips. If the span of the boom demands a greater spray height, air-induction nozzles are a MUST. Be aware of false targets.
Wind velocity	Spray only when wind speed is in the range of 3-20 km/h (15 km/h max. for 2,4-D products).
Temperature/ Relative humidity	Observe delta T. DO NOT spray in situations conducive for temperature inversions. Be aware that temperature inversions are more likely to occur at night time.
Buffer zones	Refer to label requirements and use common sense.

Always refer to the product label for specific instructions.

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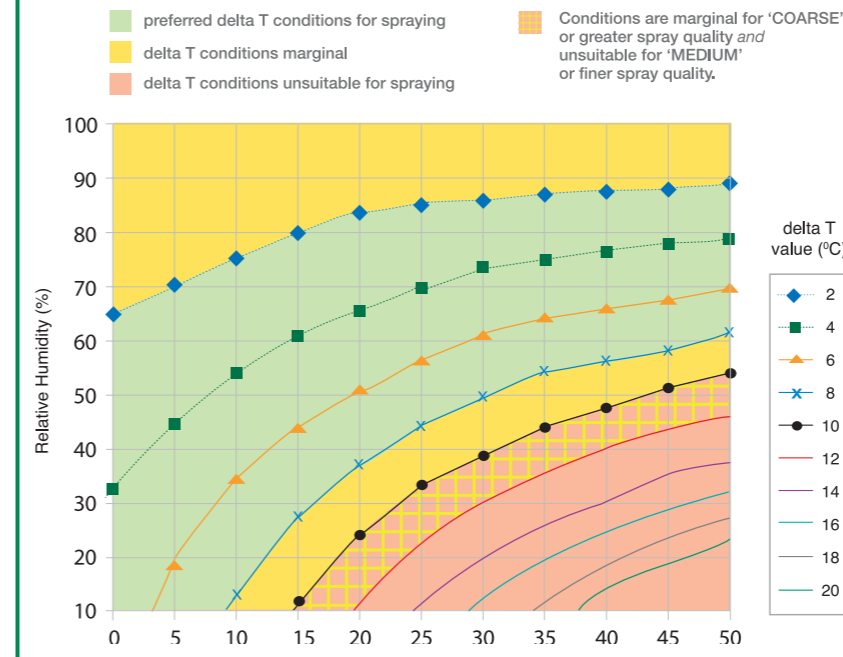
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ACTIVE/PRODUCT	WATER MANAGEMENT				
	HARDNESS	BICARBONATE	SALINITY	MUDDINESS	ALKALINITY
2,4-D ester (Estericide® Xtra)	Liase				
2,4-D amine (Amicide® Advance 700)	Liase				LI 700®
Chlorosulfuron (Lusta®)	Liase				
Clethodim (Sequence®)		Liase			
Clopyralid (Archer®)	Liase				LI 700
Dicamba Amine (Kamba® M)	Liase				LI 700
Diclofop-methyl (Nugress® 375)					
Diflufenican (Agility®)					LI 700
Diflufenican/MCPA (Nugrex)	Liase				LI 700
Diuron	Liase				LI 700
Diuron + 2,4-D amine (Amicide Advance 700)	Liase				LI 700
Diuron + MCPA (Agritone 750)	Liase				LI 700
Roundup® DST	Liase				LI 700
Glypha. (Credit® + Bonus)					
Glypha. (Roundup® Attack)	Liase				
Agritone 750 amine	Liase				LI 700
LVE Agritone ester	Liase				
Diquat/Paraquat (Revolver®)					
Simazine 900 DF	Liase				
Tepraloxidim		Liase			
Tralkoxydim		Liase			
Chlorpyrifos EC					LI 700
Alpha Cypermethrin EC (Fastac Duo® ¹)					LI 700
Dimethoate EC					LI 700

Recommendations depend upon the severity of the problem.

LI 700 Can be managed with LI 700
Water should be avoided
Liase Can be managed with Liase
Generally no problem

Selecting the right delta T conditions for spraying



Water management with LI 700® and Liase

Managing droplet size with LI 700

Several independent studies have shown that LI 700 decreases the number of undesirable very fine droplets that are prone to drift. In contrast, most commonly used non-ionic surfactants increase the number of droplets in the fine spectrum and therefore increase the risk for drift.

LI 700 will not eliminate drift but it will reduce the potential for drift. Nozzles have a greater influence on droplet size than surfactants but when using an adjuvant in the spray tank LI 700 is part of the solution rather than part of the problem.

Managing high pH with LI 700

Most pesticides perform best in slightly acidic conditions. This can create problems when the water used for spray applications is alkaline (for example, majority of bore water sources or water out of concrete tanks).

In alkaline water some chemicals are broken down rapidly by irreversible chemical reactions, commonly referred to as alkaline hydrolysis. A most alarming example of rapid breakdown is the insecticide Dimethoate.

Half of the product is irreversibly destroyed in an alkaline spray solution of pH 9 in only 45 minutes.

Minimising breakdown can be achieved by acidifying the spray solution with 100 mL/100 L of LI 700.

LI 700 acidifying properties do not only protect many pesticides from chemical degradation in the tank, it also provides a more favourable pH environment on the leaf surface for chemical uptake. Its multi-functional chemistry opens cuticle pathways in the waxy layer of the plant and increases penetration and translocation to the target site.

Managing hardness with Liase

The other main factor influencing water quality is hardness. Hardness is caused by abundance of positively charged metal ions in water, usually Ca⁺⁺. These ions can bind strongly to negatively charged weak acidic pesticides such as glyphosate and hinder their performance.

The addition of Liase at 2 L/100 L can overcome these problems. Liase is a high quality aqueous solution of ammonium sulphate. The sulphate ions will bind strongly with Ca⁺⁺ ions and effectively take them out of solution.

Drift reduction



Droplet management with LI 700

Scene from Nufarm videoclip. Application with TeeJet® XR 11002 nozzles at 2 bar. The bike on the left is spraying a solution containing 0.1%v/v LI 700. The bike on the right is spraying a solution containing 0.2%v/v non-ionic wetter.



XR02, 2.5 bar: Difference between non-ionic surfactant and LI 700

TANK MIXING ORDER		
	FORMULATION	EXAMPLE
1	60-80% of required water volume	
2	Water conditioners	LI 700®, Liase, Activator® ³ (anti-foaming)
3	Wettable/dispersible powders	Associate®, Lusta®
4	WDG's dry flowable granules	Diuron 900DF
5	Flowables (suspension concentrates)	Flowable Diuron, Regent® ¹ 200SC
6	EC's (emulsifiable concentrates)	Fastac® ¹ Duo, TriflurX®
7	Water soluble concentrates	Amicide Advance 700, Roundup Attack
8	Adjuvants/Wetter	Bonza®, Chemwet 1000

BROADCAST AND TURF APPLICATIONS

L/HA 50CM NOZZLE SPACING

Bar	Flowrate	6 km/h	8 km/h	10 km/h	12 km/h	14 km/h	15 km/h	16 km/h	17 km/h	18 km/h	20 km/h	22 km/h	24 km/h	25 km/h	26 km/h	28 km/h	30 km/h
2	0.33	66	49	39	33	28	26	25	23	22	20	18	16	16	15	14	13
3	0.4	80	60	48	40	34	32	30	28	27	24	22	20	19	18	17	16
4	0.46	92	69	55	46	40	37	35	32	31	28	25	23	22	21	20	18
5	0.52	104	78	62	52	44	41	39	36	35	31	28	26	25	24	22	21
6	0.57	114	85	68	57	49	45	43	40	38	34	31	28	27	26	25	23
7	0.61	122	92	73	61	52	49	46	43	41	37	33	31	29	28	26	24
8	0.65	130	98	78	65	56	52	49	46	43	39	35	33	31	30	28	26
9	0.69	138	104	83	69	59	55	52	49	46	42	38	35	33	32	30	28
10	0.73	146	110	88	73	63	59	55	52	49	44	40	37	35	34	32	29
2	0.49	98	74	59	49	42	39	37	35	33	30	27	25	24	23	21	20
3	0.6	120	90	72	60	51	48	45	42	40	36	33	30	29	28	26	24
4	0.69	138	104	83	69	59	55	52	49	46	42	38	35	33	32	30	28
5	0.78	156	116	93	78	66	62	58	55	52	47	42	39	37	36	33	31
6	0.85	170	127	102	85	73	68	64	60	57	51	46	42	41	39	37	34
7	0.92	184	138	110	92	79	73	69	65	61	55	50	46	44	42	40	37
8	0.98	196	147	118	98	84	79	74	69	65	59	54	49	47	45	42	39
9	1.04	208	156	125	104	89	83	78	74	69	63	57	52	50	48	45	42
10	1.1	220	164	131	110	94	87	82	77	73	66	60	55	52	50	47	44
2	0.65	130	98	78	65	56	52	49	46	43	39	35	33	31	30	28	26
3	0.8	160	120	96	80	69	64	60	56	53	48	44	40	38	37	35	32
4	0.92	184	139	111	92	79	74	70	65	61	56	50	46	44	43	40	37
5	1.03	206	155	124	103	89	83	78	73	69	62	56	52	50	48	45	41
6	1.13	226	170	136	113	97	91	85	80	75	68	62	57	54	52	49	45
7	1.22	244	183	147	122	105	98	92	86	81	74	67	61	59	57	53	49
8	1.31	262	196	157	131	112	105	98	92	87	79	71	65	63	60	56	52
9	1.39	278	208	166	139	119	111	104	98	93	83	75	69	66	64	60	55
10	1.46	292	219	175	146	125	117	110	103	97	88	80	73	70	67	63	58
2	0.82	164	122	98	82	70	65	61	58	55	49	45	41	39	38	35	33
3	1	200	150	120	100	86	80	75	71	67	60	55	50	48	46	43	40
4	1.15	230	173	138	115	99	92	87	81	77	69	63	58	55	53	50	46
5	1.29	258	194	155	129	111	103	97	91	86	78	70	65	62	60	56	52
6	1.41	282	212	170	141	121	113	106	100	94	85	77	71	68	65	61	57
7	1.53	306	229	183	153	131	122	115	108	102	92	83	76	73	70	66	61
8	1.63	326	245	196	163	140	131	123	115	109	98	89	82	78	75	70	65
9	1.73	346	260	208	173	148	139	130	122	115	104	95	87	83	80	74	69
10	1.83	366	274	219	183	157	146	137	129	122	110	100	91	88	84	79	73
2	0.98	196	147	118	98	84	79	74	69	65	59	54	49	47	45	42	39
3	1.2	240	180	144	120	103	96	90	85	80	72	65	60	58	55	52	48
4	1.39	278	208	166	139	119	111	104	98	93	83	75	69	66	64	60	55
5	1.55	310	232	186	155	133	124	116	109	103	93	85	77	74	72	67	62
6	1.7	340	255	204	170	145	136	128	120	113	102	93	85	82	78	73	68
7	1.83	366	275	220	183	157	147	138	129	122	110	100	92	88	85	79	73
8	1.96	392	294	235	196	168	157	147	138	131	118	107	98	94	90	84	78
9	2.08	416	312	249	208	178	166	156	146	139	125	113	104	100	96	89	83
10	2.19	438	329	263	219	188	175	165	155	146	132	120	110	105	101	94	88
2	1.31	262	196	157	131	112	105	98	92	87	79	71	65	63	60	56	52
3	1.6	320	240	192	160	137	128	120	113	107	96	87	80	77	74	69	64
4	1.85	370	277	222	185	158	148	139	131	123	111	101	92	89	85	79	74
5	2.07	414	310	248	207	177	165	155	146	138	124	113	103	99	95	89	83
6	2.26	452	339	272	226	194	181	170	160	151	136	124	113	109	105	97	91
7	2.44	488	367	293	244	209	195	184	172	163	147	133	122	117	113	105	98
8	2.61	522	392	313	261	224	209	196	184	174	157	142	131	125	120	112	104
9	2.77	554	416	333	277	238	222	208	196	185	167	151	139	133	128	119	111
10	2.92	584	438	351	292	250	234	219	206	195	176	160	146	140	135	125	117

NOTE: COLOUR CODING FOR NOZZLE SIZES ARE NOT RELATED TO COLOUR CODING FOR SPRAY QUALITIES

Nozzle spacing	25 cm spacing	30 cm spacing	35 cm spacing	40 cm spacing	45 cm spacing
Conversion factor	2	1.66	1.43	1.25	1.11

This 50 cm nozzle spacing table can still be used for booms with different nozzle spacing by using the above conversion factors. For example, if pressure and speed are given, the L/ha value for 30 cm spacing can be calculated by multiplying the given L/ha table value by 1.66. And the other way around. For example, a grower wants to use 80 L/ha. His boom nozzle spacing is 30 cm. To use this table he needs to divide 80 L/ha by the 30 cm conversion factor (= 1.66). 80 L/ha / 1.66 = 48.2 L/ha = a 48.2 L/ha value in this 50 cm spacing table reflects a 80 L/ha value for 30 cm spacing.

Flow Rate

$$\text{L/min/nozzle} = \frac{\text{L/ha} \times \text{km/h} \times \text{W(m)}}{600}$$

Example
A Farmer wants to spray 70 L/ha, drive with a speed of 18 km/h and his boom has a nozzle spacing of 50 cm:
70 L/ha x 18 km/h x 0.5 m ÷ 600 = 1.05 L/min

To do so he needs to use a nozzle that delivers 1.05 L/min. He has several options, for example, he could use an 025 nozzle size at 3.5 bar or an 02 size at 5.5 bar (see table).

L/min/nozzle = nozzle flow rate in litre per minute
L/ha = water application rate per hectare
Km/h = driving speed
W = Width of nozzle spacing in m
600 = constant

Travel Speed

$$\text{Speed (km/h)} = \frac{\text{Distance (m)} \times 3.6}{\text{Time (sec)}}$$

For accurate application it is important to calibrate the speed of the tractor. An easy way to do so is to drive in the gear the application will be done in, measure the time it takes to travel 100 m and apply this simple formula. For example, it takes the farmer 20 sec to drive 100 m. His application speed is 18 km/h.
100m x 3.6 ÷ 20 sec = 18 km/h

Application Rate

$$\text{Application rate (L/ha)} = \frac{\text{L/min/nozzle} \times 600}{\text{km/h} \times \text{W}}$$

Spot/Band Spraying

For spot and band spraying, the same formula can be used but W (nozzle spacing) becomes the spray width divided by the number of directed nozzles.
For example: a grower directs 3 nozzles over a 1 m strip.
W = 1 m ÷ 3 nozzles = 0.33 m

Pressure

1 bar (bar) = 100 kilopascal (kPa)
= 14.5 pound per square inch (PSI)
1 pound per square inch (PSI) = 6.89 kilopascal (kPa)
= 0.0689 bar (bar)

As a rule of thumb, to double the flow through a nozzle, the pressure must be increased four times.

Spray quality


Nozzle selection is often based upon droplet size. The droplet size from a nozzle becomes very important when the efficacy of a particular crop chemical is dependent on coverage, or the prevention of spray leaving the target area is a priority.

VF	F	M	C	VC	XC
VERY FINE	FINE	MEDIUM	COARSE	VERY COARSE	EXTREMELY COARSE

NOTE: COLOUR CODING FOR SPRAY QUALITIES ARE NOT RELATED TO COLOUR CODING FOR NOZZLE SIZES


Spray quality classifications are based on BCPC specifications and are in accordance with ASAE Standard S-572 at the date of printing. Classifications are subject to change. An important point to remember when choosing a spray nozzle that produces a droplet spectra in one of the six categories, is that one nozzle can produce different droplet spectra classifications at different pressures. A nozzle might produce MEDIUM droplets at low pressures, while producing FINE droplets as pressure is increased. Note: Always double check your application rates.

Conventional



agrotop TipCap

	BAR					
	1.5	2	2.5	3	3.5	4
TCP 11001	VF	VF	VF	VF	VF	VF
TCP 110015	F	VF	VF	VF	VF	VF
TCP 11002	F	F	F	F	F	F
TCP 110025	F	F	F	F	F	F
TCP 11003	F	F	F	F	F	F
TCP 11004	F	F	F	F	F	F




ALBUZ® AXI 110

UPGRADE TO CERAMIC


	BAR				
	1.5	2	2.5	3	4
AXI 110015	F	F	F	F	F
AXI 11002	F	F	F	F	F
AXI 110025	M	M	M	M	F
AXI 11003	M	M	M	M	M
AXI 11004	M	M	M	M	M

Low Drift



Turbo TeeJet®

	Bar							
	1.5	2	2.5	3	3.5	4	4.5	5
TT11001	M	M	M	F	F	F	F	F
TT110015	C	M	M	M	M	M	F	F
TT11002	C	C	M	M	M	M	M	M
TT110025	C	C	C	M	M	M	M	M
TT11003	C	C	C	C	M	M	M	M
TT11004	C	C	C	C	C	M	M	M




ALBUZ® ADI 110

UPGRADE TO CERAMIC


	BAR				
	2	2.5	3	3.5	4
ADI 11001	M	M	M	F	F
ADI 110015	M	M	M	M	M
ADI 11002	M	M	M	M	M
ADI 11003	C	M	M	M	M
ADI 11004	VC	C	C	C	C

Low Pressure Air Induction



agrotop AirMix®

	Bar								
	2	2.5	3	3.5	4	4.5	5	5.5	6
AM11001	M	M	M	M	F	F	F	F	F
AM110015	XC	VC	C	C	C	C	C	C	M
AM11002	C	C	C	C	M	M	M	M	M
AM110025	VC	C	C	C	C	C	M	M	M
AM11003	VC	VC	C	C	C	C	C	C	M
AM11004	VC	VC	C	C	C	M	M	M	M



ALBUZ® CVI 110

UPGRADE TO CERAMIC

	BAR						
	2	2.5	3	3.5	4	4.5	5
CVI 110015	C	C	C	C	C	C	C
CVI 11002	C	C	C	C	C	C	M
CVI 11							