

DOES KOMBO 950[®] LF PROVIDE ENOUGH AMS?

The simple answer is YES...for the majority of situations. Many agronomists ask, how can KOMBO 950[®] LF deliver equivalent efficacy compared to an LI 700 type adjuvant at 0.25% + Bagged AMS at 0.8% when KOMBO 950[®] LF at 0.5% is only delivering 0.4% AMS into the spray solution (i.e. half the amount)? The simple answer is that the 0.8% rate of AMS is way more than is required in most situations to soften hard water. This 0.8% rate relates to the amount of AMS required to ensure compatibility between Glyphosate and Triazines and does not relate at all to the amount of AMS required to soften the vast majority of hardness levels that farmers use as the water source for spraying.

This fact was highlighted by the GRDC in their Adjuvants Handbook 2012 edition on page 41. In this article they made reference to Syngenta trials that were carried out some years earlier. The article states “add enough AMS to treat the hardness in the water and then add extra for plant stimulation”.

HOW MUCH AMS IS REQUIRED TO TREAT HARD WATER?

This was proven in Syngenta laboratory trials as follows:

Water Hardness Level (CaCO ₃ ppm)	Syngenta Boost (AMS) Recommendation (fl oz/100 gal.)	Equivalent Amount of AMS Crystal (lbs per 100 gal.)
200	32 fl oz / 100 gal.	.09 lbs / 100 gal.
300	48 fl oz / 100 gal.	1.30 lbs / 100 gal.
400	67.79 fl oz / 100 gal.	1.74 lbs / 100 gal.
500	80 fl oz / 100 gal.	2.17 lbs / 100 gal.
600	96 fl oz / 100 gal.	2.60 lbs / 100 gal.
700	112 fl oz / 100 gal.	3.04 lbs / 100 gal.
800	128 fl oz / 100 gal.	3.48 lbs / 100 gal.
900	144 fl oz / 100 gal.	3.91 lbs / 100 gal.
1000	160 fl oz / 100 gal.	4.35 lbs / 100 gal.
1250	200.30 fl oz / 100 gal.	5.44 lbs / 100 gal.
1875	300.16 fl oz / 100 gal.	8.15 lbs / 100 gal.
2500	400 fl oz / 100 gal.	10.87 lbs / 100 gal.

FROM THIS WORK, THE CONCLUSION WAS AS FOLLOWS:

AMOUNT OF AMS CRYSTAL REQUIRED TO SOFTEN 1PPM OF TOTAL WATER HARDNESS = 0.00417 lbs/100 gal.

Therefore, the correct use rate formula to supply sufficient AMS crystal to soften hard water is as follows:

AMOUNT OF AMS CRYSTAL REQUIRED (lbs/100 gal.) = (TWH MEASURED AS CaCO₃ in ppm) x 0.5

HOW MUCH AMS IS REQUIRED FOR PLANT STIMULATION?

It is well accepted that AMS is not just used to soften hard water. It is important to have some Ammonium ions available in the spray solution that are not involved in protecting the Glyphosate molecule from the free Calcium ions in the hard water. These free ammonium ions act as a “nitrogen hit” on the leaf surface, thereby assisting with herbicide uptake.

In all replicated trials for APVMA registration of **KOMBO 950[®] LF** the TWH in the spray water was fixed at 500ppm measured as CaCO₃. In all trials the rates of **KOMBO 950[®] LF** tested were 0.25%, 0.5%, 0.75% and 1.0%. No improved efficacy was achieved at any of the rates above 0.5%, but improved efficacy was observed using 0.5% as opposed to 0.25%. From this work we were able to calculate the amount of AMS that was required for plant stimulation as follows:

From the Syngenta trials the theoretical amount of AMS required to soften this water was 2.09 lbs / 100 gal. (i.e. 500ppm x 0.5).

At 0.5% dilution rate **KOMBO 950[®] LF** delivers 400g/100L of active AMS into the spray solution.

Therefore, our conclusion was that the amount of AMS required for plant stimulation was 1.25 lbs/100 gal.

(i.e. 0.88 lbs - 0.55 lbs = 0.33 lbs).

From this work we conclude that the formula for the total amount of AMS required to both soften hard water and also provide plant stimulation is as follows:

**TOTAL AMS CRYSTAL REQUIRED (g/100L) =
AMOUNT TO SOFTEN WATER HARDNESS
+ AMOUNT FOR PLANT STIMULATION
= TWH X 0.5 + 150**

So for example, if TWH was 500ppm then amount of AMS crystal required = 500 x 0.5 + 150 = 3.33 lbs / 100 gal.

This is the precise amount of AMS that **KOMBO 950[®] LF** delivers to the spray solution at a dilution rate of 0.5%, hence we fully back **KOMBO 950[®] LF** up to 500ppm of TWH to deliver sufficient AMS to soften this water while still making available sufficient free ammonium ions for plant stimulation.

How do I calculate the correct use rate of KOMBO 950[®] LF based my TWH?

RATE OF **KOMBO 950[®] LF** (g/100L) = (TWH measured as CaCO₃ in ppm x 0.5 + 150)/0.8

For example,

1. If TWH was 500ppm, then rate of **KOMBO 950[®] LF** = (500 x 0.5 + 150) /0.8 = 4.17 lbs.
2. If TWH was 100ppm, then rate of **KOMBO 950[®] LF** = (100 x 0.5 + 150) /0.8 = 2.09 lbs.

COMPATIBILITY WITH NON-GLYPHOSATE BASED HERBICIDES:

KOMBO 950® LF is physically compatible with but not limited to the following Non -Glyphosate based herbicide active ingredients:

2, 4-D Ester | 2, 4-D Amine | Oxyfluorfen |
Carfentrazone | Metsulfuron | Chlorsulfuron |
Triasulfuron | Triclopyr | Fluroxypyr

TRIAL SUMMARY

Glyphosate Efficacy Trials:

Please note:

1. The spray water used in all 6 trials was set at pH 8.0 and a TWH of 500ppm (measured as CaCO₃).
2. Higher rates of KOMBO 950® LF (6.26 lbs. / 100 gal. and 8.35 g / 100 gal.) were tested in all trials but did not provide improved efficacy compared to the 4.17 lbs. / 100 gal. rate.

TRIAL 1: Young NSW, February 2008 | Hairy Panic (*Panicum capillare*)

No.	Treatment	Rate	% Brownout (15 DAT)	ANOVA (P=0.05, LSD)
1	Untreated		0.0	a
2	Roundup CT	6.84 fl oz/acre	70.0	bcd
3	Roundup CT KOMBO 950® LF	6.84 fl oz/acre 2.09 lbs/100 gal.	76.7	def
4	Roundup CT KOMBO 950® LF	6.84 fl oz/acre 4.17 lbs/100 gal.	78.3	efg
5	Roundup CT LI 700 AMS	6.84 fl oz/acre 2.09 lbs/100 gal. 6.68 lbs/100 gal.	81.7	efghi
6	Roundup CT Hotup	6.84 fl oz/acre 64 fl oz/100 gal.	68.3	bc

TRIAL 2: Narrabri NSW, July 2008 | Burr Medic (*Medicago polymorpha*)

No.	Treatment	Rate	% Brownout (21 DAT)	ANOVA (P=0.05, LSD)
1	Untreated		0.0	a
2	Roundup CT	6.84 fl oz/acre	33.3	bc
3	Roundup CT KOMBO 950® LF	6.84 fl oz/acre 2.09 lbs/100 gal.	43.3	bcdefg
4	Roundup CT KOMBO 950® LF	6.84 fl oz/acre 4.17 lbs/100 gal.	45.0	cdefgh
5	Roundup CT LI 700 AMS	6.84 fl oz/acre 32 fl oz/100 gal. 6.68 lbs/100 gal.	38.3	bcde
6	Roundup CT Hotup	6.84 fl oz/acre 64 fl oz/100 gal.	41.7	bcdefg

TRIAL 3: Narrabri NSW, July 2008 I
Annual Ryegrass (*Lolium rigidum*)

No.	Treatment	Rate	% Brownout (28 DAT)	ANOVA (P=0.05, LSD)
1	Untreated		0.0	a
2	Roundup CT	6.84 fl oz/acre	68.3	b
3	Roundup CT KOMBO 950® LF	6.84 fl oz/acre 2.09 lbs/100 gal.	80.0	bcdefg
4	Roundup CT KOMBO 950® LF	6.84 fl oz/acre 4.17 lbs/100 gal.	85.0	defg
5	Roundup CT LI 700 AMS	6.84 fl oz/acre 32 fl oz/100 gal. 6.68 lbs/100 gal.	85.0	defg
6	Roundup CT Hotup	6.84 fl oz/acre 64 fl oz/100 gal.	83.3	cdefg

TRIAL 4: Young NSW, December 2007 I
Goosefoot (*Chenopodium pumilio*)

No.	Treatment	Rate	% Brownout (7 DAT)	ANOVA (P=0.05, LSD)
1	Untreated		0.0	a
2	Roundup CT	13.68 fl oz/1 acre	40.0	b
3	Roundup CT KOMBO 950® LF	13.68 fl oz/1 acre 2.09 lbs/100 gal.	45.0	bcd
4	Roundup CT KOMBO 950® LF	13.68 fl oz/1 acre 4.17 lbs/100 gal.	51.7	cd
5	Roundup CT LI 700 AMS	13.68 fl oz/1 acre 32 fl oz/100 gal. 6.68 lbs/100 gal.	45.0	bcd
6	Roundup CT Hotup	13.68 fl oz/1 acre 64 fl oz/100 gal.	46.7	bcd

TRIAL 5: Young NSW, December 2007 I
Summer Grass (*Digitaria* spp)

No.	Treatment	Rate	% Brownout (7 DAT)	ANOVA (P=0.05, LSD)
1	Untreated		0.0	a
2	Roundup CT	13.68 fl oz/1 acre	66.7	bc
3	Roundup CT KOMBO 950® LF	13.68 fl oz/1 acre 2.09 lbs/100 gal.	85.0	cd
4	Roundup CT KOMBO 950® LF	13.68 fl oz/1 acre 4.17 lbs/100 gal.	93.3	d
5	Roundup CT LI 700 AMS	13.68 fl oz/1 acre 32 fl oz/100 gal. 6.68 lbs/100 gal.	63.3	b
6	Roundup CT Hotup	13.68 fl oz/1 acre 64 fl oz/100 gal.	66.7	bc

TRIAL 6: Narrabri NSW, December 2008 I
Awnless Barnyard Grass (*Echinochloa colona*)

No.	Treatment	Rate	% Brownout (20 DAT)	ANOVA (P=0.05, LSD)
1	Untreated		0.0	a
2	Roundup CT	13.68 fl oz/1 acre	45.0	cd
3	Roundup CT KOMBO 950® LF	13.68 fl oz/1 acre 2.09 lbs/100 gal.	53.3	def
4	Roundup CT KOMBO 950® LF	13.68 fl oz/1 acre 4.17 lbs/100 gal.	58.3	ef
5	Roundup CT LI 700 AMS	13.68 fl oz/1 acre 32 fl oz/100 gal. 6.68 lbs/1 gal.	61.7	f
6	Roundup CT Hotup	1.0L/ha 500ml/100L	38.3	bc

TRIAL SUMMARY

TRIAL 1: York WA, February 2017 I 4-6 leaf Paddy Melon (*Cucumis myriocarpus*)

Garlon Efficacy Trials:

Please note:

- The spray water used in all 3 trials was York town water which had a pH 7.8 and a TWH of 105ppm (measured as CaCO₃).
- All trials were conducted by Melissa Welsh & Andrew Wherrett from Living Farm York WA.

No.	Treatment	Rate	% Brownout (7 DAT)	% Brownout (16 DAT)	% Brownout (29 DAT)
1	Untreated		0 <i>f</i>	0 <i>f</i>	0 <i>g</i>
2	Garlon 755	1,094 fl oz/1 acre	49 <i>cd</i>	54 <i>d</i>	66 <i>cd</i>
3	Garlon 755 Liberate	1,094 fl oz/1 acre 32 fl oz/100 gal.	37 <i>e</i>	44 <i>e</i>	48 <i>f</i>
4	Garlon 755 Uptake	1,094 fl oz/1 acre 64 fl oz/100 gal.	59 <i>b</i>	74 <i>b</i>	77 <i>b</i>
5	Garlon 755 LI 700	1,094 fl oz/1 acre 2.09 lbs/100 gal.	44 <i>de</i>	53 <i>de</i>	53 <i>ef</i>
6	Garlon 755 Hasten	1,094 fl oz/1 acre 64 fl oz/100 gal.	61 <i>b</i>	68 <i>bc</i>	74 <i>bc</i>
7	Garlon 755 KOMBO 950® LF	1,094 fl oz/1 acre 4.17 lbs/100 gal.	61 <i>b</i>	67 <i>bc</i>	70 <i>bcd</i>
I.s.d.					
c.v.			6.5	6.3	6.4
<i>f</i> - prob.			<0.001	<0.001	<0.001

TRIAL 2: York WA, February 2017 I

<4 leaf Paddy Melon (*Cucumis myriocarpus*)

TRIAL 3: York WA, February 2017, Mintweed (*Salvia reflexa*)

No.	Treatment	Rate	% Brownout (7 DAT)	%	% Brownout (29 DAT)
1	Untreated		0 <i>f</i>	0 <i>d</i>	0 <i>e</i>
2	Garlon 755	1,094 fl oz/1 acre	53 <i>de</i>	64 <i>c</i>	76 <i>c</i>
3	Garlon 755 Liberate	1,094 fl oz/1 acre 32 fl oz/100 gal.	47 <i>e</i>	58 <i>c</i>	59 <i>d</i>
4	Garlon 755 Uptake	1,094 fl oz/1 acre 64 fl oz/100 gal.	69 <i>c</i>	81 <i>b</i>	86 <i>b</i>
5	Garlon 755 LI 700	1,094 fl oz/1 acre 32 fl oz/100 gal.	45 <i>e</i>	58 <i>c</i>	58 <i>d</i>
6	Garlon 755 Hasten	1,094 fl oz/1 acre 64 fl oz/100 gal.	59 <i>cd</i>	78 <i>b</i>	80 <i>bc</i>
7	Garlon 755 KOMBO 950® LF	1,094 fl oz/1 acre 4.17 lbs/100 gal.	64 <i>c</i>	78 <i>bc</i>	78 <i>bc</i>
I.s.d.					
c.v.			7.2	5.8	7.2
<i>f</i> - prob.			<0.001	<0.001	<0.001

No.	Treatment	Rate	% Brownout (7 DAT)	% Brownout (16 DAT)	% Brownout (29 DAT)
1	Untreated		0 <i>f</i>	0 <i>d</i>	0 <i>e</i>
2	Garlon 755	1,094 fl oz/1 acre	6 <i>e</i>	19 <i>c</i>	25 <i>cd</i>
3	Garlon 755 Liberate	1,094 fl oz/1 acre 32 fl oz/100 gal.	8 <i>de</i>	16 <i>c</i>	20 <i>d</i>
4	Garlon 755 Uptake	1,094 fl oz/1 acre 64 fl oz/100 gal.	13 <i>d</i>	23 <i>c</i>	29 <i>c</i>
5	Garlon 755 LI 700	1,094 fl oz/1 acre 32 fl oz/100 gal.	10 <i>de</i>	20 <i>c</i>	27 <i>c</i>
6	Garlon 755 Hasten	1,094 fl oz/1 acre 64 fl oz/100 gal.	7 <i>de</i>	23 <i>c</i>	36 <i>b</i>
7	Garlon 755 KOMBO 950® LF	1,094 fl oz/1 acre 4.17 lbs/100 gal.	11 <i>de</i>	31 <i>b</i>	40 <i>b</i>
I.s.d.				6.6	
c.v.			8.6	7.9	5.24
<i>f</i> - prob.			<0.001	<0.001	<0.001

SPRAY DRIFT WIND TUNNEL TRIALS

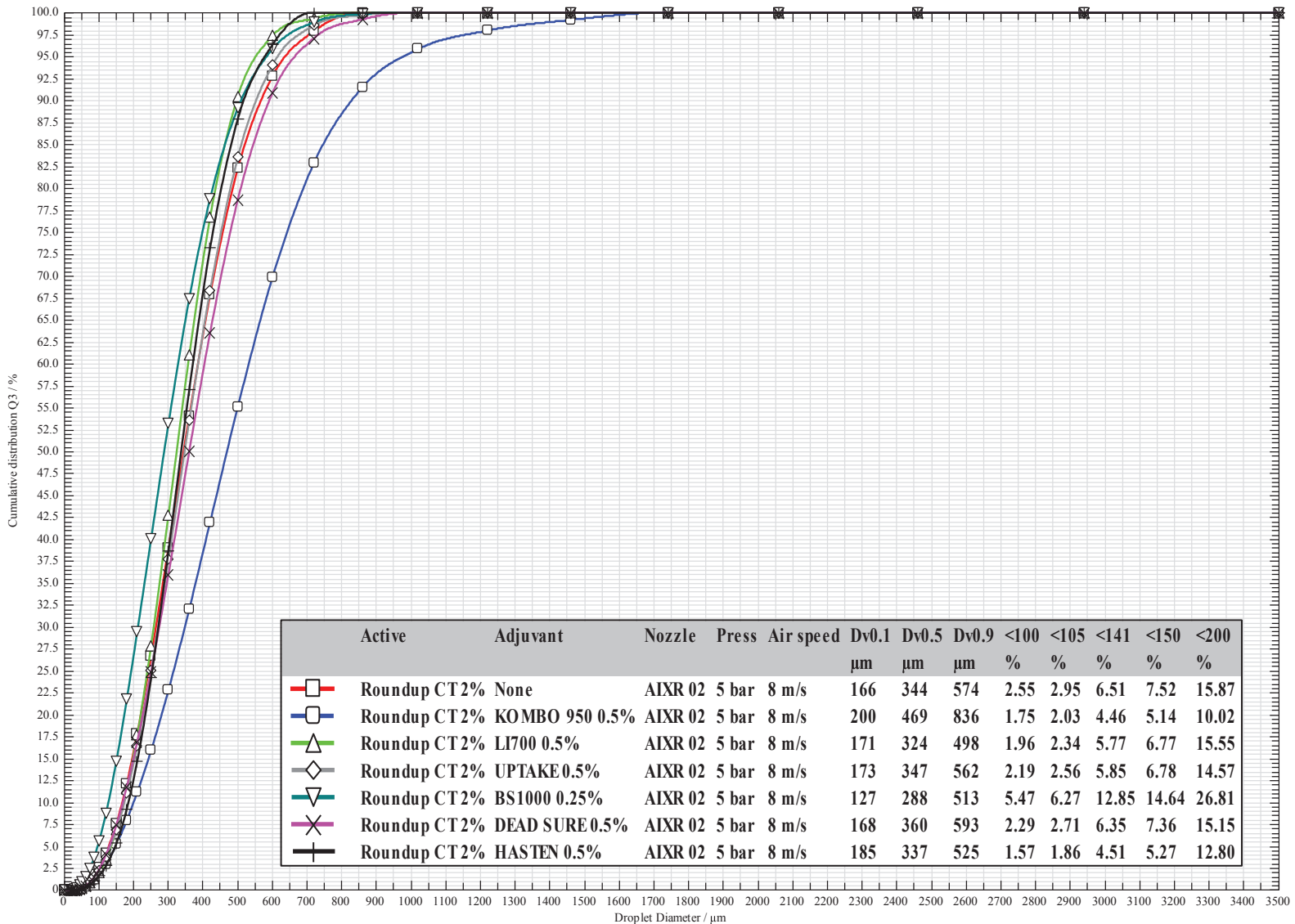
Please note:

1. These trials were conducted in a Wind Tunnel in October 2016, at The University of Queensland (Gatton Campus) by Dr Andrew J. Hewitt, PhD.
2. This was an atomization study conducted to measure the droplet size spectra produced by spraying tank mixtures containing Roundup CT with and without KOMBO 950® LF versus other popular adjuvants through various nozzles to simulate ground boom applications.
3. When compared to LI 700, Uptake, BS1000, Dead Sure and Hasten; KOMBO 950® LF was clearly the leader for coarsening the sprays as shown by an increase in the median droplet diameters, which would clearly reduce drift potential under field conditions.

TRIAL 1 : Droplet Size Spectra for Applications of Roundup CT with/without Different Adjuvants

Through AIXR at 5 bar

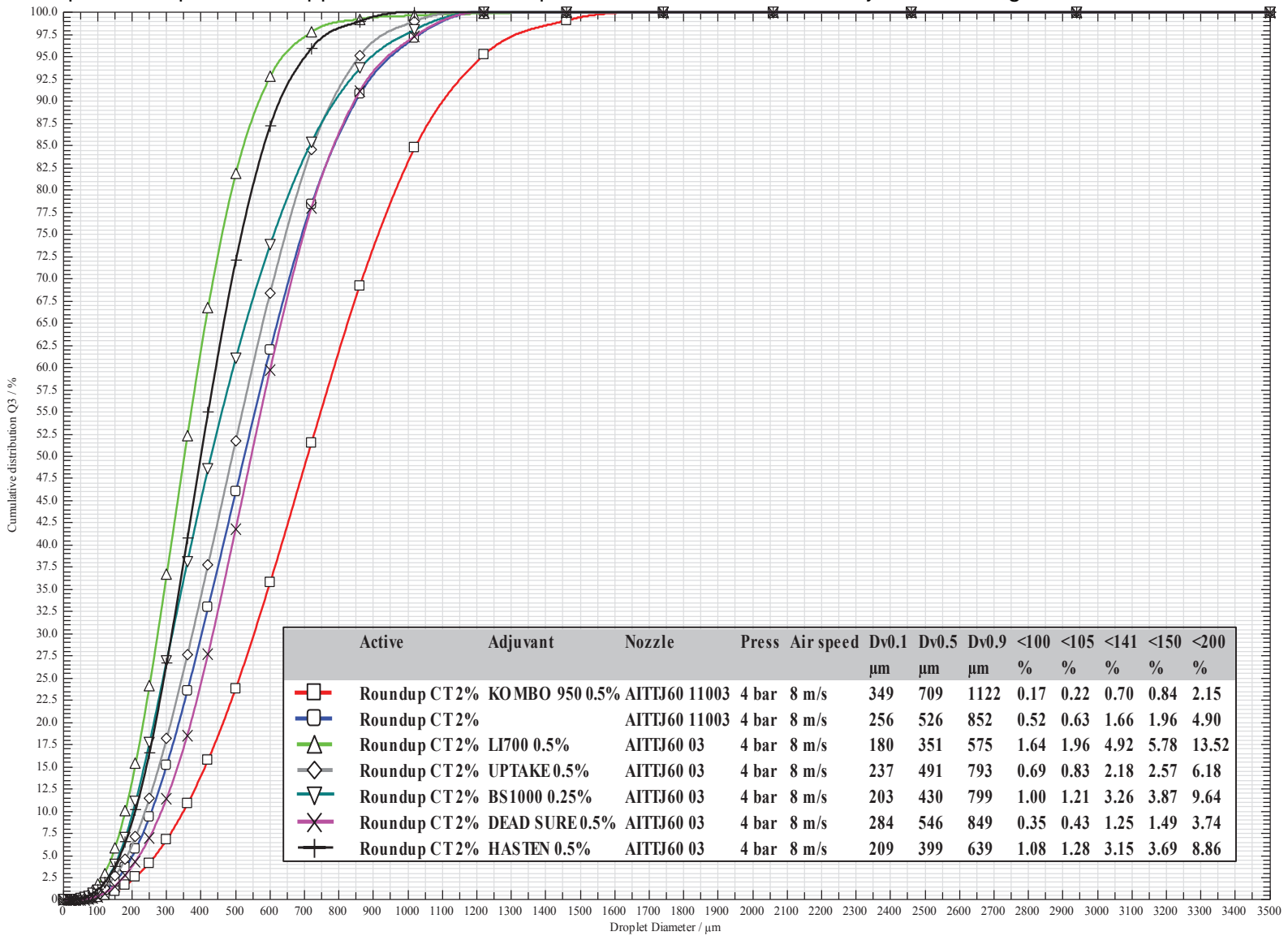
Droplet Size Spectra For Applications Of Roundup CT With / Without Different Adjuvants Through AIXR At 5 Bar



SPRAY DRIFT WIND TUNNEL TRIALS

TRIAL 2 : Droplet Size Spectra for Applications of Roundup CT with/without Different Adjuvants Through AITTJ60 4 bar

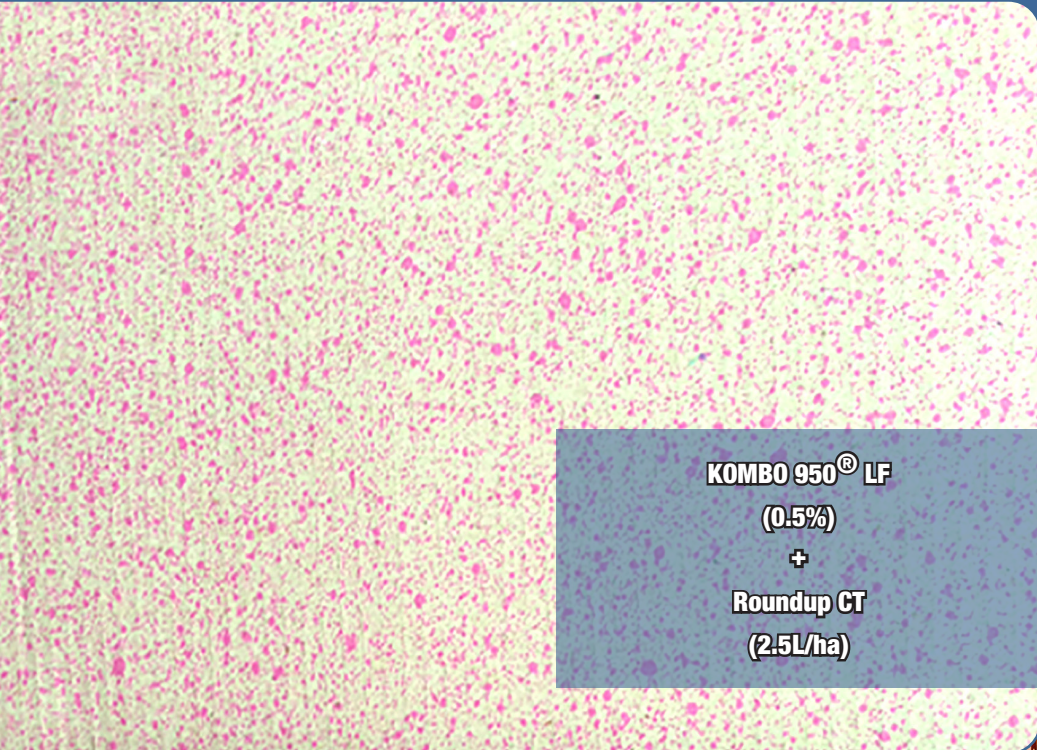
Droplet Size Spectra For Applications Of Roundup CT With/ Without Different Adjuvants Through AITTJ60 4 Bar



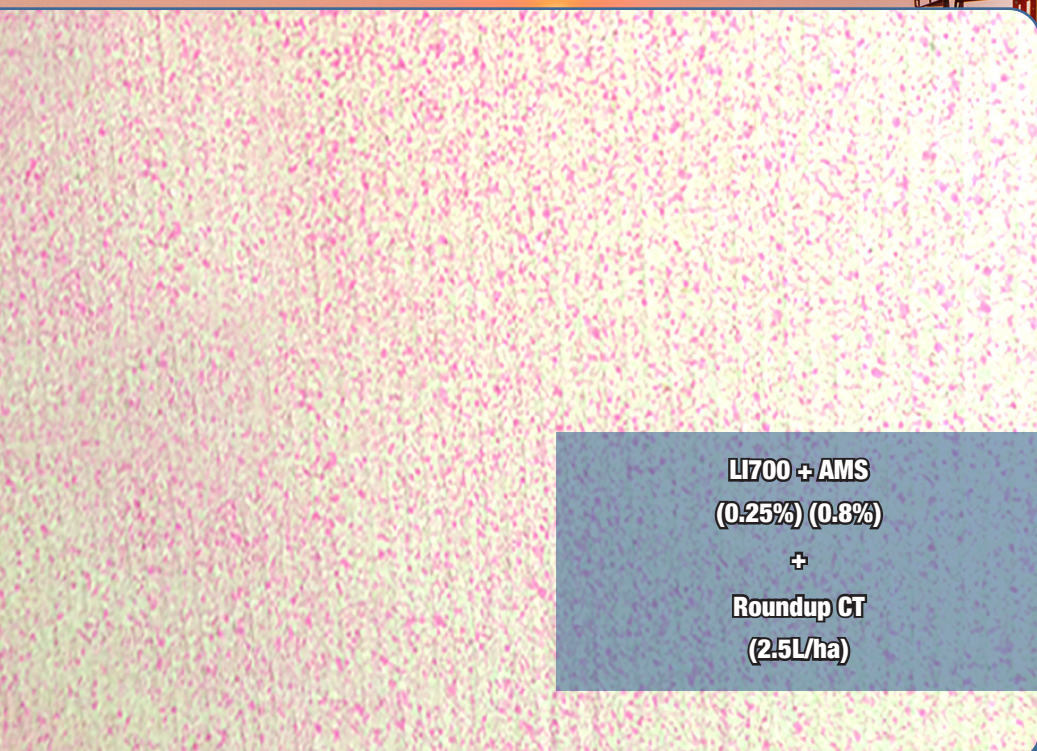
SPRAY DROPLET PATTERN TRIAL

Please note:

1. Trial conducted August 2014, Red dye sprayed over cardboard sheets using ATV.
2. Boom height was 70 cm - Nozzles were AirMix Flat Fan 110-01 - Pressure 4 bar (60 psi) - Water Rate 110 L/ha



KOMBO 950[®] LF
(0.5%)
+
Roundup CT
(2.5L/ha)



LI700 + AMS
(0.25%) (0.8%)
+
Roundup CT
(2.5L/ha)

